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**Achieving Gender Equality in Learning Outcomes:
Evidence from a non-formal education program in Bangladesh**

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Abstract

Non-formal education (NFE) programs have been a long standing approach to educating marginalized children, especially girls, across the developing world. Though such programs provide girls expanded access to learning opportunities, the evidence of whether enhanced access actually leads girls to achieve on par with boys remains limited. I analyze the academic achievement of girls relative to boys in a sample of 1,203 children participating in a NFE program in rural Bangladesh, known as SHIKHON which means “learning” in Bengali. I find strong correlational evidence that gender is not significantly associated with achievement; on average, girls achieve on par with boys across four subject areas including literacy (English and Bangla), numeracy, science and social science.

Key words: non-formal education; Bangladesh; girls’ education; gender parity; fixed effects; hierarchical linear modeling (HLM)

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1. Introduction

Educating girls has been long-standing focal priority for developing regions across the globe. There is overwhelmingly positive empirical evidence that investing in girls' education, particularly across developing countries in Asia, Africa and Latin America, leads to numerous private and social benefits that range from decreased fertility and infant mortality rates to increased economic growth and productivity (Herz & Sperling, 2004; King & Hill, 1997; Schultz, 2002; Tembon & Fort, 2008). With strong international support for investments in educating girls coupled with compelling empirical evidence of its payoffs, substantial progress in achieving gender parity in terms of access to education has become a reality. In fact, a ubiquitous "female schooling advantage" now exists throughout the developing world with girls' participation in schooling exceeding that of boys (Grant & Behrman, 2010, p. 73). However, despite mounting evidence on the educational progress that girls have achieved over the past two decades, there are two key gaps in the extant literature on the progress made towards achieving educational parity for girls.

First, the bulk of the attention on educational progress for girls has focused almost exclusively on the role of the formal education sector. In addition to the formal sector's role in promoting the educational rights of girls, non-formal education (NFE) plays an equally important and critical role in ensuring that girls are provided with a high quality and equitable education. Non-formal education programs, such as Mexico's Consejo Nacional de Fomento Educativo (National Council for Education Development, CONAFE), Complementary Basic Education in Tanzania (COBET), and the Bangladesh Rural Advancement Committee's (BRAC) non-formal education program offer a parallel track of education (Hoppers, 2006, p. 24) to the most vulnerable and marginalized childhood populations, including girls. Non-formal schools provide education that children would have received in the formal sector, but it is delivered in an accelerated format typically using child-centered approaches in multi-age one room schools led by local community women. Given that

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these schools have an explicit mission to educate marginalized children, including girls, they have undoubtedly played a critical role in ensuring that girls are educated in fair and equitable ways.

Despite the longstanding presence of non-formal schools across the developing world dating back to the 1970's (Coombs, 1976), the evidence examining how girls academically achieve in such settings is relatively limited. In fact, there are only handful studies that have examined gender explicitly in the context of NFE programs; and among those studies, it is inconclusive whether or not females achieve at levels comparable to that of their male counterparts (Chowdhury, Nath, & Choudhury, 2003; Nath, Sylva, & Grimes, 1999; Sukontamarn, 2003).

Second, while it is well known that girls have achieved parity in terms of both schooling progression and participation, we have limited knowledge about whether or not that parity translates into actual learning and achievement outcomes as well (Grant & Behrman, 2010). Though Grant and Behrman (2010) do acknowledge an unequivocal “female schooling advantage” across the six developing regions comprising 38 countries in their study, they also note that there is, “...little doubt that gender bias remains” (Grant & Behrman, 2010, p. 87). As they acknowledge, equality in participation does not necessarily translate into equality in outcomes. This is due to differences in how girls are treated relative to boys within schools as well as the types of schools that girls attend (Grant & Behrman, 2010, p. 87). Grant and Behrman's (2010) conclusion is extremely salient given persistent and systemic discrimination against women and girls, particularly in developing country settings (United Nations Children's Fund, 2003, 2006).

My study explicitly addresses these two gaps, contributing to a deeper understanding of gender and education. First, I situate my study in the context of a unique and large-scale NFE program in Bangladesh known as SHIKHON, which means “learning” in the Bengali language. Since 2007, the SHIKHON program has educated over 155,000 children, aged 7-14, through 5,180 non-formal primary education schools across rural Bangladesh. Second, I focus on achievement outcomes of

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girls in SHIKHON schools across a set of nationwide core grade 5 subject areas including literacy (English and Bangla), numeracy, science and social science. In my quantitative study, I analyze data collected on over 1,200 SHIKHON students and ask: How do girls achieve relative to boys overall and across each grade 5 subject area?

I structure the rest of my paper as follows: in Section 2, I briefly review relevant background information on the non-formal education sector and discuss how NFE programs can promote girls' education. I also describe the context and setting for my study, the SHIKHON non-formal education program in Bangladesh, and review prior empirical evidence of the gender gap in performance within NFE programs in Bangladesh. In Sections 3 and 4, I describe my data and outline my methods. In Section 5, I present my results and in Section 6, I close with a discussion of my study limitations and the substantive implications of my findings.

2. Background and context

2.1 Non-formal education (NFE)

The term “non-formal education” (NFE) has been used broadly to describe education that is typically offered outside of the formal compulsory education sector (Coombs, 1976; Hoppers, 2006; Romi & Schmida, 2009; United Nations Educational Scientific Cultural Organization, 1997). NFE is also used to describe vocational and/or technical education focusing on skill development, adult literacy (Hoppers, 2006) as well as education that occurs throughout the life course (Rogers, 2005; UNESCO, 1997); however, in this paper I use the term non-formal education NFE as it applies to the primary schooling level in developing country contexts.

NFE is often conceived of and described as a “shadow” or “second chance” (Hamadache, 1991, p. 119) system that parallels—but is not entirely separate from (Coombs, 1976, p. 282) and often intertwines with—the formal education system (Hoppers, 2006, p. 24). Also, NFE provides

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children with an “alternative route” (United Nations, 2004, p. 45) to education. Though there is no one definitive or consistent definition of non-formal education, there are several features that distinguish non-formal education from the formal education system. These distinguishing features can be divided roughly into the broader goals and aims of NFE and the means through which education is managed and delivered in NFE programs.

The primary aim of NFE is to educate children that are not currently served by the formal education sector. In this respect, NFE is *compensatory*, making up for limitations inherent in the formal schooling sector (Hamadache, 1991, p. 113). In addition, NFE aims to be *socially inclusive* (Hoppers, 2006, p. 51), by providing educational opportunities for children who have been left out of the formal schooling system due to myriad factors, which can include, but are not limited to their gender, disability status, race/ethnicity, socioeconomic status and religious beliefs. Furthermore, children tend to be marginalized from the formal school sector because they live in geographically remote areas and thus lack access to school. Therefore, in contrast to the formal compulsory education sector, NFE programs often are intentionally designed to selectively target specific groups of children rather than children who are simply eligible for school due to their age (Hamadache, 1991).

Given the marginalized populations that NFE programs traditionally target, NFE seeks to offer learning opportunities that are adaptable and flexible to the specific needs and schedules of learners. For example, unlike formal schooling, NFE schools do not follow a strict schedule and classes may be scheduled around children’s work needs (Ardt et al., 2005). NFE programs also tend to be directly administered by non-governmental organizations rather than the national government and often emphasize parental and community involvement (Dang & Sarr, 2011, p. 2). Though many NFE schools follow a curriculum that mirrors that of the formal schooling sector, NFE programs ensure that teachers—many who are local, female and part-time volunteers—use learner-centered

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approaches that engage students with materials relevant to students' own individual backgrounds and social contexts (Hamadache, 1991).

2.2 How non-formal education (NFE) programs can promote girls' education

Through the efforts of UNESCO's Education for All (EFA) movement, gender parity in education across developing the world has been a key element of policy discussions among stakeholders engaged in the educational sector, including multi-lateral aid organizations and non-governmental organizations (NGO's) (UNESCO, 2014). According to the 2013/4 EFA monitoring report, due to systematic marginalization of women both culturally and politically, gender parity will not be reached before 2086 for particular low income regions such as sub-Saharan Africa (UNESCO, 2014). However, NFE programs have been effective in improving equity in access and participation in South and Southeast Asia (Loh-Ludher, 2007) due to their ability to operate outside the constraints of formal education systems.

Importantly, the structure of NFE programs provides high leverage opportunities to support and promote girls' education. For example, given that non-formal schools are often located in local villages, the distance that girls must travel to schools is greatly reduced. This has been shown to effectively promote girls' enrollment since locating schools closer to girls reduces both the direct and opportunity costs of schooling (Gertler & Glewwe, 1992; King & Lillard, 1987; Lavy, 1996). Also, situating schools so they are more accessible can reduce the personal safety risks that girls may face while travelling to school (Sukontamarn, 2003, p. 3). In terms of NFE school staffing, NFE programs rely overwhelmingly on local females as teachers and there is compelling evidence suggesting that girls who have a female teacher tend to enroll at higher rates (Banerjee, Jacob, Kremer, Lanjouw, & Lanjouw, 2002; Banerjee, Kremer, Lanjouw, & Lanjouw, 2002); one reason why this might occur is that female teachers can serve as positive role models for girls (Mensch & Lloyd, 1998, p. 182). Finally, given that the NFE program curriculum is much more flexible versus

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that of formal schools, NFE programs have the latitude to develop and implement “girl friendly” curricula; a gender sensitive curriculum that NFE programs have the potential to provide can combat gender stereotyping typically found in a traditional school curricula (World Bank, 2012, p. 218).

2.3 The educational context of Bangladesh and the SHIKHON program

2.3.1 The educational context of Bangladesh

Over the past decade, Bangladesh has made considerable strides in improving enrollment rates in the formal primary education system with approximately 94% of all children enrolled in grades 1-5 (Bangladesh Bureau of Educational Information Statistics, 2012a). Yet, approximately 2 million children still remain out of the formal education system; nearly 45% of children drop out before completing grade 5 (BANBEIS, 2012b) while children residing in impoverished remote rural areas of the country are prevented from accessing education due to lack of schools. Systemic discrimination based upon disability status, ethnicity or gender further marginalizes many children, constraining their ability to participate in the formal education system. The Education for All (EFA) goal of providing free and compulsory education by 2015 for all children—irrespective of a child’s gender, difficult circumstances or ethnicity—underscores the critical importance of pursuing strategies to educate out of school children across Bangladesh (UNESCO, 2011).

As with other developing countries, Bangladesh has undertaken NFE to provide out of school children with a decent, free and comprehensive education. According to the government’s 2004 National Policy on Non-Formal Education, NFE is defined as:

“...a purposeful and systematically organized form of learning that generally occurs outside the formal educational institutions. It is designed to meet the learning needs of educationally disadvantaged persons of different ages and backgrounds, flexible in terms of organization, time and place and may cover basic and continuing educational programs to impart basic literacy, including life skills, work skills, general culture, and facilitates lifelong learning and enhancement of earning capabilities for poverty reduction. It ensures equity in access and human resource development, it

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may or may not follow a “ladder” system, and may be of varying duration.” (Ministry of Primary Mass Education, 2006, p. 4)

In achieving its vision of NFE, the government has relied critically upon non-government organizations and local community-based organizations to bring NFE programs to scale to achieve maximum impact on out of school children’s basic competency levels in literacy and numeracy. Moreover, the government has established partnerships with more than 136 organizations (Us-Sabur, 2007) to create and sustain the delivery of NFE in a locally responsive manner that supports the unique learning needs and challenges of young children who are marginalized due to their geographical location, ethnicity, gender and physical and/or mental disabilities. One innovative NFE program that has provided primary education to out of school children since 2007 is Save the Children’s SHIKHON Program.

2.3.2 The SHIKHON Program¹

The SHIKHON program—which means “learning” in Bangla—is a low-cost NFE program that recognizes not only the value in enhancing children’s access to education, but it offers children a *comprehensive, relevant and quality* primary education that they would have not otherwise received (Children, 2011). Since its inception in 2007, Save the Children’s SHIKHON NFE program has reached over 155,000 children, aged 7-14, throughout 5,180 one-room community schools across rural Bangladesh². The program, jointly funded by the European Commission, Dubai Cares and Chevron, is designed to target children who are either out of school and/or marginalized from the formal schooling system due to their disability status, ethnicity and/or gender.

The SHIKHON program is committed to achieving the following three results:

1. Increased access to cost effective non-formal primary education for out of school children

¹ The information in the section comes from a variety of unpublished internal working documents and reports that were developed by Save the Children, Bangladesh Country office.

² In comparison, the largest and most well established provider of NFE in Bangladesh over the past quarter century, the Bangladesh Rural Advancement Committee (BRAC), runs over 22,000 schools, serving 670,815 students (Bangladesh Rural Advancement Committee (BRAC), 2012).

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2. Increased quality of non-formal education for out of school children
3. Increased community and government partnerships to address educational needs of vulnerable children

The SHIKHON program specifically targets three regions (Figure 1) in Bangladesh: the Northeast, Southwest and Northwest. Within each of these regions remote rural villages, river islands (known as *chars*), seasonally inundated low-lying areas (known as *haors*) and coastal areas are highly prevalent; these geographic factors prevent children from accessing schools. Each region operates SHIKHON schools via one of three implementing partners who have a distinguished track record of supporting local development projects targeting the under-served in rural Bangladesh: (1) Friends in Village Development Bangladesh (FIVDB) (Sylhet/Northeast); (2) Jagorani Chakra Foundation (JCF) (Southwest); and (3) Rangpur Dinajpur Rural Service Bangladesh (RDRS) (Northwest). Like many of SHIKHON program's NFE counterparts throughout both Bangladesh and in other developing countries, the SHIKHON program's objective is to ensure progress in achieving the United Nation's (UN) Millennium Development Goal (MDG) of universal primary education by 2015 (United Nations, 2013).

Within each community, SHIKHON schools are overseen by an 11 member School Assistance Group (SAG), half of whose members include women from the community. The SAG, in conjunction with SHIKHON program staff identify potential teachers from the community, a site or location for the school house and 30-35 vulnerable children in the community of the appropriate age, targeting disabled, ethnic or working children. Each SHIKHON school is organized in a one-room configuration with one trained teacher, often female, who is a trusted community member with a minimum education of a Secondary School Certificate (SSC) which is obtained after reaching grade 10. Teachers are supported with a series of comprehensive pre-service trainings, regular in-service trainings, subject-specific lesson modules and guidebooks. Each teacher provides the

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children with exposure to the same educational curriculum that they would have received in grades 1-5 of a formal government primary school in an accelerated format which lasts four years at a cost of approximately \$96 USD per child. Teachers remain with their students for the duration of the four year SHIKHON program.

Figure 1. Map of SHIKHON Implementation Areas in Bangladesh (Sylhet/Northeast, Northwest and Southwest)



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The SHIKHON program follows the National Primary Education Curriculum set by the National Curriculum and Textbook Board (NCTB) Authority of Bangladesh and uses NCTB textbooks in all its schools from grade 1 to grade 5. SHIKHON concentrates on achieving the competencies for each subject at each grade level and has developed learning support materials to enable teachers to meet this goal. Each classroom is equipped with essential teaching aids, a readiness kit of learning materials to promote self-initiated learning and story books. Children receive stationery and the teacher is provided with in-depth subject-wise Teacher Guide Books at each grade level. At each grade level, comprehensive records are kept on attendance, achievement, school operations and community participation. At the end of grade 5, SHIKHON students work towards taking the National Grade 5 Completion Exam. Additional school health and nutrition activities are built into the curriculum, including vitamin supplementation and deworming which promote better health and subsequent attendance.

The learning opportunities that SHIKHON teachers provide are flexible, meaning that they are responsive to and organized around children's needs. For example, unlike formal schools, the SHIKHON program takes children who begin the program, irrespective of age, and provides them with four months of in-depth school readiness classes which emphasize "...problem solving, creative expression, self-initiated learning and play" (Save the Children, 2011). These readiness skills serve as a strong foundation so that children can be successful throughout their four years in the SHIKHON program.

Recognizing that the delivery of education extends beyond the SHIKHON schools, the program also has a strong community-based component and provides regular sessions for parents to support their children's learning. These sessions equip parents with practical strategies for raising healthy children and they also increase parental knowledge of how to best to support their children's learning needs. In order to cultivate and maintain strong literacy environments in children's home,

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the program also encourages mothers of SHIKHON students to borrow story books from the SHIKHON “Reading for Children” library to read together with their children at home. Similar to government-run schools in Bangladesh, parents do not incur any direct costs related to their child’s education in the SHIKHON program; they may choose, however, to invest in additional coaching services and materials³.

After children complete the four years of the SHIKHON program, some, but not all may pursue further education in the formal secondary school system. Anecdotal evidence suggests that SHIKHON can lead children further through the educational pipeline, helping them successfully transition from SHIKHON into secondary school. For example, of the ninety children who completed their primary school education through the SHIKHON program in Vedorganj Upazilla in Shariatpur, half (forty-five students) took the formal Primary School Completion (PSC) exam. Among those, roughly 90%, or around forty students, passed the PSC exam and are currently attending local secondary schools (Uddin, n.d., p. 4).

Finally, the first ever evaluation conducted by Gee (2012) of the SHIKHON program in 2012 examined achievement overall among SHIKHON children and found that SHIKHON children had achieved competency levels that placed them on par with their formally educated peers. However, the study did not explicitly or comprehensively explore gender differentials in achievement, overall and across specific subject areas.

³ Approximately 25% of the 1203 SHIKHON households who were surveyed in 2007 report paying for coaching services, spending an average of 20 Tk (0.25 USD), while about 29% purchased additional materials, spending an average of 62 Tk (0.80 USD) (Source: author’s calculations).

2.4 Girls' achievement in (NFE) programs in Bangladesh: Prior empirical evidence

There are two prior empirical studies published in the peer-reviewed literature and one non-peer reviewed study that are relevant to understanding how girls achieve relative to boys in NFE settings in Bangladesh.⁴

The most recent study by Chowdhury et al. (2003) found that despite the emphasis that non-formal schools place on promoting access to education for girls, enhanced access has not translated into parity in achievement for girls. Girls still underperform, on average, relative to boys. Specifically, they found that among children, aged 11-12, attending non-formal schools in Bangladesh, there was a statistically significant 9.5 percentage point gap in basic learning competency rates that favors boys (44% versus 34.5%). Chowdhury et al. (2003) did not further examine whether this overall gap also extends to gaps in specific subject areas (i.e., numeracy, literacy, etc.).

Nath et al. (1999) examined the impact of Bangladesh Rural Advancement Committee (BRAC) non-formal schools and found that girls underperform boys in reading, writing and numeracy while achieving slightly above boys in life skills. However, as Nath et al. (1999) acknowledge, none of these differences were statistically significant. Methodologically, however, Nath et al. (1999) neither controlled for background characteristics of children, nor the clustering of children within classrooms and schools which could have biased their estimates. One other study by Sukontamarn (2003), though non-peer reviewed, is relevant to understanding the relationship between gender and learning outcomes in NFE programs. Sukontamarn (2003) examined achievement outcomes of 3,360 children aged 11-12 years old in non-formal schools across Bangladesh and determined that

⁴ In addition to the studies reviewed here, the United Nations Children's Fund (UNICEF) Evaluation and Research Database (ERD) contains 14 evaluation reports of non-formal education programs (see: http://www.unicef.org/evaldatabase/index_23771.html). None of these studies examine the influence of mothers' education on girls' achievement and only one examines gender differences in the context of Yemen's early childhood program, Getting Ready for School. However, the outcomes in this study are not achievement in specific subject areas (only broad skills such as following directions) and are relevant only to the population of children transitioning into primary school.

girls underperform boys across four content areas including reading, writing, numeracy and life skills & knowledge.

In sum, the empirical evidence of gender differentials in NFE settings in Bangladesh is not only limited, but mixed. The most recent studies that focus on NFE in the Bangladeshi context report underperformance of girls relative to boys; these results are sometimes significant (as in the case of Chowdhury et al. (2003) and Sukontamarn (2003)) while other times they are not (the Nath et al. (1999) study).

3. Data

3.1. Site, sampling procedures and data collection

Site and Sample. My analysis is based upon data collected on a sample of 1,203 children across 201 SHIKHON schools in the three regions of Bangladesh targeted by the program:

Sylhet/Northeast, Southwest and Northwest. A two stage stratified sampling method was utilized to select sample participants from a total population of 1,497 SHIKHON Schools containing 41,014 students. In the first stage, schools were stratified by each of the three participating regions and 67 schools were selectively sampled from the population of approximately 500 SHIKHON schools in each region. Then, in the second stage, three boys and three girls were randomly sampled within each of the 67 schools for a total of 201 children in each region. The required sample size (n) of SHIKHON students for estimating average competency for any subject area for boys or girls was

determined using the formula: $n = \frac{z^2 s^2 (d.eff)}{e^2}$, where $z=1.96$, s (the standard deviation)=5.0, $d.eff$

(the design effect)=1.5, e (precision level)=0.85. Thus $n=199$. In practice, 201 children were selected from each region for convenience of allocation. The resulting sample size was therefore 1,206. Due to differences in between the sampling plan and actual response rates when data collection was

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carried out in the field, the actual analysis sample includes 1,203 children. Accordingly, the total response rate was 99%.

Data Collection. A team of 32 experienced field data collectors commenced data collection in October 2011. Field data collectors acquired information on all sample children using two primary instruments including a socio-demographic survey as well as a grade 5 competency assessment. To maintain the quality of the data, six SHIKHON management staff members visited field sites in each of the three implementation regions in order to monitor the data collection process and verify the data that was collected by field data collectors, including cross checking collectors' data sheets.

3.2 Measures

3.2.1 Outcome Variables

Student Achievement. For this analysis, my primary outcome consists of children's achievement on a grade 5 competency assessment test in five main subject areas including Bangla (reading and writing), English (reading and writing), mathematics, social studies and science. Students were tested in the fall of the final year of the four year SHIKHON program. Each of these competency areas is specified by the National Curriculum and Textbook Board (NCTB) Authority of Bangladesh. Importantly, the assessment tool administered to SHIKHON students is adapted from a competency-based test instrument that was developed and designed by *Education Watch*, a nationally recognized organization in Bangladesh that assesses and monitors Bangladesh's progress in achieving the Education for All (EFA) goals as set forth by the United Nations Educational, Scientific and Cultural Organization (UNESCO). This particular assessment tool was selected for its wide use and recognition in Bangladesh particularly as the results have been used to understand competency levels of children in other non-formal education settings. Overall, there were a total of 56 items on the assessment tool and I use students' overall total scores (total correct) as well as

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individual scores in each subject area. The number of items that comprise each of the five subject area subtests are as follows: Bangla (8); English (5); mathematics (12); social studies (13); and science (18). Each test item was scored dichotomously, either correct or incorrect.

The Cronbach's alpha, a measure of internal consistency reliability capturing the interrelatedness of test items (Cortina, 1993, p. 100), is .91 for all 56 items while it is .80 for the 12 items in math and .80 for the 18 science items. For items comprising the subtests in Bangla, English and social studies, the Cronbach's alphas are 0.69, 0.64 and 0.69 respectively.

3.2.2 Predictor and Control Variables

The relevant predictor of achievement I use in my analysis is a child's gender (coded as 1=male, 0=female).

I also include several individual-level control variables in my analysis typical in the educational production function literature (Glewwe, Lambert, & others, 2010) including a child's age (in years), the natural log of annual income (in Bangladeshi Takas (BDT), where 1 USD \approx 78 BDT) of the child's household, number of siblings concurrently attending school and educational resources in the home (whether a child has books in the home). Finally, I control for mother's education level which is self-reported by the mother herself. Mother's education level is a categorical variable corresponding to the major education levels in the Bangladeshi educational system. These six levels and corresponding years of education include: No Formal Education (illiterate and/or possesses the basic ability to sign their name) (0 years); Primary (1 to 5 years); Junior (6 to 8 years); Secondary (9 to 10 years); Higher Secondary (11 and 12 years); and Tertiary (greater than 12 years) (Bangladesh Bureau of Educational Information and Statistics 2006). For analytic purposes, I converted this categorical variable into six separate dummy variables, one dummy for each level of education.

3.2.3 Sample Descriptive Statistics

Table 1 provides descriptive statistics (unweighted means and standard deviations) for the analytic sample of 1,203 children organized by outcome, predictor and control variables and disaggregated by gender. As shown, the sample includes children who are on average 11 years of age and the sample is evenly split between genders. In terms of overall achievement, SHIKHON children score an average of 38 out of 56 in total. Among the subject areas, children's achievement is highest in science (they answer an average of 13 items out of 18 correctly), while children only answer a bit more than half of the mathematics items correctly. With respect to key demographics, a majority of children have mothers who either have had no school (mothers are either illiterate or have the basic ability to sign their names) (59% of the sample) or attained a primary education (30%). Finally, the average log of annual household income is 11 BDT (approximately 60,000 BDT which is approximately \$700 USD in constant 2013 dollars).

4. Methods

To investigate how girls achieve relative to boys, I estimate a typical educational production function (Bowles, 1970; Hanushek, 1995) by fitting, separately for each of my achievement outcomes, the following multiple ordinary least squares (OLS) regression model for the i th child in the j th school:

$$Y_{ij} = \beta_0 + \beta_1(MALE)_{ij} + \gamma Z_{ij} + \mu_j + \varepsilon_{ij} \quad (1)$$

where Y_{ij} = selected achievement outcome; $(MALE)_{ij}$ = a dichotomous variable coded as MALE=0 for females, 1 otherwise. Z_{ij} = a vector of individual level controls; μ_j = teacher/school fixed effects ε_{ij} = error term assuming $\varepsilon_{ij} \sim N(0, \sigma^2)$.

Table 1

Selected univariate descriptive statistics for outcome, predictor and control variables for sample children participating in the SHIKHON non-formal education program ($n=1203$).

	Female	Male	Total
<i>Outcome variables</i>			
Total score	37.482 (10.895)	38.096 (10.559)	37.791 (10.727)
Bangla	5.559 (1.953)	5.672 (1.806)	5.616 (1.880)
English	3.432 (1.323)	3.464 (1.290)	3.448 (1.306)
Mathematics	6.821 (3.264)	7.018 (3.165)	6.920 (3.214)
Science	12.794 (3.918)	12.955 (3.844)	12.875 (3.880)
Social studies	8.876 (2.787)	8.987 (2.629)	8.932 (2.708)
<i>Predictor variable</i>			
Male	0.000 (0.000)	1.000 (0.000)	0.504 (0.500)
<i>Control variables</i>			
Age	10.933 (1.254)	10.970 (1.211)	10.952 (1.232)
Family members in school			
Males (6-12 years old)	0.506 (0.682)	1.233 (0.609)	0.872 (0.741)
Females (6-12 years old)	1.236 (0.660)	0.421 (0.622)	0.825 (0.759)
Males (13-18 years old)	0.208 (0.438)	0.236 (0.466)	0.222 (0.452)
Females (13-18 years old)	0.236 (0.481)	0.186 (0.434)	0.211 (0.458)
Book availability in home	0.345 (0.476)	0.350 (0.477)	0.347 (0.476)
Log of income (in BDT)	11.041 (0.596)	11.021 (0.631)	11.031 (0.614)
Mother's education (%)			
No School	0.580 (0.494)	0.594 (0.491)	0.587 (0.493)
Primary (1-5 years)	0.285 (0.452)	0.312 (0.464)	0.298 (0.458)
Junior secondary (6-8 years)	0.082 (0.275)	0.059 (0.237)	0.071 (0.256)
Secondary (9-10 years)	0.044 (0.204)	0.031 (0.174)	0.037 (0.190)
Higher secondary (11-12 years)	0.008 (0.091)	0.002 (0.041)	0.005 (0.070)
Tertiary (> 12 years)	0.002 (0.596)	0.002 (0.631)	0.002 (0.614)
<i>N</i>	597	606	1203

Note: Standard deviation in parentheses; unweighted means.

Note that in addition to controlling for student-level background characteristics, including age and household income, represented by Z_{ij} , I exploit a unique feature of the structure of the SHIKHON program that allows me to simultaneously control for omitted quality differences of both teachers and schools that remained fixed over time which could potentially bias the estimate of the impact of gender on achievement outcomes. Children in a village have only one choice of SHIKHON school to attend (with no other schooling alternatives) and students are exposed to only one teacher for the entire 4 years of schooling (there is no variation in exposure to different teachers or schools for children within the same village). Thus, including teacher/school fixed-effects, represented by μ_j , sweeps out all time invariant unobserved differences between teachers/schools. I use cluster-robust (Huber-White) standard errors to account for possible non-independence between children who share the same teacher/school.

The estimate of parameter β_1 in equation (1) captures the achievement differential between girls and boys. When β_1 is positive and statistically significantly different than zero at the Bonferroni corrected alpha level of .008 ($\alpha=.05/6$)⁵, I can reject the null hypothesis that the selected achievement outcome of girls does not differ from boys. Accordingly, I can conclude that females underperform boys (or conversely, boys outperform girls) on my selected achievement outcome, conditional on included controls and teacher/school fixed effects.

Since a two stage stratified sampling was used (schools were selectively sampled first, then students randomly sampled within schools), I incorporate both school and student level weights in all analyses. I conduct my analyses using Stata 12.1 (StataCorp, 2011).

⁵ I adjust my significance level using the Bonferroni correction to account for an inflated Type I error rate given that I am testing the effect of gender on 6 different outcomes.

As an alternative to using cluster-robust standard errors to handle clustering⁶ in my data, I replicate my analyses using a 3-level hierarchical linear model (HLM) (Raudenbush & Bryk, 2002). I choose HLM, given that it is a widely used method in educational research that explicitly accounts for different levels of clustering in the data through models that are specified for each level represented in the data (Author, 2014). In this case, a model for SHIKHON children's performance includes a level-1 student model, a level-2 teacher/school model and finally, a level-3 region model. Importantly, these models account for the variances in the outcome that arise from different levels of the clustered data. I provide a detailed 3-level model specification I fit to my data in the Appendix. For further discussion of HLM, including its limitations, readers should consult Gelman (2006).

5. Results

5.1 How do girls achieve relative to boys overall and across each grade 5 subject area?

Table 2 displays the results of fitting the teacher/school fixed model specified in equation (1). As shown in the first row, the fitted coefficient estimates on the dummy variable for gender (MALE)—interpreted as the difference in points scored in each subject area by gender, conditional on teacher/school fixed effects and key individual-level controls—indicate that boys slightly outperform girls in terms of total score (0.59 points), Bangla (0.11 points), mathematics (0.25 points), science (0.20 points) and social studies (0.05 points), while they under-perform girls in English by 0.02 points. However, importantly, none of these estimates statistically significantly differ from zero at the .008 level (adjusted for multiple comparisons) and thus, I fail to reject the null hypothesis that girls do not differ from boys across their achievement outcomes. Accordingly, based

⁶ The degree to which individuals are interdependent within a cluster can be quantitatively measured by the intra-class correlation coefficient (ICC) (Killip, Mahfoud, & Pearce, 2004). Readers should see Author (2014) for a further explanation of the ICC.

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upon these results, girls attending SHIKHON schools achieve, on average, scores on each subject area that are comparable to boys' scores, with no discernible differential in performance due to students' gender.

Table 2

Estimated parameters and standard errors from fitted teacher/school fixed-effects models describing the effect of gender on achievement outcomes for children participating in the SHIKHON non-formal education program ($n=1203$).

	Total score	Bangla	English	Mathematics	Science	Social studies
Male	0.59 (0.57)	0.11 (0.12)	-0.02 (0.08)	0.25 (0.18)	0.20 (0.21)	0.05 (0.17)
Age	0.32 (0.21)	0.02 (0.04)	0.05 (0.03)	0.13* (0.06)	0.14 (0.09)	-0.02 (0.07)
Family members in school						
Males (6-12 years old)	-0.13 (0.36)	0.02 (0.08)	0.07 (0.05)	-0.10 (0.10)	-0.19 (0.15)	0.07 (0.12)
Females (6-12 years old)	0.17 (0.39)	0.05 (0.08)	0.03 (0.05)	0.05 (0.11)	-0.01 (0.15)	0.04 (0.13)
Males (13-18 years old)	0.87 (0.54)	0.15 (0.11)	0.12 (0.07)	0.22 (0.16)	0.17 (0.21)	0.22 (0.13)
Females (13-18 years old)	0.19 (0.47)	0.20* (0.08)	-0.04 (0.07)	0.03 (0.15)	0.10 (0.21)	-0.09 (0.15)
Book availability in home	0.49 (0.70)	0.15 (0.12)	0.08 (0.08)	0.04 (0.23)	0.05 (0.28)	0.17 (0.21)
Log of income (in BDT)	0.50 (0.42)	0.13 (0.09)	0.07 (0.06)	0.05 (0.14)	0.23 (0.17)	0.02 (0.12)
Mother's education						
Primary (1-5 years)	0.09 (0.56)	0.03 (0.12)	0.05 (0.08)	0.05 (0.18)	0.11 (0.23)	-0.14 (0.17)
Junior secondary (6-8 years)	-0.32 (1.10)	-0.24 (0.19)	0.04 (0.16)	0.29 (0.28)	-0.40 (0.45)	-0.00 (0.31)
Secondary (9-10 years)	2.81* (1.15)	0.40* (0.20)	0.16 (0.22)	0.76* (0.30)	0.94 (0.49)	0.55 (0.34)
Higher secondary (11-12 years)	2.79 (2.30)	0.53 (0.33)	0.58* (0.23)	0.49 (0.95)	0.15 (0.58)	1.04 (0.71)
Tertiary (> 12 years)	-0.22 (5.85)	0.81 (0.58)	1.09*** (0.09)	1.47*** (0.24)	-2.41 (3.55)	-1.19 (1.58)
Constant	27.95*** (5.27)	3.68*** (1.08)	1.92* (0.77)	4.75** (1.60)	8.79*** (2.11)	8.80*** (1.59)
R ²	0.749	0.640	0.598	0.753	0.661	0.609
Observations	1203	1203	1203	1203	1203	1203

Note: robust clustered standard errors in parentheses

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

5.2 Checking the robustness of the results using Hierarchical Linear Modeling (HLM)

Table 3 reports results from fitting 3-level (students within teachers/schools within region) Hierarchical Linear Models (HLM) to data to re-estimate the relationship between gender on overall achievement and achievement by subtest. For ease of comparison, Table 4 reports only the relevant coefficient estimates capturing the effect of gender on achievement outcomes from the first row of Table 3 relative to the estimates based on the teacher/school fixed effects model in Table 2. As shown in Table 4, both the magnitude and statistical significance of the effects of MALE on total score and the scores on each subtest for the HLM models are highly consistent with the teacher/school fixed effects models. In fact, the magnitudes of the estimates are the same for Bangla, English and mathematics. Where the magnitude of the effects do differ between the teacher/school fixed effects and HLM models, they are only slightly so and by only .01.

6. Discussion and Conclusion

Although a distinct “female schooling advantage” exists in terms of schooling participation and progress across the developing world (Grant & Behrman, 2010), our understanding of whether that advantage holds true for their learning outcomes particularly in a non-formal educational context is very limited. Non-formal education (NFE) programs have been a long standing approach to educating marginalized children, including girls; yet, the empirical evidence of whether they have provided girls with equal learning opportunities that translate into equal learning outcomes remains not only limited, but of the studies that do exist, the evidence remains largely inconclusive.

My study, grounded in the context of a non-formal education program implemented across three remote regions in rural Bangladesh, contributes to our understanding of girls’ education and investigates whether or not gender differentials exist in learning outcomes in five subject areas. I find that, on average, there are no significant differences in the achievement of girls and boys overall and

Table 3

Estimated parameters and standard errors from fitted 3-level (students within teachers/schools within regions) hierarchical linear models (HLM) describing the effect of gender on achievement outcomes for children participating in the SHIKHON non-formal education program ($n=1203$).

	Total score	Bangla	English	Mathematics	Science	Social studies
Male	0.60 (0.52)	0.11 (0.11)	-0.02 (0.07)	0.25 (0.16)	0.21 (0.19)	0.06 (0.15)
Age	0.32 (0.19)	0.02 (0.04)	0.05 (0.03)	0.13* (0.05)	0.14 (0.08)	-0.02 (0.06)
Family members in school						
Males (6-12 years old)	-0.12 (0.32)	0.02 (0.07)	0.07 (0.05)	-0.10 (0.09)	-0.19 (0.14)	0.07 (0.11)
Females (6-12 years old)	0.17 (0.35)	0.05 (0.07)	0.03 (0.05)	0.06 (0.10)	-0.00 (0.14)	0.04 (0.12)
Males (13-18 years old)	0.88 (0.49)	0.15 (0.10)	0.12 (0.07)	0.22 (0.14)	0.17 (0.19)	0.22 (0.12)
Females (13-18 years old)	0.20 (0.42)	0.20** (0.08)	-0.04 (0.06)	0.03 (0.13)	0.11 (0.19)	-0.09 (0.13)
Book availability in home	0.53 (0.63)	0.15 (0.11)	0.09 (0.07)	0.05 (0.21)	0.07 (0.25)	0.17 (0.19)
Log of income (in BDT)	0.49 (0.38)	0.13 (0.08)	0.07 (0.05)	0.05 (0.13)	0.23 (0.15)	0.01 (0.11)
Mother's education						
Primary (1-5 years)	0.09 (0.51)	0.03 (0.11)	0.05 (0.07)	0.05 (0.16)	0.11 (0.21)	-0.15 (0.15)
Junior secondary (6-8 years)	-0.32 (1.00)	-0.24 (0.17)	0.03 (0.14)	0.28 (0.26)	-0.40 (0.40)	-0.00 (0.28)
Secondary (9-10 years)	2.80** (1.04)	0.40* (0.18)	0.16 (0.20)	0.76** (0.27)	0.94* (0.44)	0.55 (0.30)
Higher secondary (11-12 years)	2.80 (2.07)	0.53 (0.29)	0.58** (0.21)	0.51 (0.85)	0.16 (0.52)	1.04 (0.64)
Tertiary (> 12 years)	-0.26 (5.32)	0.81 (0.52)	1.08*** (0.08)	1.46*** (0.22)	-2.43 (3.22)	-1.19 (1.44)
Constant	27.94*** (4.86)	3.69*** (0.99)	1.92** (0.70)	4.74** (1.47)	8.80*** (1.94)	8.80*** (1.45)
<i>Variance components</i>						
Students ($\text{var}(e_{ijk})$)	29.61*** (2.70)	1.29*** (0.08)	0.69*** (0.05)	2.60*** (0.22)	5.25*** (0.45)	2.91*** (0.25)
Teachers/schools($\text{var}(r_{0jk})$)	86.69*** (7.94)	2.21*** (0.19)	1.01 (0.10)	7.90*** (0.59)	10.09*** (0.95)	4.45*** (0.44)
Region ($\text{var}(u_{00k})$)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00*** (0.00)	0.00 (0.00)
<i>N</i>	1203	1203	1203	1203	1203	1203

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

Table 4

A comparison of parameter and standard errors from a fitted teacher/school fixed effects model and a 3-level hierarchical linear model describing the effect of gender on achievement outcomes for children participating in the SHIKHON non-formal education program (n=1203).

	Total Score	Bangla	English	Mathematics	Science	Social Studies
<i>Teacher/School Fixed Effects Model (from Table 2)</i>						
Male	0.59 (0.57)	0.11 (0.12)	-0.02 (0.08)	0.25 (0.18)	0.20 (0.21)	0.05 (0.17)
<i>3-Level hierarchical linear model (HLM) (from Table 3)</i>						
Male	0.60 (0.52)	0.11 (0.11)	-0.02 (0.07)	0.25 (0.16)	0.21 (0.19)	0.06 (0.15)

across five subject areas (Bangla, English, math, science and social studies) lending strong correlational evidence supporting the notion that girls can perform on par with boys within the SHIKHON model of NFE. My findings remain robust across two different estimation methods: (1) a teacher/school fixed effects model; and (2) a 3-level hierarchical linear model (HLM).

Given that gender parity can occur at relatively low levels of learning, it is also important to interpret these findings relative to the total possible scores that children could have achieved overall and for each subtest. An example highlights the importance of this. Imagine an extreme hypothetical case in which achievement scores are zero for both boys and girls (i.e., no child is able to answer any of the test items correctly). Despite the fact that both boys and girls score zero, we would still be able to conclude that girls' academically achieve on par with boys. In general, though, my results demonstrate that the average scores placing girls on par with boys are all at or above the 50th percentile. This indicates that girls have acquired some level of competency overall and for each subject area. For example, based on predicted achievement scores from the fixed effects models (in which control variables are constrained to their means and the main predictor dummy variable MALE takes on the value of 0 for girls), girls are predicted to score, on average, from a low of 57% (7 out of 12 items answered correctly) in mathematics to a high of 71% (13 out of 18 items answered correctly) in science.

There are a few notable caveats that one should keep in mind when interpreting these results. First, my results are based solely on an association between gender and academic achievement and do not explain why girls perform on par with boys; it could be that girls are systematically different, in both observable and unobservable (e.g., motivation) ways that lead them to perform on par with boys. It is also important to note that my results do not suggest that the SHIKHON program actually *causes* girls to achieve on par with boys; my study has no comparison or control group, so I am unable to determine how gender differentials in achievement look like for a comparison group of students not in SHIKHON program. To further test whether NFE causally impacted girls' achievement, future research should consider conducting randomized field trials of the SHIKHON program. Finally, these results only can be generalized to the population of children exposed to the SHIKHON model of non-formal education in the three regions that the program serves. Though the SHIKHON NFE program shares similarities with other NFE programs, such as the NFE schools that are overseen by BRAC, each NFE program and school is tailored to the specific needs of the communities they serve. Thus, there could be unique contextual aspects influencing how each SHIKHON NFE school was administered. In sum, the findings here apply only to the SHIKHON program and readers should not extrapolate these findings to other NFE settings. To establish a more broadly applicable understanding of girls' educational achievement and NFE, one potential direction for future research is to examine how girls achieve across the wide spectrum of NFE settings—both within Bangladesh and across other developing country settings—using a standardized assessment tool capturing achievement outcomes. In addition, examining different models of NFE delivery, including their organization and resources, can shed light on key factors that are most influential in raising achievement for girls.

In conclusion, my study has shown that girls can achieve on par with boys within the SHIKHON NFE model of education in Bangladesh. The implications of my findings are relevant

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given the additional educational incentives that girls in rural Bangladesh face after completing primary school. Currently, the Government of Bangladesh, in partnership with several multi-lateral aid organizations, offers a female secondary school stipend program. This program guarantees girls from rural areas, such as the ones targeted by the SHIKHON program, a tuition-free secondary education, conditional on maintaining both attendance and achievement standards. Achievement standards require girls to attain at least a 45% score on exams (a standard passing score is 35%) (Khandker, Pitt, & Fuwa, 2003; Schurmann, 2009). Thus, the SHIKHON program has the potential to academically prepare young girls, providing them with the foundational knowledge that enables them to access further education. In addition, the importance of preparing girls to academically succeed in higher levels of education beyond primary education is potentially far reaching as increased education levels have been shown to lead both private and social benefits, including reduced fertility, lowered infant mortality and expanded economic growth (Herz & Sperling, 2004).

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Appendix

Hierarchical Linear Model (HLM) Specifications

To estimate the relationship between gender and achievement outcomes, I fit the following 3-level model for the i th student in the j th teacher/school in the k th region (I use the notation of Raudenbush and Bryk (2002)):

Level-1 (Students)

$$Y_{ijk} = \pi_{0jk} + \pi_{1jk} (MALE)_{ijk} + \sum_{q=2}^Q \pi_{qjk} x_{qijk} + e_{ijk} \quad (A.1)$$

Level-2 (Teachers/Schools)

$$\pi_{0jk} = \beta_{00k} + r_{0jk}$$

$$\pi_{1jk} = \beta_{10k}$$

$$\pi_{qjk} = \beta_{q0k}, \text{ for } q=2, \dots, Q \quad (A.2)$$

Level-3 (Region)

$$\beta_{00k} = \gamma_{000} + u_{00k}$$

$$\beta_{10k} = \gamma_{100}$$

$$\beta_{q0k} = \gamma_{q00}, \text{ for } q=2, \dots, Q \quad (A.3)$$

Substituting levels 2 and 3 into level 1 and rearranging yields:

$$Y_{ijk} = \gamma_{000} + \gamma_{100} (MALE)_{ijk} + \sum_{q=2}^Q \gamma_{q00} x_{qijk} + [u_{00k} + r_{0jk} + e_{ijk}] \quad (A.4)$$

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Where MALE is a dummy variable capturing a child's gender and x_{qijk} represents a set of individual-level control variables. e_{ijk} is the level-1 random effect⁷ while r_{0jk} and u_{00k} represent random effects at levels 2 and 3 respectively. I constrained the effects of the level-1 control variables ($\sum_{q=2}^Q \gamma_{q00}$) to be fixed at levels 2 and 3, assuming that they are invariant across both teachers/schools and regions. I let the intercept (γ_{000}) be random across teachers and regions. The parameter of interest that captures the effect of gender on my selected achievement outcomes is γ_{100} .

In my analyses, I incorporate weights at each level to account for the 2 stage stratified sampling design. I use the `xtmixed` command in Stata 12.1 to fit all HLM models to data using maximum likelihood estimation (MLE) (StataCorp, 2011).

⁷ Here, I use the term “random effect(s)” as it is used in the hierarchical linear modeling (HLM) literature to denote the stochastic portion (Singer & Willett, 2003, p. 83) of the model.

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