

## Whither Quality?

# What Do Recent National Assessments of Student Learning Outcomes in Bangladesh Tell Us?

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## Abstract

Using nationally representative data from the Bangladesh government's National Student Assessments (NSA 2011, 2013, 2015, 2017) and Learning Assessment of Secondary Institutions (LASI 2015), this study analyzes the trends in learning outcomes at the primary level, and the disparities in learning outcomes across males and females, household income groups, school types, and geographical areas at the primary and junior secondary levels. It also examines the relationships between learning outcomes and various student, family, school and teacher factors at both the primary and junior secondary levels.

We find that learning outcomes at the primary level are low and uneven, and have not been improving. Low and uneven learning outcomes are observed at the junior secondary level as well. Furthermore, while students perform relatively well in areas related to knowledge and understanding, they face significantly more challenges in answering questions requiring application of higher-order thinking skills. Our analyses of the determinants of learning outcomes show that variations across schools explain between 35% to 78% of the variation in student outcomes in the different grades and subjects, implying that school quality matters. They also indicate that school type and teacher adequacy, two important school related factors, are significantly associated with learning outcomes. At the primary level, students from the privately managed Kindergarten schools perform better than students from government primary schools (GPS); and students from both these types of schools generally have significantly higher learning outcomes than students from newly nationalized GPS and other types of schools. Student learning outcomes are generally lower in schools that have higher student-teacher ratios or where head teachers perceive teacher vacancy to be serious problem. Key student and family factors associated with learning include reading habit, grade repetition, student effort, household economic status and parental education. Learning outcomes are generally higher for students who read supplementary books at home, have not repeated grades, devote more time to their studies, come from wealthier families and have more educated parents. These findings suggest that since learning deficit starts in the early grades, there is a need for focused interventions aimed at ensuring the acquisition of basic literacy and numeracy skills by all students at the primary level. They also point to the need for the government to implement interventions aimed at promoting the reading habit, providing special support to weaker students to minimize grade repetition, and providing more targeted financial support to poor children.

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## 1. Introduction

Education is key to enhancing the capabilities of individuals to live fulfilling lives as engaged and empowered citizens, as well as a means for building the human capital necessary for economic growth and development. Recognizing the importance of education, governments across the globe have invested heavily in the education sector during the past few decades. These investments have resulted in a tremendous growth in schooling expansion, especially in developing countries which have seen enrollments rise at rates that are much higher than the rates experienced historically by today's industrialized countries. However, this expansion in schooling has not necessarily been accompanied by an increase in learning outcomes. There is, in fact, a learning crisis in much of the developing world (see World Bank 2018a). The expected shift from "Education for All" to "Learning for All" has not taken place in these countries.

Like many other developing countries, Bangladesh too has made remarkable progress in increasing access to education, especially at the primary level. The primary net enrollment rate (NER) is now over 98%, gender parity in NER has been achieved at both the primary and secondary levels, and there has been a steady convergence in enrollment rates across income groups and geographical areas (Bhatta et al. 2019). And as elsewhere, the various education programs and projects implemented in the country have sought to increase both the quantity and quality of basic education.

Despite these investments, however, there is evidence that the learning levels in Bangladesh are low and uneven (World Bank 2019). Asadullah and Chaudhury (2013), for example, report that, in their sample of Bangladeshi rural children aged 10-18, 50% of those who had completed primary education failed to pass a basic competency test<sup>1</sup> in rudimentary mathematics. The Education Watch 2015 report (CAMPE 2015) indicates that while fifth graders, on average, achieved around 74% of the competencies specified in the grade 5 curriculum, students from Ebtedayee Madrasahs<sup>2</sup> achieved only 64%. Low learning levels is a major issue in higher grades as well. Drawing upon the findings from a sample assessment of the World Bank-supported SEQAEP<sup>3</sup> institutions in 2011, World Bank (2013) reported that only 35% and 44% of students who had completed grade 8 and started grade 9 had mastered grade 8-level competencies in math and Bangla, respectively. This learning deficit has serious implications for the development of human capital in the country. It is estimated that though Bangladeshi children can be expected to complete 11 years of schooling by the time they are 18 years old, their quality-adjusted number of expected years of schooling is only 6.5 years. As a result, "a child born in Bangladesh today will be 48 percent as productive when she grows up as she could be if she enjoyed complete education and full health" (World Bank 2018b, p.1).

As part of the quality agenda, the government of Bangladesh (GoB) has conducted a series of temporally comparable national assessments of student learning outcomes—the National Student Assessments (NSA 2011, 2013, 2015, 2017)—during the past decade to systematically track the state of student learning at the primary level. In addition, GoB also conducted a similar national assessment of junior secondary level students<sup>4</sup> (entitled Learning Assessment of Secondary Institutions—LASI) in 2015<sup>5</sup>. In Bangladesh,

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<sup>1</sup> The test was based on the primary school curriculum.

<sup>2</sup> These institutions provide Islamic religious education equivalent to the primary level.

<sup>3</sup> Secondary Education Quality and Access Enhancement Project.

<sup>4</sup> The primary level consists of grades 1-5, and junior secondary level consists of grades 6-8.

<sup>5</sup> Though there were two earlier rounds of LASI (in 2012 and 2013), these assessments were restricted to institutions supported by the World Bank funded SEQAEP project. Hence, in this paper, we look only at LASI 2015. It should be noted that, giving continuity to these assessments, GoB fielded another LASI round in 2017. However, as GoB has yet to complete the LASI 2017 analysis, data for this round have not been made available for the current study.

these are the first sets of nationally representative, sample-based rigorous assessments of student learning which use modern test theory to ensure the quality of testing as well as comparability of results across time and across grades. As noted in WDR 2018, putting in place credible metrics for measuring student achievement is a key step in improving student learning (World Bank 2018a). By revealing how the system is performing in terms of its own expectations regarding student learning and equitable learning outcomes, national assessments can help catalyze reforms. As such, the implementation of NSA and LASI must be considered a bold step taken by GoB in shifting the focus of policy dialog from expanding enrollment to improving the quality of basic education in Bangladesh. The various NSA rounds and LASI 2015 show low levels of learning outcomes in Bangla language and math at the primary level (grades 3 and 5), as well as at the junior secondary level (grades 6 and 8). Furthermore, they show significant disparities in performance across geographical areas, school types and students from different income groups, and find no sign of improving trends in learning outcomes at the primary level.

Bringing together data from the four NSA rounds, this study analyzes the trends in learning outcomes at the primary level, and how these outcomes differ across males and females, household income groups, school types, and geographical areas. It also analyzes how student performance in areas demanding higher order cognitive skills and areas focused on recall and memorization has changed over time. In addition, it discusses learning levels and disparities in learning outcomes at the junior secondary level using LASI 2015 data<sup>6</sup>. Given that literacy and numeracy skills are the foundations upon which learning in different subjects in later years is based, the focus of the study is on Bangla and math learning outcomes.

Going beyond documenting learning levels, learning trends and disparities in learning, a substantial part of this study focuses on examining the determinants of student learning outcomes using an education production function to analyze the relationships between student performance and various student, family, school and teacher factors at both the primary and junior secondary levels. These factors include variables representing inputs, processes and contextual factors that are expected to influence learning outcomes.

While the various NSA reports and the LASI 2015 report commissioned by GoB<sup>7</sup> also discuss potential determinants of learning, they rely primarily on descriptive statistics and analyses of simple bivariate relationships between these factors and student outcomes. Our analysis goes further and systematically looks at the determinants of student learning outcomes using multiple regression analysis<sup>8</sup>. As part of this analysis, we also look at the relationship between the achievement of grade-level proficiency by students and the various student, family, school and teacher factors. In addition, the discussion on the determinants of student performance includes a systematic treatment of between and within school differences. One interesting policy relevant finding of earlier studies is that there are disparities in learning outcomes across school types, with students from privately managed kindergarten (KG) schools performing better than students from government primary schools (GPS) and newly nationalized GPS (NNGPS). This study seeks to shed light on how factors potentially contributing to learning outcomes differ between these school types. A similar analysis is also done for the best and worst performing schools in NSA 2017 and LASI 2015. Lastly, the study also examines the extent to which factors that are correlated with overall learning outcomes in NSA 2017 are also correlated with student scores in areas requiring higher-order cognitive skills.

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<sup>6</sup> Note that the NSA and LASI data are from two separate testing regimes (administered independently by two different ministries), and are not linked to each other. Hence, they cannot be analyzed together to explore the continuum of performance across primary and junior secondary levels.

<sup>7</sup> See ACER (2016), DPE (2012), DPE (2014), DPE (2016), and DPE (2018a).

<sup>8</sup> While LASI 2015 does include some basic regressions exploring the determinants of student performance, it uses a relatively parsimonious set of explanatory variables, focusing on the association between socio-economic status and school climate on student achievement. Many of the key explanatory variables of interest such as the student-teacher ratio and teacher characteristics are not included.

The rest of the paper is organized as follows. Section 2 presents the data and analytical framework for the study. It describes the samples, summarizes the tests and scoring approach, and discusses the model used for analyzing the determinants of student outcomes. Section 3 describes trends and disparities in learning outcomes. Section 4 analyzes the determinants of student learning outcomes, focusing primarily on the most recent NSA round (NSA 2017) and LASI 2015. Section 5 presents a summary of the key findings and conclusions. A brief overview of the education sector in Bangladesh is provided in Annex 1 for reference.

## 2. Data and methodology

### Sample description

This study is based on data from two sources: the National Student Assessments (NSA) conducted by the Ministry of Primary and Mass Education (MoPME) in 2011, 2013, 2015 and 2017, and the Learning Assessments of Secondary Institutions (LASI) conducted by the Ministry of Education (MoE) in 2015<sup>9</sup>. The four NSA rounds assessed the learning outcomes of grade 3 and grade 5 students in Bangla and math, while LASI 2015 assessed the performance of grade 6 and grade 8 students in Bangla, math and English. Apart from testing students in the different subjects and grades, the assessments also collected background information on teachers, schools, students, and the students' households. Both NSA and LASI used nationally representative random samples of students drawn from schools across all the divisions<sup>10</sup> of the country. If a school was included in the NSA sample, all students in grades 3 and 5 in that school were tested<sup>11</sup>. Similarly, all students in grades 6 and 8 were tested if the school was selected in the LASI 2015 sample. In each round, the country was stratified by division and multi-stage random sampling was used to select districts and schools in each of the divisions. In the case of NSA 2017, all 64 districts were included in the sample. Table 2.1 summarizes the number of schools and students included in the NSA and LASI samples.

**Table 2.1: Number of schools and students in the NSA and LASI samples<sup>12</sup>**

Assessment	# schools	# students			
		Grade 3	Grade 5	Grade 6	Grade 8
NSA 2011	726	17,626	13,854		
NSA 2013	1,035	22,871	17,828		
NSA 2015	1,185	22,954	19,388		
NSA 2017	1,600	28,402	24,145		
LASI 2015	527			15,482	15,229

Source: ACER (2016), DPE (2012, 2014, 2016, 2018a)

### Tests

Both NSA and LASI test items are designed to measure the competencies prescribed by the national curriculum in the respective grades and subjects. Accordingly, assessment frameworks specifying the

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<sup>9</sup> NSA 2011 and 2013 were designed and implemented by the Directorate of Primary Education (DPE) of MoPME with technical assistance from the Australian Council for Educational Research (ACER). ACER also assisted the Monitoring and Evaluation Wing (MEW) of MoE in designing and implementing LASI 2015. On the other hand, NSA 2015 and 2017 were implemented by DPE with the assistance of the American Institutes for Research (AIR). These two firms provided technical assistance at all stages of the assessments, including during the design of the test instruments. The NSA program was actually initiated in 2006, and two rounds of NSA were administered before 2011. However, only the last four rounds (NSA 2011, 2013, 2015 and 2017) provide data that can be compared across rounds to monitor student learning over time.

<sup>10</sup>While Bangladesh is currently divided into 8 divisions, it had 7 divisions when LASI 2015 and NSA 2011-2015 were implemented. All the NSA and LASI samples are representative at the division level as well as at the national level.

<sup>11</sup> In general, primary schools have only one section in each grade.

<sup>12</sup> Note that in the case of NSA, we are dealing with pooled cross-section data for the different years, rather than panel data for schools or students. Furthermore, there is very little overlap in the schools between rounds. For example, only 19 schools (0.9% of the sample) overlapped between NSA 2015 and 2017. As the surveys do not track individual students across time, the 5th graders included in the NSA sample for any particular year (e.g., 2013) are not necessarily the same students who were 3rd graders in the NSA sample from the previous round (e.g., 2011).

knowledge and skills to be measured were prepared in alignment with the national curriculum, and the designs of the test items were guided by these frameworks. All the assessments included questions designed to test the students on their knowledge, understanding, and application and higher order thinking skills<sup>13</sup>. The NSA test items were developed by DPE in close collaboration with the National Curriculum and Textbook Board (NCTB), and the National Academy for Primary Education (NAPE)<sup>14</sup>. Similarly, the LASI 2015 tests were developed by the Monitoring and Evaluation Wing (MEW) of MoE in collaboration with NCTB, teachers and other educational practitioners. A separate test was prepared for each subject and grade. The vast majority of test items in the different subjects and grades were multiple choice questions; but a few constructed choice questions were also included.

After the marking of the tests was completed, Item Response Theory (IRT) methodology was utilized to transform raw scores into scale scores to enable valid comparison of student performance across time (horizontal equating)<sup>15</sup>. Similarly, linking test items included in the grade-specific tests were utilized to make comparisons across grades (vertical scaling). In addition, performance bands based on the scale scores were specified to help categorize learning levels of students in the different subjects (see DPE 2012; ACER 2016). Five bands were used in NSA: band 1 (far below grade 3 level); band 2 (below grade 3 level); band 3 (grade 3 level); band 4 (above grade 3 level); and band 5 (grade 5 level). Similarly, LASI 2015 used 6 bands; but while it specifies that bands 1 and 2 represent student performance below the grade 6 level, it does not specify which band corresponds to grade 8 level performance<sup>16</sup>. In this paper, we report scale scores as well as the percentage of students achieving proficiency levels corresponding to the different bands.

### Analytical framework

The analyses of the determinants of learning outcomes are performed using an educational production function that models student performance as a function of different categories of explanatory variables. The basic model linking student outcomes with various determinants of outcomes is given in Figure 2.1. It says that school inputs, teacher inputs, student inputs, and family inputs along with the national, community, and school contexts act through the school process to determine student outcomes<sup>17</sup>.

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<sup>13</sup> These cognitive processing levels are based on Bloom's taxonomy (DPE 2016). Note that except for NSA 2015 and 2017, the other datasets do not provide details on the performance of students by cognitive level. Hence, in this study, the analyses related to cognitive levels are done only for 2015 and 2017.

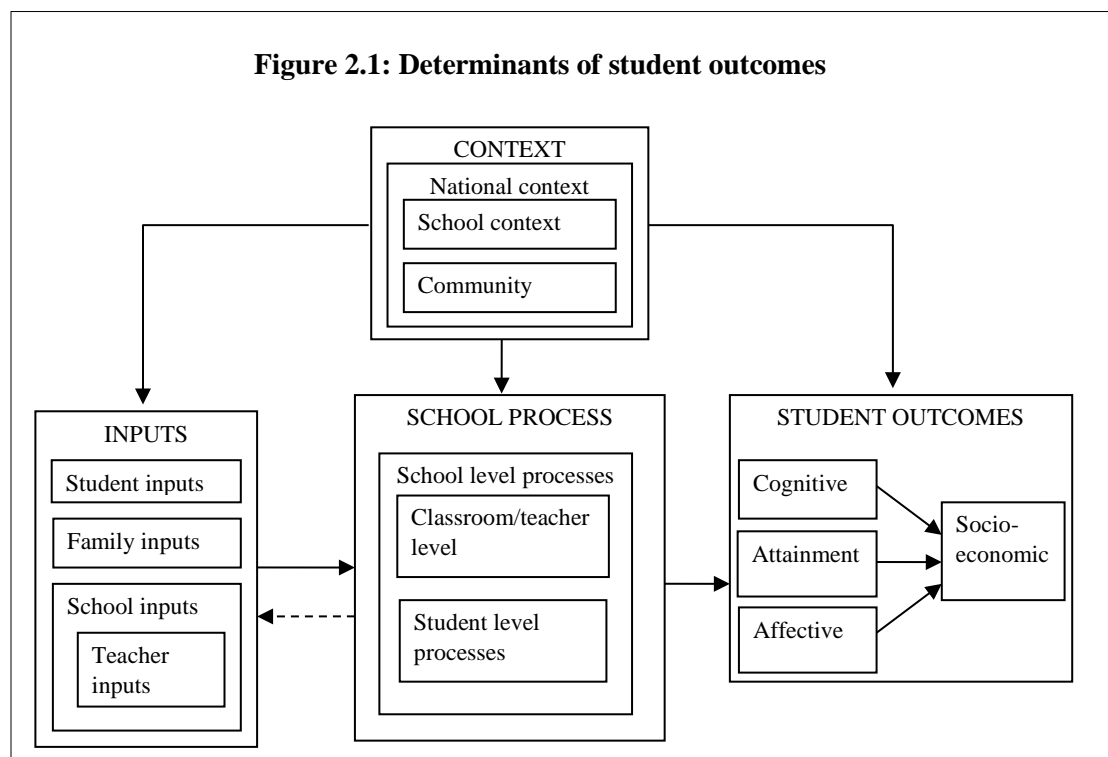
<sup>14</sup> NAPE is responsible for designing the curriculum for primary teacher education and for carrying out the training of teacher educators and education officers.

<sup>15</sup> Using the scale scoring approach, a score of 100 in NSA 2011, for example, is equivalent to a score of 100 in NSA 2017 (and 2013 and 2015 as well).

<sup>16</sup> See Annex A2.7 for cutoff scale scores for the different bands in NSA and LASI.

<sup>17</sup> The figure also shows that inputs can themselves be altered as a result of feedback from the school process. Interactions among the different factors are not shown explicitly in this simple model.





Source: Bhatta (2005) [based on models used by Scheerens (2004), Levacic and Vignoles (2002) and Ridker (1997)]

Four categories of student outcomes are identified in Figure 2.1. The first category—cognitive outcomes—refers to academic achievement and is typically measured using test scores. A related, though different, group of outcomes is attainment. The duration of school enrollment, the highest grade achieved, and academic qualifications are the important outcomes in this category. Affective outcomes, on the other hand, refer to social skills, behaviors and attitudes towards learning. These three types of outcomes, which may be viewed as proximal outcomes, largely determine the status of the student in the world of work. Work skills, employment status, and earnings are some of the indicators of socio-economic or post-school outcomes. The current paper focuses on cognitive outcomes.

We use the following simple linear regression model to capture the above functional relationship:

$$Y_{i,j} = \alpha + \beta X_{i,j} + \gamma S_j + \varepsilon_{i,j} \quad \varepsilon_{i,j} \sim N(0, \sigma^2) \quad (2.1)$$

where  $Y_{i,j}$  is the outcome (scale score) for student  $i$  from school  $j$ ,  $X_{i,j}$  represents a set of student and family characteristics,  $S_j$  represents a set of school and certain context variables that remain constant across students from the same school, and  $\varepsilon_{i,j}$  is a random error term. Ordinary Least Squares (OLS) regressions, adjusted for data clustering at the school level, are used to empirically estimate equation 2.1<sup>18</sup>. It should be noted that while the above model implies a causal relationship between  $Y_{i,j}$  and the right-hand side variables, it is not possible to establish causality using the observational data we have at

<sup>18</sup> However, the analyses of the relationship between student achievement of grade level proficiency and determinants of learning outcomes use Probit models.

hand. Hence, in the discussion below, we only refer to associations and correlations between learning outcomes and the explanatory factors.

Key findings on the trends in student learning outcomes and descriptive statistics for the potential determinants of student outcomes are presented using simple graphs and tables. Results of tests of statistical significance are presented where relevant. The key variables included in the regressions are summarized in Box 2.1<sup>19</sup>.

### **Box 2.1: Key variables of interest**

**Dependent or outcome variable (Y):** scale score\*

**Student and family characteristics (X):**

- *Student input:* age, gender, ethnic group, whether student repeated grade, whether student received stipends, whether student received private tutoring, days absent from school, whether student read books other than textbooks; hours spent studying at home
- *Family input:* education of father, education of mother, whether someone helps student with homework, household size, whether student helps with household chores, wealth index

**School and teacher characteristics and broader context (S):**

- *School:*
  - *Context:* school type, level of education offered in school, whether school is single or double shift, school management committee (SMC) status, parent teacher association (PTA) status
  - *Input:* number of teachers in the school, number of students in the school, student teacher ratio, whether the school has library, number of school days, absence rate of teachers
  - *Process:* whether homework is given
- *Head teacher:*
  - *Input:* age, qualifications, gender
- *Teachers:*
  - *Input:* age, gender, educational qualifications, length of service, major subject in the last degree, whether teacher received subject-based training
- *Community context:* location of school (urban/rural; division; district)

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\*Note: (i) In the Probit regressions analyzing the relationship between student achievement of grade level proficiency and determinants of learning outcomes, the dependent variable is whether the student's performance is at or above grade level. (ii) In the regressions analyzing higher order thinking, the dependent variable is the percentage of higher order thinking skill items answered correctly.

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<sup>19</sup> Note that not all variables are available for all years, grades and subjects. Also, the available data for both NSA and LASI have very little information on school processes. Hence, the set of explanatory variables included in this paper are primarily school, teacher, student and family input variables.

### 3. Trends and disparities in learning outcomes

#### 3.1 Trends in learning outcomes

The trends in literacy and numeracy learning outcomes at the primary level are summarized in Table 3.1, which presents the grade-specific average scale scores and standard deviations of these scores in Bangla and math for NSA 2011, 2013, 2015, and 2017. These scores indicate that student learning outcomes in both Bangla and math for grades 3 and 5 have generally not improved since 2011, and have been fluctuating over time (Figure 3.1). In fact, except in grade 3 Bangla, there has been a decline in scores in both subjects and grades. The changes in scores between 2011 and 2017 are statistically significant at the 1% level in all four cases. The table also shows estimates of the effect sizes (measured using *Cohen's d* statistic) of the score differences between 2011 and 2017 to provide an indication of whether these changes in scores can also be considered substantively significant. Following the approach in ACER (2016), we conclude that the differences in scores between 2011 and 2017 are small for grade 3 but large for grade 5, irrespective of subject<sup>20</sup>.

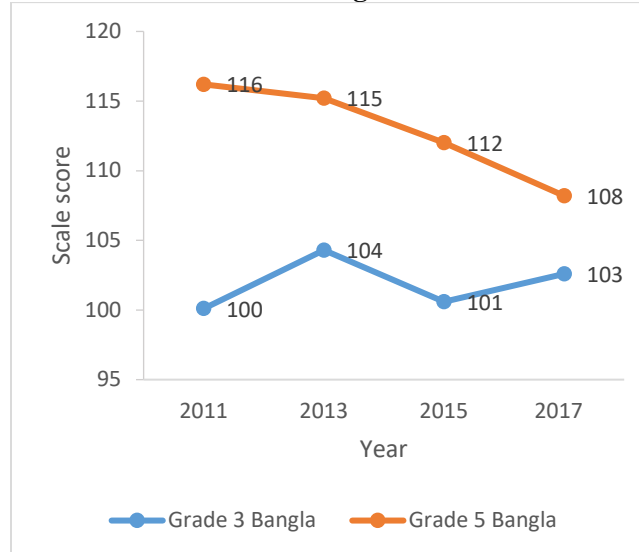
**Table 3.1: Mean scale scores for NSA 2011, 2013, 2015, and 2017**

Subject	Scale score				Cohen's d (2017-2011)
	2011	2013	2015	2017	
Grade 3 Bangla	100.1 (11.6)	104.3 (12.1)	100.6 (12.4)	102.6 (12.7)	0.19***
Grade 3 math	100.7 (13.0)	103.7 (13.0)	98.3 (11.4)	98.7 (13.9)	-0.14***
Grade 5 Bangla	116.2 (9.8)	115.2 (11.0)	112.0 (12.7)	108.2 (10.6)	-0.75***
Grade 5 math	118.6 (12.3)	115.8 (12.4)	110.2 (10.9)	111.3 (12.1)	-0.57***

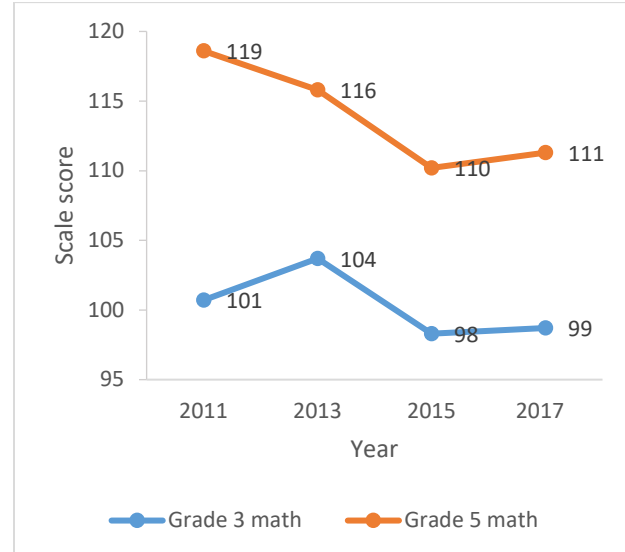
\*\*\*significant at the 1% level; standard deviations of scores shown in parentheses  
Source: Authors' calculations using NSA 2011, 2013, 2015 and 2017

**Figure 3.1: Student mean scale scores in grade 3 and 5 in Bangla and math (2011-17)**

**a. Mean scale scores in Bangla**



**b. Mean scale scores in math**

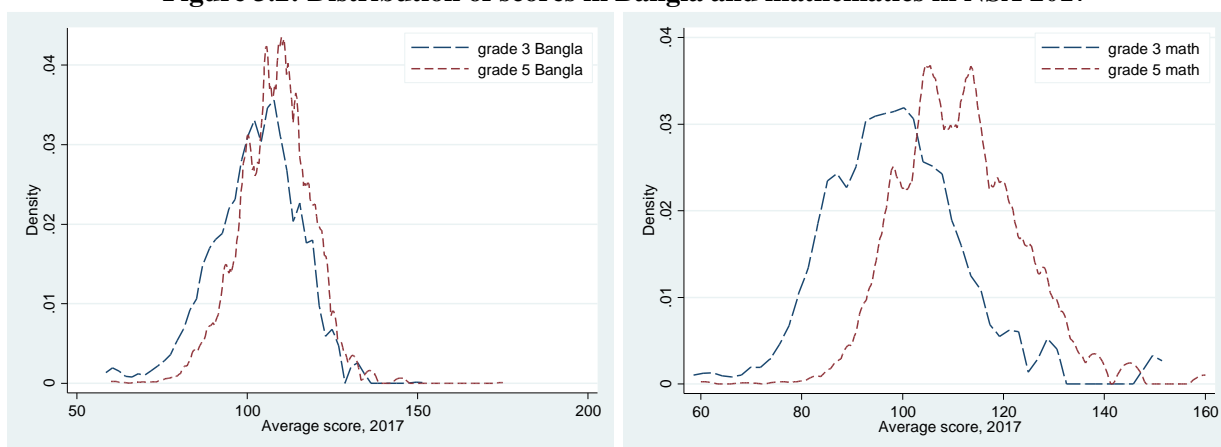


Source: Authors' calculations using NSA 2011, 2013, 2015 and 2017

<sup>20</sup> The effect size is considered small if  $|d| \leq 0.2$ , moderate if  $0.2 \leq |d| \leq 0.5$ , and large if  $|d| \geq 0.5$  (ACER 2016).

At the same time, disparities in learning outcomes across students, as reflected in the standard deviations of the scale scores in Table 3.1, have generally increased between 2011 and 2017. Furthermore, a comparison of the distributions of scores in the two subjects in 2017 suggests that while the students in grade 5 tend to have higher scores than students in grade 3 as might be expected, there is a sorting of students into low and high performing groups in grade 5 (see Figure 3.2). The implication of this finding is that, as students progress to grade 5, there is a tendency for the gap between the better performing students and the weaker students to increase, resulting in a bimodal distribution of scores. When we look at consecutive NSA administration rounds, and compare the performance of grade 3 students in one year with the performance of grade 5 students in the following round, we see an increase in scores, suggesting that students are learning more as they move up the grades<sup>21</sup>. However, the level of increase is small—between 2015 and 2017, for example, the increase in average score was only 3.5% per year for Bangla and 6.7% per year for mathematics<sup>22</sup>.

**Figure 3.2: Distribution of scores in Bangla and mathematics in NSA 2017**



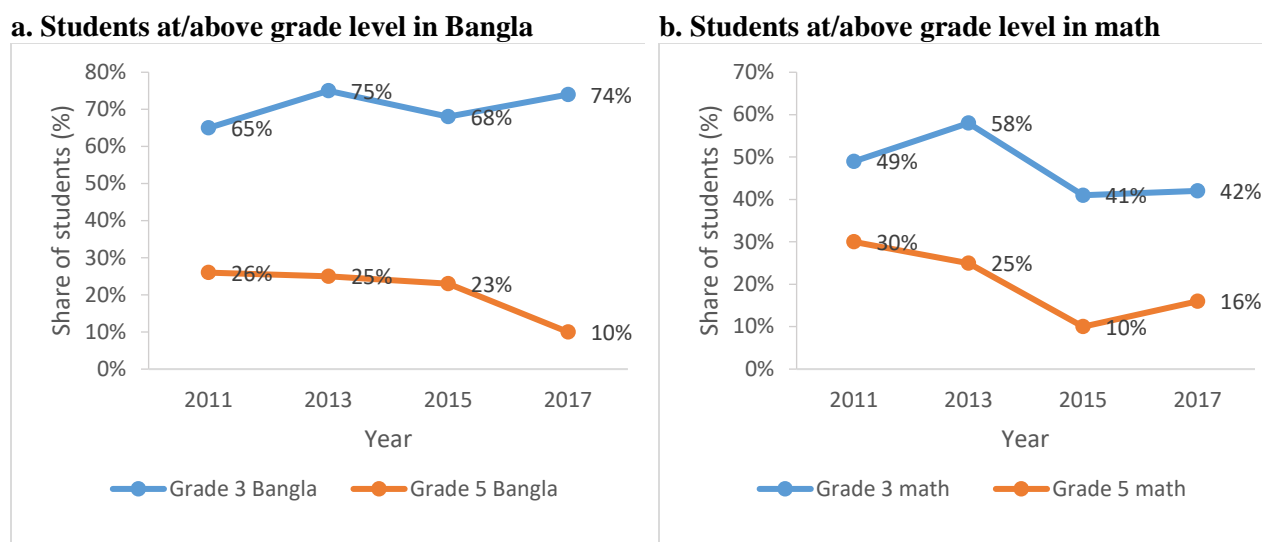
Source: Authors' estimates using NSA 2017 data

The above findings are reconfirmed when we look at the share of students in the different proficiency bands (Figure 3.3; also see Annex Tables A2.3 and A2.4). In the case of mathematics, only 49% of grade 3 students were performing at or above grade level proficiency (i.e., at band 3 or above) in 2011. This figure increased to 58% in 2013, but dropped to 41% in 2015 and increased marginally to 42% in 2017, indicating the absence of an upward trend in learning outcomes. Although the results for grade 3 Bangla are better, around 26% of the students continued to perform below grade level even in 2017. The findings for grade 5 students are even more alarming: in all four years, less than 26% of these students achieved grade level proficiency in Bangla, and the percentage of students achieving grade level proficiency in mathematics declined from 30% in 2011 to 16% in 2017.

<sup>21</sup> For example, the score for mathematics increased from 98.4 in grade 3 in 2015 to 111.5 in grade 5 in 2017 (an increase of 13.3% over two years). An increase in learning as cohorts move up the grades is expected.

<sup>22</sup> This increase can be considered small when we look at the definitions of bands in NSA. For example, the upper cutoff score for band 3 (grade 3 level proficiency) and lower cutoff score for band 5 (grade 5 level proficiency) in Bangla are 108 and 122, respectively. Hence, an average score increase of 7.5% per year would be required to move students from band 3 in 2015 to band 5 in 2017.

**Figure 3.3: Percentages of students at/above grade level proficiency in grades 3 and 5 in Bangla and math (2011-17)**



Source: Authors' calculations using NSA 2011, 2013, 2015 and 2017

Table 3.2 shows the mean scale scores in Bangla, English and math for grades 6 and 8 in LASI 2015<sup>23</sup>. As expected, compared to the scores in grade 6, the scores in grade 8 are higher in each subject, indicating an overall level of learning gain associated with the extra two years of schooling<sup>24</sup>. However, the annual percentage increases in scores are even smaller (ranging from 2.2% in mathematics to 3.3% in Bangla) than the annual increases observed in NSA between 2015 and 2017. On the other hand, the standard deviations in test scores are smaller in grade 8 than in grade 6 for English and math, indicating some progress in reducing the performance gap between the better and weaker students.

Again, it is easier to interpret the outcomes when we look at the percentages of students falling in the different performance bands<sup>25</sup>. “Band 2 or below” is the lowest achievement level in LASI, and represents performance below the grade 6 proficiency level. Around 24%, 30%, and 7% of grade 6 students performed at the “band 2 or below” level in math, English, and Bangla, respectively (Figure 3.4; also see Annex Tables A2.5 and A2.6). The corresponding figures for grade 8 were 7%, 11% and 2%, respectively, indicating that some students had not reached grade 6 level proficiency even in grade 8. These results indicate that learning outcomes at the junior secondary level (grades 6-8) also leave much room for improvement.

<sup>23</sup> Though the mean scale scores for LASI are more than three times higher than those for NSA, they do not necessarily represent higher learning outcomes as the mean scores for NSA and LASI differ substantially by design. After calculating students' ability scores (theta values) based on responses to the different assessment items by performing a Weighted Likelihood Estimation (WLE), the theta values are transformed into a scale score having a certain mean score and standard deviation. The mean score used in NSA is 100 while different mean scores are used in LASI for different subjects (300 for Bangla and Math, and 350 for English).

<sup>24</sup> In the case of LASI, we do not have data from 2013 to compare the performance of grade 6 students in 2013 with the performance of grade 8 students in 2015. Hence, we compare the performance of grade 6 and grade 8 students in 2015.

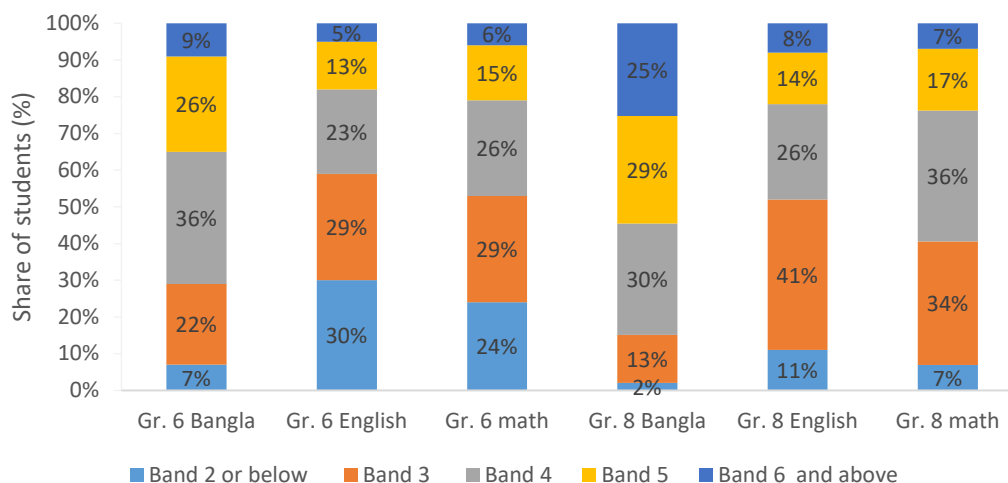
<sup>25</sup> Note, however, that there is no clear link between NSA and LASI proficiency levels. Hence it is not possible to directly compare the percentages of students achieving grade level proficiency in grade 6 with the percentages achieving grade level proficiency in grades 3 and 5 to make inferences regarding the progress made in learning between primary and junior secondary levels.

**Table 3.2: Mean scale scores by grade in Bangla, English and math in LASI 2015**

Subject	Scale score	
	Grade 6	Subject 8
Bangla	379.5 (45.6)	403.7 (49.4)
English	331.1 (52.5)	347.8 (46.4)
Math	380.4 (62.5)	395.8 (52.6)

Source: Authors' calculations using LASI 2015; standard deviations of scores shown in parentheses

**Figure 3.4: Percentages of students in different performance bands by grade in LASI 2015**



Source: Authors' estimates using LASI 2015

The above findings provide clear evidence of the low levels of learning outcomes at both the primary and junior secondary levels, and a fluctuating, non-improving trend in learning at the primary level. While the observed lack of improvement in the NSA scores might be a reflection of the continuing low quality of school inputs and processes in Bangladesh, other factors could also have contributed to these outcomes. For example, the improvement in access to primary education in Bangladesh has resulted in increased enrollment of students from disadvantaged backgrounds. As these disadvantaged students on average perform at lower levels than those from well-off backgrounds, their greater participation in schooling may have contributed to keeping the scores low. Another potential factor is the impact of the curriculum revision that was taking place in the primary education subsector during this period. The revision was initiated in 2011, but the implementation of related activities was still in progress in 2017. Hence, the transitions taking place in instructional practice and other related activities could also have affected the NSA scores.

### 3.2 Disparities in learning outcomes

Among the many dimensions along which disparities in learning outcomes could potentially be observed, the international literature suggests that it is most relevant to look at disparities across males and females, school types, locations, and income groups. The discussion below analyzes how scale scores differ along these dimensions. Table 3.3 summarizes the differences in NSA scales scores between the different

population groups defined by these dimensions, and also shows how these differences have changed between 2013 and 2017<sup>26</sup>. A similar summary for grades 6 and 8 is presented in Table 3.4<sup>27</sup>.

**Table 3.3: Differences in NSA scale scores between genders, income groups, school types, and single shift vs. double-shift schools (2013, 2017)**

NSA	Year	(Female – Male)	(Rural-Urban)	Wealthiest - poorest	KG school - others	GPS-others	KG-GPS	KG-NNGP S	GPS-NNGPS	Double shift-Single shift
Grade 3 Bangla	2017	1.12***	-2.20***	4.45***	5.68***	1.20	4.48***	5.47***	0.99	-1.87***
	2013	0.95***	0.78	2.16***	4.36***	1.64	2.73***	3.80***	1.08	
Grade 3 Math	2017	0.06	-0.53	3.52***	4.47***	3.19***	1.28	3.65***	2.37***	-1.29*
	2013	-0.23	1.74**	1.39**	2.36	1.44	0.92	2.74**	1.83*	
Grade 5 Bangla	2017	0.46*	-2.93***	5.01***	8.45***	4.23***	4.22***	7.24***	3.01***	-0.86*
	2013	-0.03	-0.81	1.47**	7.31***	5.31***	2.00**	5.14***	3.14***	
Grade 5 Math	2017	0.45	-0.36	2.99***	6.09***	7.05***	-0.95	3.04***	4.00***	0.13
	2013	-0.43*	1.86**	0.40	5.71***	6.02***	-0.31	3.25**	3.56***	

\*\*\*significant at the 1% level; \*\*significant at the 5% level; \*significant at the 10% level

+ moderate effect size (i.e.,  $|d| \leq 0.5$ ); ++ large effect size (i.e.,  $|d| \geq 0.5$ ); small effect size ( $|d| \leq 0.2$ ) not shown

Authors' estimates using NSA (2013 and 2017) data.

Note: The "Others" school type includes Madrasah, ROSC Centers and BRAC Centers.

### Female-male differences

The 2017 results indicate near-gender parity in learning outcomes, though females have slightly better performance than males in both grades and subjects. Between 2013 and 2017, the performance of girls improved relative to that of boys in all cases. The change is particularly prominent for Bangla: in grade 3, the female-male difference was already statistically significant in 2013, and the gap widened further in 2017; in grade 5, while the gender gap was insignificant in 2013, it became marginally significant (in favor of girls) in 2017. The better performance in language observed for girls is largely in line with findings from other countries as well. For example, the PISA studies have consistently found that girls outperform boys in reading (e.g., see OECD 2013; OECD 2016).

There are no statistically significant gender gaps in Bangla in grades 6 and 8, suggesting that boys overcome their earlier learning disadvantage by the time they leave primary school (see Table 3.3)<sup>28</sup>. However, the gender gap in math is in favor of boys in both grades 6 and 8 and the gap is bigger in grade

<sup>26</sup> Because of some data limitations in NSA 2011, we use 2013 rather than 2011 as the initial year.

<sup>27</sup>In addition, box plots showing the distributions of the scores for NSA 2017 and LASI 2015 for the different population groups are provided in Annex 3 for reference.

<sup>28</sup> In the case of English language, however, although boys and girls have similar performance in grade 6, boys have significantly higher scores than girls in grade 8.

8, a finding that is again consistent with the findings from both developing and developed countries which show better math performance for boys in post-primary grades (Bhardwaj et al. 2015; Dickerson et al. 2015; OECD 2016). In this context, it is relevant to note that the absence of statistically significant gender differences in grade 3 and grade 5 math scores in 2017 may be a sign of progress in enhancing equity in math outcomes, especially given that the gender difference in math performance in grade 5 was marginally in favor of boys in 2013.

**Table 3.4: Differences in LASI scale scores between genders, income groups, and school types, 2015**

	Female – Male)	Rural-Urban	Wealthiest-poorest	Secondary –all others	Higher secondary– all others	Madrasah – all others
Grade 6 Bangla	1.74	-28.62*** ++	34.43*** ++	5.91	14.26*	-11.40*** +
Grade 8 Bangla	-0.37	-30.57*** ++	35.92*** ++	8.21**	27.05*** +	-17.88*** +
Grade 6 English	0.70	-32.01*** ++	38.79*** ++	4.18	35.09*** +	-15.75*** +
Grade 8 English	-4.98**	-31.30*** ++	32.28*** ++	3.90	27.95*** +	-13.05*** +
Grade 6 Math	-10.74**	-13.04**	21.29*** +	-9.46	19.78	5.15
Grade 8 Math	-14.06*** +	-7.18	9.85**	2.31	17.90*	-8.13*

\*\*\*significant at the 1% level; \*\*significant at the 5% level; \*significant at the 10% level

+ moderate effect size (i.e.,  $|d| \leq 0.5$ ); ++ large effect size (i.e.,  $|d| \geq 0.5$ ); small effect size ( $|d| \leq 0.2$ ) not shown  
Authors' estimates using LASI 2015 data

Note: In the last three columns, “all others” refers to the other two school types. For example, “all others” in the last column includes secondary and higher secondary institutions.

### Rural-urban differences

Comparing the performances of rural and urban areas using the NSA 2017 data, we see that rural areas have a significant disadvantage in Bangla learning in both grades. However, there is no statistically significant rural-urban difference in math scores in either grade. These results are interesting considering that in 2013, learning outcome differences were either not significant (e.g., in Bangla) or in favor of rural areas (e.g., in math). While the rural-urban convergence in mathematics learning outcomes can be considered a positive change from the perspective of equity, the divergence in Bangla performance in favor of urban areas between these two years suggests that, overall, rural areas might be falling behind in ensuring quality education to their children.

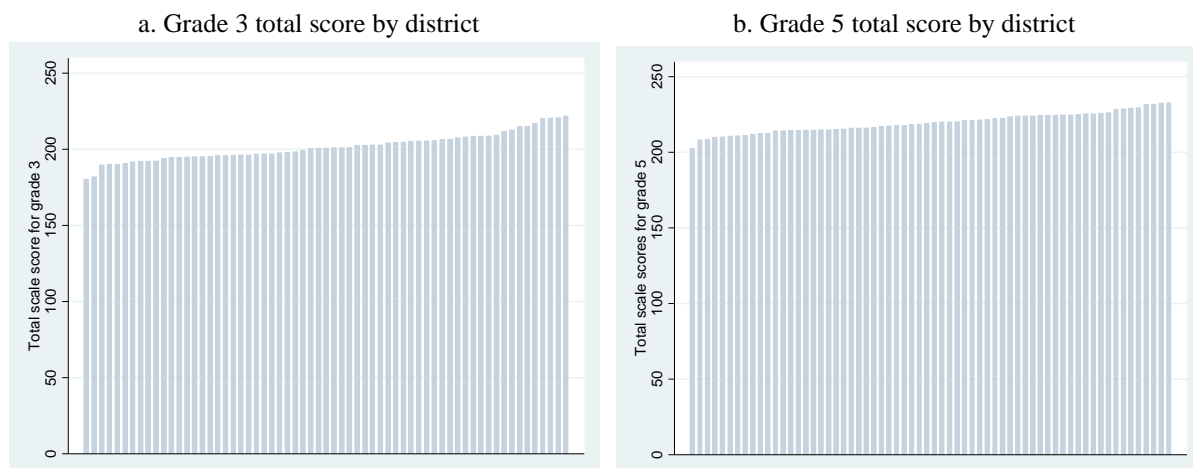
At the junior secondary level, rural-urban differences in learning outcomes are quite substantial and statistically significant in all subjects and grades except in grade 8 mathematics. In particular, it appears that the disadvantages in foundational literacy experienced by rural students get amplified as they move up the grades. The “urban bias” in learning outcomes seen here is not unique to Bangladesh. As documented in World Bank (2019), primary school students in a number of urban areas have better performance in reading and mathematics than students in rural areas in India, Nepal, Pakistan, and Sri Lanka.

Apart from the rural-urban gap in learning outcomes, the NSA and LASI data show a wide variation in student performance across divisions and districts as well. The disparities in performance at the primary level across districts can be seen in Figure 3.5, which presents district-wise scale scores (total for the two



subjects) for each grade in NSA 2017. The lowest scoring district for both grades 3 and 5 is Sylhet (total scores for grade 3 and 5 are 180 and 202, respectively), while the highest scoring district in both cases is Barisal (222 and 233, respectively). The differences across districts are even more pronounced when we look at the share of students performing at or above grade level (also see Annex 3.3). For example, in grade 3 mathematics, the percentage of students performing at or above grade level ranges from a low of 13% in the district of Cox’s Bazaar to a high of 76% in Barisal.

**Figure 3.5: Disparities across districts in total (math + Bangla) scale scores, NSA 2017<sup>29</sup>**



Source: Authors’ estimates using NSA 2017 data

### Differences across income groups

Poverty has a negative impact on access to schooling to begin with; and once children are in school, it tends to hamper learning. The negative relationship between a student’s economic status and academic achievement is well established in the literature. There is also evidence from different countries that the difference in learning outcomes between rich and poor students increases as the children progress to higher grades (World Bank 2018).

The NSA 2017 data show that children from the wealthiest households<sup>30</sup> do perform significantly better than children from the poorest households in both subjects and grades. Furthermore, while significant differences in outcomes between the two groups existed in 2013 as well for all subjects and grades except grade 5 math, the magnitudes of the differences were lower. In other words, disparities in learning outcomes between the rich and poor have increased in both grades and subjects over time. For example, while there was parity in math learning outcomes in grade 5 between rich and poor students in 2013, richer students had significantly better performance in 2017.

<sup>29</sup> In figure 3.5, the districts are ordered by performance to clearly show the extent to which learning outcomes vary across the districts.

<sup>30</sup> Wealthiest and poorest households are identified using information on six proxy variables—having a *pucca* house (house built with permanent materials like bricks, concrete, cement, iron, etc.), having a separate room for study, electricity, TV, safe water and sanitary latrine. For analyses using NSA data, a household is considered to be in the wealthiest category if it has at least five of these assets, while it is considered to be in the poorest category if it has two or less assets. In the LASI sample, the wealthiest households are those having all six assets. This categorization was used for LASI so that roughly one-fifth of the students would be included in each group. If the NSA categorization approach were used for LASI households, more than 40% of the households would be included in the wealthiest category.

The increases in disadvantages experienced by the poor are higher in grade 5 than in grade 3, suggesting that there has been a more rapid deterioration in the equity of learning outcomes in higher grades. Similarly, the LASI 2015 results show large and statistically significant differences in learning outcomes between the wealthiest and poorest students in all three subjects in both grades 6 and 8, reinforcing the finding that household economic status matters, and pointing to the possibility of a widening gulf between the two groups as they move up the grades.

### Differences across school types

Discussions on school type and learning outcomes typically focus on the differences between public and private schools. Evidence from different countries suggests that there is no consensus on which type of school has better performance (World Bank 2019). In the context of Bangladesh, analysis of performance differences across school types become particularly challenging as there are 25 different types of schools at the primary level and 7 types of schools at the secondary level<sup>31</sup>. For the purpose of this paper, we group the primary schools in Bangladesh in the following four categories: GPS<sup>32</sup>, NNPGS, KG schools, and other schools. At the primary level, the GPS, NNGPS, and KG schools comprise 29%, 19.5% and 17.6% of the total number of schools, respectively. While both GPS and NNPS are fully government supported and managed, the NNGPS typically do not have as much resources as GPS and are considered inferior in terms of quality<sup>33</sup>. The KG schools are privately managed and are often viewed as better quality schools compared to GPS and NNGPS. The “others” category includes all the other types of schools. At the secondary level, where around 98% of the schools are privately managed<sup>34</sup>, the following categories are used for our analysis: higher secondary institutions<sup>35</sup> (7.5%), secondary schools (58.3%), and Madrasahs (23.5%)<sup>36</sup>.

Among the different school types at the primary level, we see that KG schools clearly have the best performance. Not only do they perform significantly better than the schools in the base category of “others”, but they also perform better than the relatively well-resourced GPS in Bangla in both grades, and much better than NNGPS in both subjects and grades. While the results are qualitatively similar for both 2013 and 2017, the performance advantage experienced by KG schools has generally increased between the two years. The GPS are the second best performing category of schools after KG schools. And, in general, the performance difference between GPS and the other two lower performing categories of schools has either not changed much or has increased between 2013 and 2017. Comparing the GPS with the NNPS, it is seen that except in grade 3 Bangla where the performance difference between them is not significant, GPS students have higher learning outcomes in both years. Considering that both GPS and NNPS are publicly financed and managed, the government is in a good position to implement interventions aimed at raising the quality of the NNGPS to that of the GPS.

At the junior secondary level, students from higher secondary institutions have the best performance while students from Madrasahs are, on average, the worst performers. Interestingly, however, there is little difference in student performance in mathematics between the Madrasahs and other institutions.

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<sup>31</sup> These are types based on management structure.

<sup>32</sup> These also include government schools that have secondary as well as primary grades.

<sup>33</sup> NNGPS, formerly referred to as Registered Non-Government Primary Schools (RNGPS), were nationalized in 2013.

<sup>34</sup> However, over 80% of these schools receive some level of government subsidy.

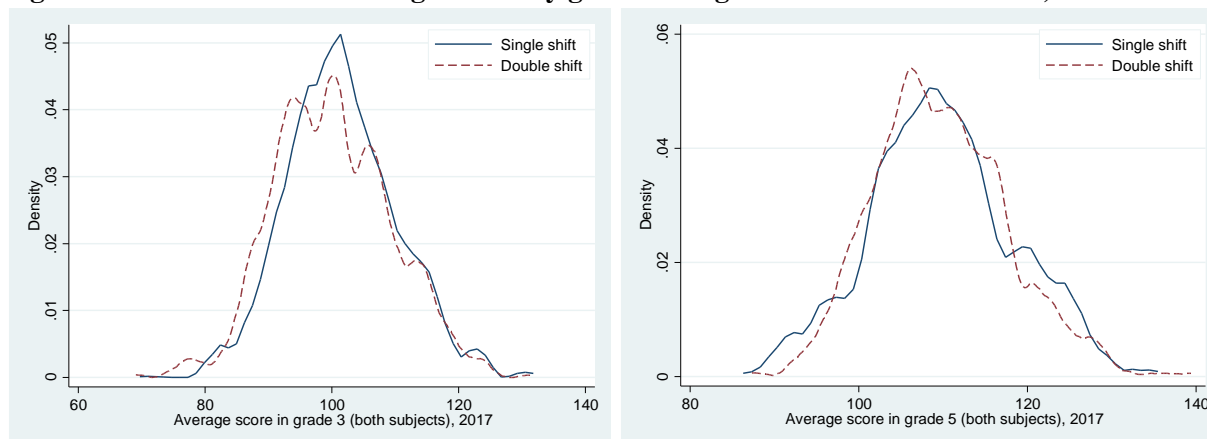
<sup>35</sup> These institutions include high schools as well as colleges with grades 11 and 12.

<sup>36</sup> Madrasahs are Islamic religious educational institutions. Note that the secondary level also includes technical and vocational schools. But these schools are not included in the LASI sample.

### Differences between single shift and double shift schools

The amount of instructional time is widely recognized as an important factor affecting student learning (TIMSS 2015; World Bank 2018)<sup>37</sup>. In Bangladesh, a significant percentage of government primary schools are double-shift schools with shorter school days compared to single-shift schools<sup>38</sup>. It is, therefore, relevant to investigate how student performance differs between these two types of schools. As shown in Table 3.3, while there is no difference in grade 5 math performance between the two types of schools, double shift schools have lower learning outcomes than single-shift schools in both subjects in grade 3 as well as in grade 5 Bangla. The weaker performance of students in double-shift schools can also be seen in Figure 3.6, which shows for each grade the distributions of average scores (in the two subjects) for the two types of schools. The distributions in the figure also suggest that the disadvantages associated with double-shift schools are more severe in grade 3. These findings are particularly important from a policy perspective as converting double-shift schools to single shift is a measure fully within the control of the government.

**Figure 3.6: Distribution of average scores by grade in single vs. double shift schools, 2017**



Source: Authors' estimates using NSA 2017 data

### Understanding the differences in terms of effect size (Cohen's *d*)

The practical significance of the differences observed above can be better understood by looking at their effect sizes (Cohen's *d*). As shown in Table 3.3, for both NSA 2013 and 2017, the observed differences in learning outcomes between males and females, urban and rural areas, and single-shift and double-shift schools are small in terms of effect sizes. On the other hand, differences in scores across schools types are not only statistically significant but also substantively significant in most cases: the effect sizes of differences between KG schools and "others" are either moderate or large in all instances, and are moderate when comparing KG schools with NNGPS. The effect sizes for the score differences between GPS and "others", and between GPS and NNGPS tend to be moderate for grade 5, but small for grade 3.

<sup>37</sup> Although more instructional time does not automatically mean that students are spending more time productively engaged in learning, there is evidence that more contact hours between teachers and students do make a difference.

<sup>38</sup> In 2017, only 22% of primary schools operated on a fully single-shift basis and another 20% of schools provided at least 3 grades on a single-shift basis (DPE 2018b). The total number of annual contacts hours in single-shift schools is 900 hours for grades 1-2 and 1200 hours for grades 3-5. In double-shift schools, the figures are 600 hours for grades 1-2 and 780 hours for grades 3-5.

The effect sizes of the differences between students from the wealthiest and poorest households are also moderate for 2017, but small for 2013.

In the case of LASI 2015, all the differences that are statistically significant in Table 3.4 at the 1% level are moderate or large in terms of effect sizes. Another notable observation is that the effect sizes of score differences are largely similar for Bangla and English (in both grades), but different for mathematics. For example, the effect sizes for differences between rural and urban areas and between the wealthiest and poorest households are large for both grades 6 and 8 in Bangla and English. Similarly, the effect size is moderate for these two subjects when comparing Madrasahs and all other schools. However, in math, the effect sizes for score differences between rural and urban areas and between school types are small in both grades.

### **3.3 Performance differences across cognitive process levels**

Our analysis of NSA 2015 and 2017 data indicate that, like in many other countries, a large share of Bangladeshi primary level students struggle more in areas that demand higher-order cognitive skills. In both grades and subjects, we see that students are able to correctly answer significantly higher proportions of questions related to knowledge and understanding compared to questions testing application and higher order thinking skills (Table 3.5). The difference is particularly high for grade 5 Bangla in 2017—students are able to answer only 48% of the questions testing application and higher-order skills while they are able to answer over 70% of questions related to knowledge and understanding. There is no consistent pattern of improvement in performance across the two grades between 2015 and 2017. For example, while there is some improvement in Bangla performance on questions related to application and higher order skills in grade 3, the opposite is true in grade 5.

**Table 3.5: Student learning outcomes by cognitive processing level (proportion of correct answers), 2015 and 2017**

	Cognitive level	Score in Bangla	(F-M)	Score in math	(F-M)
Grade 3 (2015)	Knowledge	72.00 (23.23)	1.92***	61.98 (23.07)	-0.09
	Understanding	65.12 (22.87)	1.64***	61.49 (23.02)	-2.39***
	Application	62.12 (24.16)	2.95***	50.38 (23.32)	-0.31
	Higher-order thinking	40.02 (24.50)	3.06***	51.66 (49.97)	-2.32*
Grade 3 (2017)	Knowledge	71.71 (22.95)	2.29***	60.30 (26.27)	0.55
	Understanding	63.69 (21.75)	1.23***	64.05 (25.32)	-0.76*
	Application and above	61.59 (27.72)	3.09***	51.82 (28.15)	-0.35
Grade 5 (2015)	Knowledge	76.17 (18.19)	0.94**	70.03 (22.22)	-0.16
	Understanding	78.86 (17.19)	0.34	61.09 (22.72)	-1.24*
	Application	68.30 (24.49)	1.55***	54.82 (23.32)	-1.26*
	Higher-order thinking	58.94 (21.09)	1.79***	42.32 (33.09)	-1.88*
Grade 5 (2017)	Knowledge	74.27 (19.11)	0.21	62.36 (23.97)	1.58***
	Understanding	70.48 (19.00)	0.43	55.54 (23.11)	0.07
	Application and above	48.02 (19.95)	2.99***	51.95 (28.00)	1.18**

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; source: Authors' estimates using NSA 2015 and 2017 data; standard deviations of scores given in parentheses; score refers to percentage of questions answered correctly; (F-M) refers to female-male difference in score.

Note: While NSA 2015 included disaggregated data for “application” and “higher order thinking”, the NSA 2017 data included only one category “application and above”.

The standard deviation figures in Table 3.5 show that, in general, the variation in scores across students is higher in mathematics than in Bangla, and higher in areas related to higher cognitive processing levels. Hence, not only are students struggling more with questions requiring application and higher-order thinking skills, but there is also a greater disparity in learning outcomes across students in these areas. Another notable finding is that there is a statistically significant gender difference in grade 3 Bangla performance in favor of girls in both 2015 and 2017 across all cognitive process levels. Furthermore, girls continue to outperform boys in application and higher-order thinking skills in grade 5 Bangla as well in both years. In the case of mathematics, however, girls generally lag behind boys across all levels in 2015. But the gender difference largely disappears in 2017 in grade 3, and actually changes in favor of girls in grade 5.

**Table 3.6: Difference in student learning outcomes across cognitive processing level (difference in proportion of correct answers) by economic status and school type, 2015 and 2017**

Cognitive level		Score difference in Bangla		Score difference in math	
		Wealthiest - poorest	KG school - others	Wealthiest - poorest	KG school - others
Grade 3 (2015)	Knowledge	4.42***	12.3***	2.06	7.28**
	Understanding	4.71***	14.11***	1.21	6.33
	Application	4.09***	9.41***	3.53**	9.05*
	Higher-order thinking	4.2***	10.01***	-2.03	28.8**
Grade 3 (2017)	Knowledge	7.25***	9.60***	-0.48	0.034
	Understanding	6.15***	8.13***	-1.00	-0.43
	Application and above	10.5***	12.52***	-1.58	1.18
Grade 5 (2015)	Knowledge	4.23***	3.49	2.32*	-1.14
	Understanding	3.37***	2.81	0.94	12.5***
	Application	4.62***	10.94**	1.93	6.7*
	Higher-order thinking	6.43***	8.55**	8.56***	8.32***
Grade 5 (2017)	Knowledge	7.52***	12.56***	0.5	2.42
	Understanding	7.58***	13.22***	1.97*	2.23
	Application and above	8.72***	14.11***	1.53	2.08

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; source: Authors' estimates using NSA 2015 and 2017 data

Table 3.6 shows the differences in Bangla and math scores between children from different types of schools and between children from the wealthiest and poorest households<sup>39</sup>. We find that, in Bangla, children from the wealthiest households perform significantly better than children from the poorest households across all cognitive processing levels in both 2015 and 2017. The results are largely similar when we compare the performance of students from KG schools with those from other schools (these include non-GPS and non-NNGPS schools). However, differences in math performance between school types and between the wealthiest and poorest households are mostly not statistically significant. It should also be noted that, in most cases, differences in scores between these various groups are larger for questions requiring applications/higher-order thinking skills than for questions related to lower cognitive levels.

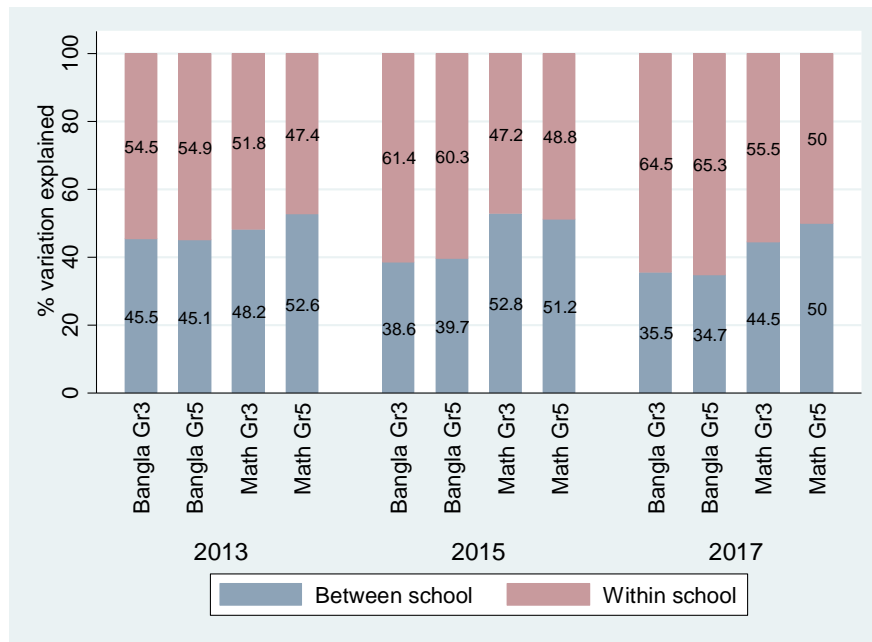
<sup>39</sup> Since information on the rural-urban locations of schools was not available for NSA 2015, we did not analyze rural-urban differences.

## 4. Determinants of student learning outcomes

### 4.1 Between-school and within-school differences

Global evidence suggests that a significant portion of the variation in student learning outcomes is related to differences in the schools attended by students. For example, Goyal and Pandey (2008) find that between 30% and 46% of the variation in student test scores is Madhya Pradesh, India and between 34% and 56% of the variation in student outcomes in Uttar Pradesh, India are explained by differences across schools (or between-school variance). This phenomenon can be observed in richer countries as well. The PISA scores from 2012 show that 37% of the math performance differences across students in OECD countries is explained by differences between schools (OECD 2013). Similarly, according to the PISA 2015 study, differences between schools account for 30% of the variation in student performance across OECD countries (OECD 2016). It is, therefore, relevant to begin our discussion on determinants of student learning outcomes in Bangladesh by analyzing the between and within school variations in assessment scores.

**Figure 4.1: Between-school and within-school variations in test scores in different subjects and grades at the primary level (2013, 2015, 2017)**



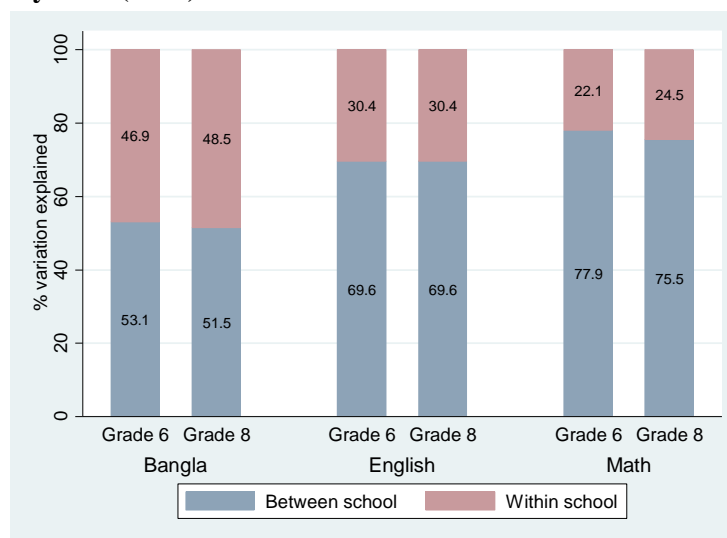
Source: Authors' estimates using NSA (2013, 2015, 2017) data

The percentage contributions of between-school and within-school variations in explaining differences in student learning outcomes at the primary level in Bangladesh are shown in Figure 4.1<sup>40</sup>. Consistent with the findings from other countries, differences between schools account for a significant portion (35% to 53%) of the variation in student test scores in both grades and subjects. While there is little difference across grades 3 and 5 in the contribution of between-school variation in Bangla, the importance of

<sup>40</sup> We use a school fixed-effect linear regression model to estimate the share of the total variation explained by between-school and within-school differences. In this approach, the share of the variation explained by between-school differences is simply the R-squared in a linear regression model with scale score as the dependent variable and the school attended as the sole independent variable (Goyal and Pandey 2008). The remaining or unexplained share of the variation can be viewed as arising from differences within schools.

between-school differences largely increases when moving from grade 3 to grade 5 in math. Furthermore, in all three years, the contributions of between-school differences appear to be greater in the case of mathematics than in the case of Bangla. A similar pattern can be observed at the secondary level (Figure 4.2): the contribution of between-school differences is greater for mathematics than for language (Bangla and English). It is also worth noting that the contribution of between-school differences is much greater in the case of secondary schools compared to primary schools, and ranges from 52% to 78%. This is not surprising considering that the vast majority of secondary institutions are private schools which vary widely in terms of quality and other characteristics. Another notable observation at the primary level is that in both subjects and grades, the percentage of the total variation in student outcomes explained by differences between schools declined between 2013 and 2017.

**Figure 4.2: Between-school and within-school variations in test scores in different subjects and grades at the secondary level (2015)**



Source: Authors' estimates using LASI 2015 data

These findings provide a number of interesting insights into why learning outcomes differ across students. First, the school a child attends matters. Second, the school a child attends plays a particularly important role in determining learning outcomes in math, and the importance of a child's school appears to increase in higher grades. Third, while the contribution of between-school differences in explaining variations in student outcomes has declined slightly over time, there is still plenty of scope for reducing disparities in the quality of the learning environment across schools. And fourth, differences within schools (e.g., among students) are equally important in determining learning outcomes, especially at the primary level.

#### 4.2 Determinants of learning outcomes: regression results

The regression results from our analysis of the determinants of student learning outcomes are summarized in Tables 4.2-4.6. The analyses for primary grades based on the NSA 2017 data are presented in Tables 4.2-4.5, while regressions results for grades 6 and 8 based on LASI 2015 data are presented in Table 4.6. Further analyses using data from NSA 2013 and NSA 2015 can be found in Annex Tables A4.3 and A4.4<sup>41</sup>. The regressions in these tables use the relevant scale score as the dependent variable, and the

<sup>41</sup> Note: Regressions for the 2011 sample could not be done as data from the head teacher, teacher and student surveys were not available.



various student, family, teacher and school characteristics listed in Table 2.1 as the explanatory variables. As noted in Section 2, the method of Ordinary Least Squares (OLS), adjusted for school level clustering of the error terms, is used to estimate the regression coefficients<sup>42</sup>. Division or district level fixed effects are included in all the models, unless otherwise noted, to control for differences in division and district characteristics.

#### Regression results for grades 3 and 5 (2017)

Before proceeding with the presentation of regression results for NSA 2017, we look at the sample means for the different school, teacher, student and household variables used in the regressions (Table 4.1). The sample means are largely similar across the four columns. The proportions of GPS are 0.57 for grade 3 and 0.56 for grade 5, and 85% of the students are enrolled in schools in rural areas. More than two thirds of the schools are double-shift schools. Only slightly over fifty percent of the schools have library facilities. The student-teacher ratio (STR) is about 36. More than 90% of the schools have SMCs and PTAs. In slightly over 40% of the schools, head teachers report teachers' job satisfaction level to be high.

Teachers in the sample have 12 to 13 years of teaching experience. The proportions of female teachers differ widely by subject—for example, only 43% of the teachers are female for grade 5 math, while the corresponding figure is 69% for grade 5 Bangla. Only about a third of the teachers have subject-based training. Almost all teachers report assigning homework.

Almost all students speak Bangla at home. Between 13% and 14% of the students have repeated a grade at least once. Fifty percent of grade 3 and 65% of grade 5 students have read supplemental books. While the education levels of parents vary a lot, around 30% of the students have at least one parent who has studied beyond grade 8. The average number of family members is slightly less than four. Private tutoring is fairly common-- more than a third of the students have received private tutoring.

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<sup>42</sup> In general, many coefficients that are statistically significant in the absence of adjustments for school level clustering become statistically insignificant when clustering is taken into account.

**Table 4.1: Descriptive statistics (sample mean) for schools in NSA 2017**

<b>Variable</b>	<b>Grade 3 math</b>	<b>Grade 5 math</b>	<b>Grade 3 Bangla</b>	<b>Grade 5 Bangla</b>
Proportion of students in GPS Schools	0.57	0.56	0.57	0.56
Proportion of students in NNGPS Schools	0.21	0.21	0.21	0.21
Proportion of students in KG Schools	0.08	0.08	0.08	0.08
The school is in rural area	0.85	0.85	0.85	0.85
The school has multiple shifts	0.73	0.72	0.73	0.72
The school has library	0.54	0.54	0.54	0.54
Student-teacher ratio (STR)	36.39	35.42	36.39	35.42
Number of school days	237.3	237.6	237.3	237.6
Head teacher is female	0.35	0.35	0.35	0.35
Head teacher is aged 40 or above	0.74	0.75	0.74	0.75
The school has a SMC	0.97	0.97	0.97	0.97
The school has a PTA	0.9	0.91	0.9	0.91
Teachers absent less than 10% of the days	0.85	0.85	0.85	0.85
Teacher vacancy is a serious problem	0.38	0.38	0.38	0.38
Overcrowded classes is a serious problem	0.37	0.36	0.37	0.36
Teachers read to enhance skills	0.87	0.87	0.87	0.87
Teachers' job satisfaction is high	0.41	0.41	0.41	0.41
Teachers' skill is high	0.45	0.44	0.45	0.44
Prop. of teachers with bachelor's degree+	0.68	0.74	0.59	0.67
Proportion of female teachers	0.60	0.43	0.71	0.69
Average number of years of teaching	12.39	13.97	12.46	13.45
Prop. of teachers with subject based training	0.38	0.51	0.28	0.37
Prop. of teachers who give homework	0.96	0.96	0.96	0.96
Proportion of female students	0.44	0.46	0.44	0.46
Proportion of students speaking Bangla	0.99	0.99	0.99	0.99
Proportion of students repeating grade	0.14	0.13	0.14	0.13
Proportion of students receiving stipend	0.15	0.14	0.15	0.14
Prop. Of students taking private tutoring	0.39	0.47	0.39	0.47
Prop. Of student receiving homework help	0.83	0.77	0.83	0.77
Proportion of students reading supplemental books	0.5	0.65	0.5	0.65
Average number of days students is absent	2.3	1.99	2.3	1.99
Prop of parent's max education: up to grade 5	0.35	0.32	0.35	0.32
Prop of parent's max education: up to grade 8	0.27	0.25	0.27	0.25
Prop of parent's max education : up to grade 10	0.14	0.17	0.14	0.17
Prop of parent's max education: more than grade 10	0.14	0.15	0.14	0.15
Average number of assets	3.71	3.95	3.71	3.95
Average number of family members	3.68	3.76	3.68	3.76
Observations	37380	30490	37380	30490

Source: Authors' estimates using NSA 2017 data

As shown in Tables 4.2-4.5, three regression models are estimated for each subject and grade. The first model includes only school characteristics as explanatory variables. Model (2) includes teacher characteristics in addition to school characteristics. The third model is the most comprehensive one and includes student, household, school, and teacher characteristics in the regression. In the case of NSA 2013 and 2015, estimates are shown only for model (3) (see Annex Tables A4.3 and A4.4), and relevant insights from these regressions are highlighted in the discussion below.

In tables 4.2-4.5, the regression results for model (1)—which looks at the relationship between school factors and student performance—indicate that school type, quantity of teachers, and time on task have a statistically significant association with student outcomes. More specifically, they show that compared to students from Madrasahs and other schools<sup>43</sup>, students from KG schools, GPSs, and NNGPSs have, on average, significantly better performance even when we account for other school-related factors<sup>44</sup>. Furthermore, students from KG schools and GPSs generally have substantially higher scores than students from the NNGPSs. The potential reasons behind the better performance of students from these two types of schools are discussed later in this section.

Similarly, having an adequate number of teachers, as represented by the STR, is associated with higher scores. The positive relationship between teacher adequacy and student performance is also reflected in the statistically significant coefficient for the variable “teacher vacancy is a serious problem” as reported by the head teacher in the regressions for grade 3 and grade 5 mathematics. Time on task is represented by two variables in the regressions: whether school operates double-shifts and the number of school days. Consistent with the findings from Section 2, students from double-shift schools have lower scores in both subjects and grades<sup>45</sup>. And there is also a statistically significant relationship between the number of school days and learning outcomes in grade 5 Bangla. Surprisingly, students from schools with head teachers who consider overcrowding to be a serious concern tend to perform better than others. Perhaps this result is driven by the fact that the perception of overcrowding is highly correlated to school type, and students who attend one type of school may be systematically different from those attending another type of school. Compared to other schools, a much larger percentage of GPS (and to some extent NNGPS) view overcrowding as a big concern in their schools. Future research should explore management and other issues related to school types further as existing NSA (and LASI) datasets have very limited information on these variables.

As can be seen from the regressions for model (2), the above findings are maintained when we add teacher related factors to the set of explanatory variables in model (1)<sup>46</sup>. It is interesting to note that none of the teacher characteristics has a statistically significant association with learning outcomes in mathematics in both grades. However, student scores in grade 5 Bangla do have a positive relationship with teacher qualifications (proportion of teachers with bachelors of higher degrees) and teaching experience (number of years of teaching). On the other hand, short-term teacher training, as represented by the proportion of teachers with subject-based training, is negatively associated with grade 5 Bangla scores. The loss of teaching days resulting from the teachers’ participation in such short-term, in-service training program could potentially be a reason for this counter-intuitive finding. The government targets to provide short-term training to around 300,000 teachers each year. The typical length of subject-based

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<sup>43</sup> Madrasahs and other schools represent around 10% of the sample of schools.

<sup>44</sup> Though students in NNGPS perform better than the students from other schools, the coefficient estimates are not statistically significant in a couple of regressions.

<sup>45</sup> However, the coefficient is not statistically significant in the case of grade 5 mathematics.

<sup>46</sup> However, the coefficient for one of the time on task variables—number of school days—becomes insignificant in the regression for grade 5 Bangla, and instead becomes significant in the case of grade 3 Bangla.

training is 6 days. But some types of short-term training are much longer—for example, the inception training for new teacher lasts for 15 days. It is also surprising the coefficient on the school process variable “proportion of teachers who give homework” is insignificant except in the regression for grade 3 Bangla. The insignificance of the coefficient estimate can partly be attributed to the low variation in the explanatory variable (as noted in Table 4.1, over 95% of the teachers report that they assign homework).

Most of the above findings regarding school and teacher characteristics are maintained in the regressions for model (3)—the most comprehensive and preferred model which also includes student and household factors. The key school characteristics associated with higher student learning outcomes are school type and teacher adequacy. More specifically, compared to students from Madrasahs and other schools, students from GPS and KG schools, in particular, do better. Similarly, student learning outcomes are generally lower in schools that have higher STRs or where head teachers perceive teacher vacancy to be a serious problem<sup>47</sup>. None of the teacher characteristics has a statistically significant association with learning outcomes, except in the regression for grade 5 Bangla where teacher qualifications and teaching experience are positively related and training experience is negatively related to scores.

The regressions for model (3) show five notable results related to the relationship between learning outcomes and student/household characteristics. The first is that scores for female students are significantly higher than the scores for males in Bangla (but not in mathematics). The second is that scores are higher in both subjects and grades for students from wealthier families. These two results reconfirm the findings from Section 3. The third is the positive association between parental education and student learning outcomes in both subjects and grades. In particular, the higher the maximum level of education of the parents, the larger the scale score on average. The fourth is the statistically significant relationship between the variable “student reads books other than textbooks at home” and learning outcomes in both grades and subjects. This finding highlights the critical role of reading habit in facilitating effective learning. The fifth is the statistically significant negative relationship between scores and whether the student has repeated a grade, indicating that students with prior learning difficulties continue to have lower learning outcomes. This is an important finding considering that more than 12.5% of the students in the sample had repeated a grade at some point in their schooling.

It should also be noted that some factors that we would expect to influence student performance do not show a statistically significant relationship with learning outcomes. Examples of such factors include the language spoken at home by the student, whether student receives private tutoring, whether student receives help with homework, head teacher characteristics, the qualifications and experience of teachers, and the percentage of teachers who assign homework. Similarly, some variables have a statistically significant bivariate relationship with learning outcomes, but the relationship loses significance when other explanatory variables are taken into account. Two such variables of particular interest are whether the student’s school operates double shifts, and the location of the school (urban vs. rural).

#### Supplementary regression results for grades 3 and 5

Supplementing the above analyses of the determinants of learning outcomes using scale scores, we next perform Probit regressions (for both subjects and grades) where the dependent variable is whether the student’s performance was at or above grade level in NSA 2017 (Annex Table A4.2). Except for the variables representing school type, none of the other school characteristics are statistically significant in

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<sup>47</sup> The coefficient for STR is statistically significant for grade 3 math and grade 5 Bangla, while the coefficient for “teacher vacancy is a serious problem” is statistically significant in all regressions except the one for grade 3 Bangla.

more than two instances. As before, KG schools and GPS do better than NNGPSs and other schools, except for grade 5 math where the relationship is not statistically significant. Students from schools where the head teacher perceives teacher vacancy to be a serious problem tend to perform worse, particularly in grade 5 math and Bangla. As with most other regressions explored earlier, the coefficients on teacher characteristics are not significant in any of the regressions.

With regards to student and household characteristics, the statistical significance and directions of relationships for the following explanatory variables are similar to the findings in the regressions discussed earlier: whether students have repeated grade, reading habit (student reads books other than textbooks at home), parental education and economic status. Gender differences in outcomes are insignificant for grade 5 students. And though the coefficient on the gender variable is statistically significant for grade 3 students, the directions are different for math and Bangla.

Regression results for NSA 2013 and NSA 2015 are summarized in Annex Tables A4.3 and A4.4. Interestingly, none of the school and teacher characteristics is consistently statistically significant in either of the two years. In general, the co-efficient on KG schools is positive, but it is statistically significant in only three of the eight regressions. The variable “Head teacher aged 40 years or below” has a statistically significant positive relationship with learning outcomes in five of the eight regressions. In general, schools with headteachers with less than 10 years of education perform worse. In both 2013 and 2015, students from schools with PTA generally have higher scores in grade 5 Bangla. In 2013, the co-efficient on the rural variable is positive in all four grade-subject combinations, but is statistically significant only for grade 5 math<sup>48</sup>.

However, as in the regressions for 2017, a number of student and household characteristics show a statistically significant relationship with learning outcomes in 2013 and 2015. In particular, the coefficients on whether student has repeated grade, and whether student reads supplemental reading materials at home are statistically significant in both years. Students whose parents have completed at least grade 10 also perform better than students with parents who are illiterate. Students who are absent longer do worse than those who are more regular in school. Indigenous people, on average, perform worse than non-indigenous people. The relationship between scores and being female is negative for math in both grades, but is mostly positive for Bangla. There is also a statistically significant negative relationship between test scores and student’s age in 2013<sup>49</sup>. Unlike in 2017, the co-efficient on economic status is not statistically significant in both years.

Finally, we also run regressions for the determinants of learning outcomes using pooled cross-section data for NSA 2013, 2015 and 2017. The estimates, provided in Table A4.5, are qualitatively largely similar to the estimates from the separate year-specific regressions presented above. For example, learning outcomes are positively correlated to school type, with students from KG schools and GPS scoring, on average, much higher than students from NNGPS, Madrasahs and other types of schools. Students who have ever repeated grades or have been absent from school for a longer period fare worse than others. Students who read supplementary books at home or whose parents are more educated do better. Female students appear to do better than male students in Bangla. Interestingly, the assets the family owns are not statistically significantly related to learning outcomes, once we control for other characteristics. Consistent with the trends shown in Table 3.1, the coefficients for the 2015 and 2017 year dummies are negative and statistically significant confirming that learning outcomes, on average, have declined since 2013.

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<sup>48</sup> Note: The 2015 data do not have information on the urban-rural locations of schools.

<sup>49</sup> The age variable was missing in NSA 2015 and 2017.

**Table 4.2: OLS regression results for determinants of student performance in grade 3 math, 2017**

<b>Variable</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>
<i>School characteristics</i>			
The school is in rural area	0.435	1.017	1.288
School type: GPS	6.035***	6.634***	5.821**
School type: NNGPS	4.492**	4.950**	5.122**
School type: KG	7.523***	8.297***	5.629**
The school has multiple shifts	-2.108**	-2.586**	-1.678
The school has library	-0.214	-0.360	-0.403
Student-teacher ratio (STR)	-0.0795***	-0.0798***	-0.0780***
Number of school days	0.00957	0.00192	0.00867
Head teacher is female	0.300	0.378	0.806
Head teacher is aged 40 or above	-0.281	-0.755	-1.544
The school has a SMC	-0.151	-0.0463	-0.427
The school has a PTA	0.324	-0.545	0.580
Teachers absent less than 10% of the days	0.313	-0.260	0.121
Teacher vacancy is a serious problem	-1.769**	-2.026**	-1.776*
Overcrowded classes is a serious problem	2.483***	3.343***	2.793***
<i>Teacher characteristics</i>			
Prop. of teachers with bachelor's degree+		-0.171	0.503
Proportion of female teachers		0.102	0.701
Average number of years of teaching		0.000638	0.00252
Proportion of teachers with subject based training		0.827	0.302
Proportion of teachers who give homework		4.066	2.832
<i>Student and household characteristics</i>			
Student is female			-0.649*
Student speaks Bangla at home			-2.053
Student has repeated grade			-2.937***
Student receives stipend			1.498*
Student takes private tutoring			0.0251
Student reads books other than textbooks at home			2.919***
Number of days student is absent			-0.0567
Parent's max education: up to grade 5			0.421
Parent's max education: up to grade 8			1.359**
Parent's max education: up to SSC (grade 10)			2.420***
Parent's max education: more than grade 10			4.112***
Wealth index			0.473***
Student's total number of family members			-0.0293
Constant	92.99***	90.65***	87.58***
Observations <sup>50</sup>	11,448	9,218	6,614
Adjusted R-squared	0.181	0.207	0.251

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using NSA 2017 data

<sup>50</sup> The differing numbers of observations in the three models are a result of missing observations, which increase as the number of variables increase progressively in models (1) to (3).

**Table 4.3: OLS regression results for determinants of student performance in grade 5 math, 2017**

<b>Variable</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>
<i>School characteristics</i>			
The school is in rural area	0.0884	0.402	1.307
School type: GPS	7.473***	6.894**	5.841**
School type: NNGPS	4.766*	5.070*	4.549
School type: KG	7.881***	6.842**	4.766*
The school has multiple shifts	-0.960	-0.949	-0.451
The school has library	0.206	0.797	-0.262
Student-teacher ratio (STR)	-0.0140	-0.0117	-0.0194
Number of school days	0.0144	0.0354**	0.0243
Head teacher is female	-0.0190	0.534	0.682
Head teacher is aged 40 or above	-0.109	-0.554	-0.406
The school has a SMC	2.148	1.421	2.431
The school has a PTA	0.0758	0.999	1.967
Teachers absent less than 10% of the days	-0.305	-0.540	-0.0924
Teacher vacancy is a serious problem	-2.236**	-3.093***	-3.224***
Overcrowded classes is a serious problem	2.569***	1.917*	1.616
<i>Teacher characteristics</i>			
Prop. of teachers with bachelor's degree+		0.230	-0.485
Proportion of female teachers		-0.529	-0.924
Average number of years of teaching		-0.0111	1.87e-05
Proportion of teachers with subject based training		-0.545	-0.515
Proportion of teachers who give homework		-0.571	-2.190
<i>Student and household characteristics</i>			
Student is female			0.0207
Student speaks Bangla at home			1.336
Student has repeated grade			-1.783***
Student receives stipend			1.898*
Student takes private tutoring			-0.837
Student reads books other than textbooks at home			2.522***
Number of days student is absent			-0.0786
Parent's max education: up to grade 5			-0.472
Parent's max education: up to grade 8			-0.233
Parent's max education: up to SSC (grade 10)			0.504
Parent's max education: more than grade 10			2.325***
Wealth index			0.618***
Student's total number of family members			-0.0248
Constant	99.72***	94.55***	94.71***
Observations	9,806	8,015	6,258
Adjusted R-squared	0.186	0.201	0.240

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using NSA 2017 data

**Table 4.4: OLS regression results for determinants of student performance in grade 3 Bangla, 2017**

<b>Variable</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>
<i>School characteristics</i>			
The school is in rural area	-0.622	-0.217	0.110
School type: GPS	4.855***	5.146**	5.771**
School type: NNGPS	4.619**	5.274**	5.959**
School type: KG	7.718***	8.250***	6.535***
The school has multiple shifts	-2.297***	-2.203**	-0.978
The school has library	-0.196	0.303	0.234
Student-teacher ratio (STR)	-0.0340*	-0.0444**	-0.0390
Number of school days	0.00622	0.0127	0.0160
Head teacher is female	0.810	0.359	0.689
Head teacher is aged 40 or above	-0.889	-0.836	-1.260
The school has a SMC	-1.546	-2.908	-2.158
The school has a PTA	0.0432	0.933	0.558
Teachers absent less than 10% of the days	-0.728	-0.278	-0.0134
Teacher vacancy is a serious problem	-0.980	-1.554**	-0.896
Overcrowded classes is a serious problem	2.051***	2.205***	1.609**
<i>Teacher characteristics</i>			
Prop. of teachers with bachelor's degree+		1.148	0.474
Proportion of female teachers		0.729	0.503
Average number of years of teaching		0.0213	0.0212
Proportion of teachers with subject based training		0.743	-0.209
Proportion of teachers who give homework		3.958*	3.103
<i>Student and household characteristics</i>			
Student is female			1.488***
Student speaks Bangla at home			-4.251*
Student has repeated grade			-2.418***
Student receives stipend			0.587
Student takes private tutoring			-0.0103
Student reads books other than textbooks at home			3.041***
Number of days student is absent			-0.0309
Parent's max education: up to grade 5			0.319
Parent's max education: up to grade 8			1.545*
Parent's max education: up to SSC (grade 10)			3.319***
Parent's max education: more than grade 10			4.773***
Wealth index			0.559***
Student's total number of family members			0.00859
Constant	105.4***	98.24***	96.12***
Observations	11,779	9,958	7,183
Adjusted R-squared	0.142	0.149	0.198

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using NSA 2017 data



**Table 4.5: OLS regression results for determinants of student performance in grade 5 Bangla, 2017**

<b>Variable</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>
<i>School characteristics</i>			
The school is in rural area	-1.599*	-0.771	-0.0388
School type: GPS	6.109***	6.180***	5.343***
School type: NNGPS	4.928***	4.306**	4.112**
School type: KG	8.860***	9.229***	7.006***
The school has multiple shifts	-1.385**	-1.238*	-0.843
The school has library	0.403	0.132	-0.278
Student-teacher ratio (STR)	-0.0439***	-0.0548***	-0.0584***
Number of school days	0.0209**	0.0199	0.0120
Head teacher is female	0.523	0.228	0.712
Head teacher is aged 40 or above	-0.162	-0.113	-0.576
The school has a SMC	1.157	0.764	0.670
The school has a PTA	-0.982	-1.625	-0.781
Teachers absent less than 10% of the days	-0.187	0.171	0.600
Teacher vacancy is a serious problem	-0.809	-1.319*	-1.324**
Overcrowded classes is a serious problem	1.845***	2.128***	2.193***
<i>Teacher characteristics</i>			
Prop. of teachers with bachelor's degree+		1.586**	2.300***
Proportion of female teachers		0.966	0.579
Average number of years of teaching		0.134***	0.160***
Proportion of teachers with subject based training		-1.846***	-1.465**
Proportion of teachers who give homework		1.225	1.134
<i>Student and household characteristics</i>			
Student is female			0.416
Student speaks Bangla at home			-1.122
Student has repeated grade			-2.708***
Student receives stipend			1.006*
Student takes private tutoring			-0.647*
Student reads books other than textbooks at home			2.259***
Number of days student is absent			-0.130**
Parent's max education: up to grade 5			-0.511
Parent's max education: up to grade 8			0.351
Parent's max education: up to SSC (grade 10)			1.253**
Parent's max education: more than grade 10			2.656***
Wealth index			0.637***
Student's total number of family members			-0.0496
Constant	103.5***	98.53***	99.19***
Observations	9,872	7,671	5,967
Adjusted R-squared	0.145	0.173	0.217

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using NSA 2017 data

### Regression results for grades 6 and 8

The regression results for grades 6 and 8 using the comprehensive model (model (3)) are presented in Table 4.6<sup>51</sup>. It should be noted that, compared to the results for NSA 2017, the relationships between the various explanatory variables and learning outcomes are less consistent across the grades and subjects in LASI 2015. This is particularly true for school and teacher characteristics.

Among the school-related factors considered, the location of the school has a relatively consistent statistically significant relationship with learning outcomes. Except in grade 8 mathematics, where the performance of students in rural areas is better, students from urban areas have higher learning outcomes in all grades and subjects<sup>52</sup>. Similarly, we see that school type also matters—students from Madrasahs have, on average, lower scores than students from other types of schools, especially in English (though the relationship is statistically significant only at the 10% level in most cases). As in NSA 2017, teacher adequacy is also significantly related to learning outcomes in some of the regressions. More specifically, higher STR and the head teacher’s perception that teacher vacancy is a serious problem are associated with lower scores in a number of cases. An interesting finding not seen in NSA 2017 is the relationship between head teacher characteristics and learning outcomes. Having a female head teacher is associated with higher scores in both grades and all subjects except mathematics. Teachers’ skills appear to matter more in grade 8 and the absence of a library is associated with lower learning outcomes in grade 8 Bangla and grade 6 English.

As in NSA 2017, the relationships between teacher characteristics and learning outcomes generally appear weak. Having teachers with higher qualifications (master’s degree and above) is associated with higher scores in all three subjects in grade 8 but not in grade 6. And students from schools with higher proportions of teachers with an M.Ed. degree have better performance in Bangla and English but not in mathematics. Teaching experience and training, in general, are not significantly related to outcomes.

The relationships between student characteristics and learning outcomes are more stable across the six regressions and largely in line with common expectations. In particular, student effort—represented by the time devoted to study by the student—has a positive and statistically significant association with learning outcomes in both grades and subjects. On the other hand, students who are absent from school longer tend to perform worse than students who are more regular in all grade subject combinations. Similarly, consistent with the findings from NSA 2017, students who have repeated a grade at some point in their schooling have, on average, lower scores than other students. There is also a consistent negative correlation between the student’s age and learning outcomes regardless of grade and subject suggesting that, other things being equal, older students perform worse than younger students. There is also a positive correlation between reading habit (represented by “student reads supplemental books at home”) and student scores, but the estimates are statistically significant for only Bangla grade 6 and Math grade 8. Interestingly, none of the regressions show any significant association between student engagement in household chores and learning outcomes, even though we would expect that helping with household chores would require students to sacrifice some of the time they could otherwise have spent studying. It is likely that the low variation in this explanatory variable (more than 98% of students report that they help with household chores) is contributing to this rather surprising result.

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<sup>51</sup> Estimates for all models, including model (3), are provided in Tables A4.6-A4.11. Descriptive statistics for the variables included in these models is provided in Annex Table A4.1

<sup>52</sup> Though the relationship is not statistically significant in grade 6 mathematics.

The findings for household characteristics are similar to those for NSA 2017. Compared to students whose parents are illiterate, students whose parents have completed at least grade 11 perform better. And there is a positive relationship between household wealth and student learning outcomes in both grades and all subjects, and the relationships are statistically significant in most cases.

**Table 4.6: Determinants of performance in Bangla, English and math in grades 6 and 8, 2015**

Variable	Bangla Grade 6	English grade 6	Math grade 6	Bangla Grade 8	English grade 8	Math grade 8
<i>School characteristics</i>						
The school is in rural area	-7.846**	-8.020*	3.791	-8.863**	-13.00***	14.33***
The School is a Madrasah	-8.644**	-9.667*	6.947	-17.02***	-7.993*	-9.261*
Student-teacher ratio (STR)	-0.123**	-0.126	-0.227***	-0.0611	-0.0219	-0.0836
Head teacher is female	22.14***	25.61***	17.81	6.859	13.06*	11.54
Head teacher is aged 40 or above	-0.766	-3.457	-0.528	1.104	-0.242	0.247
Teacher vacancy is a serious problem	0.0696	-2.757	-9.121*	-4.110	-5.087	0.372
Teachers' skills are high	2.007	5.484	11.59**	6.288**	10.75***	8.863**
Lack of library a serious problem	-3.147	-9.698***	-7.890	-7.668***	-0.701	-5.053
<i>Teacher characteristics</i>						
Prop. of teachers with master's degree and higher	0.734	8.772*	4.147	10.98***	7.691*	23.69***
Proportion of female teachers	5.263*	-10.42**	-1.873	-2.039	-3.734	-17.46**
Average number of years of teaching	0.559	-1.470	0.671	-1.474	-2.088*	1.387
Proportion of teachers with B.Ed. Degree	2.398	9.229**	4.808	1.623	9.815**	-4.288
Proportion of teachers with M.Ed. Degree	24.55***	10.81	-16.31*	16.98	5.669	-0.441
Prop of teachers whose major is the subject taught	2.651	3.081	4.073	11.63***	1.509	4.016
Proportion of teachers with subject based training	0.304	-5.351	-3.912	-1.640	-9.512**	-7.177
Prop. of teachers who have taken CPD ICT training	0.921	0.0729	-3.242	1.692	-3.828	1.334
Prop. of teachers who seek guidance in learning	-0.649	7.894**	3.744	-0.312	3.411	0.912
<i>Student and household characteristics</i>						
Student's age	-3.972***	-4.253***	-4.185***	-4.258***	-3.079***	-2.950**
Student is female	2.395	2.042	-8.965***	2.324	-2.462	-13.51***
Student has repeated grade at junior secondary level	-12.94***	-13.02***	-16.43***	-13.04***	-8.059***	-6.223**
Student receives stipend	-1.980	0.462	-2.037	-2.813**	-3.447***	-1.735
Student received tuition waiver	-1.115	0.706	-4.536	-1.402	-1.061	-6.420**
Student receives help in homework	-2.285*	-0.419	-1.034	-4.039***	-2.781*	0.381
Student helps with chores	1.492	1.663	0.0263	5.294	6.572	7.248
Time devoted to study	6.938***	5.954***	7.132***	9.206***	3.363***	5.933***
Student reads supplemental books	4.872***	0.0645	4.771	1.915	1.808	3.612*
Number of days student is absent in 2 weeks	-1.903***	-1.035*	-2.585***	-1.898***	-1.120**	-2.013***
Parents education: up to grade 5	-0.237	3.702*	4.035	1.204	2.411	3.231*
Parents education: up to grade 8	2.811	3.502	3.749	2.015	2.455	3.506*
Parents education: up to grade 10	6.309***	5.057**	7.167**	6.511***	5.594***	3.648*
Parents education: grade 11 or higher	10.10***	15.79***	15.54***	18.31***	19.43***	14.43***
Wealth index	2.209***	2.010***	1.972**	1.068**	0.885	0.502
Constant	384.4***	332.7***	368.1***	414.4***	363.0***	388.7***
Observations	10,570	11,282	10,911	11,323	11,788	11,415
Adjusted R-squared	0.235	0.239	0.229	0.236	0.211	0.243

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using LASI 2015 data

### **4.3 Explaining performance of students in areas requiring higher order thinking**

We consider next an area where most students struggle – correctly answering assessment questions that demand higher-order cognitive skills. We look at whether there is a statistically significant relationship between the percentage of application and higher-order thinking skills related test items answered correctly and various school, teacher, student and household characteristics.

As shown in Table 4.7, it appears that these relationships vary across subjects. For example, none of the school and teacher characteristics are statistically significant for math in either grade. However, school type, STR, and the perceptions of the head teacher on teacher vacancy and overcrowding are all statistically significant in the regression for Bangla in both grades 3 and 5. Similarly, there is a positive relationship between student scores and teacher qualifications (proportion of teachers with at least a bachelor's degree) and teaching experience (average number of years of teaching), and a negative relationship between learning outcomes and short-term teacher training (the proportion of teachers with subject based training), though all these relationships are statistically significant only for grade 5 Bangla.

In the case of student and household characteristics, while economic status has a statistically significant relationship with learning outcomes in all four regressions in the expected direction, the relationships between student scores and many other variables are different for the different subjects. For instance, there appears to be a negative relationship between private tutoring and how well students perform in mathematics, though the co-efficient is marginally statistically significant only for math in grades 3 and 5. The co-efficient on gender (being female) is positive and statistically significant for Bangla in grades 3 and 5. Reconfirming the findings from Section 3.3, this result indicates that female students perform better than males in Bangla in areas requiring higher order thinking skills. The explanatory variables related to grade repetition, reading habit, and parental education are also correlated with higher-order thinking skills along the lines discussed in the previous subsection.

**Table 4.7: OLS regression results for percentage of higher order thinking items answered correctly, 2017**

Variable	Grade 3 Math	Grade 5 Math	Grade 3 Bangla	Grade 5 Bangla
<i>School characteristics</i>				
The school is in rural area	3.339	-3.447	-2.072	1.039
School type: GPS	10.75*	-2.124	13.71***	13.46***
School type: NNGPS	7.699	-1.892	13.34***	9.193***
School type: KG	6.625	-2.425	14.93***	13.07***
The school has multiple shifts	-0.376	1.844	-3.050	-1.473
The school has library	3.831*	-0.601	0.406	-1.105
Student-teacher ratio (STR)	-0.0557	0.0258	-0.103**	-0.0999***
Number of school days	0.0551	0.00250	0.0251	0.00593
Head teacher is female	-5.280***	-3.489	-1.229	0.527
Head teacher is aged 40 or above	-2.282	2.561	-1.424	-0.305
The school has a SMC	-10.30*	2.943	1.198	3.391
The school has a PTA	3.420	7.415	3.856	-2.092
Teachers absent less than 10% of the days	-0.480	-0.384	1.196	2.767*
Teacher vacancy is a serious problem	-0.849	-2.838	-3.356*	-2.699**
Overcrowded classes is a serious problem	0.567	-2.120	4.436**	3.514***
Teachers read to enhance skills	-3.280	1.136	0.601	3.465*
<i>Teacher characteristics</i>				
Prop. of teachers with bachelor's degree+	0.0897	-3.552	2.594	3.067**
Proportion of female teachers	-0.898	1.658	-0.736	0.202
Average number of years of teaching	0.0366	-0.00474	0.0205	0.202***
Prop. of teachers with subject based training	-1.041	0.345	-1.158	-2.437**
Proportion of teachers who give homework	6.634	-6.294	5.213	0.687
<i>Student and household characteristics</i>				
Student is female	1.385	-0.353	2.943***	2.977***
Student speaks Bangla at home	1.849	-16.78***	-9.783**	-0.525
Student has repeated grade	0.533	-1.360	-4.252***	-5.316***
Student receives stipend	0.00866	-0.276	1.739	2.610**
Student takes private tutoring	-0.253	2.431*	1.190	-0.0528
Student receives help with homework	-3.956***	-0.346	-0.396	-2.233***
Student helps with household chores	-2.996	-0.0231	0.705	-0.594
Student reads supplementary books at home	0.980	-0.694	4.783***	4.432***
Number of days student is absent	0.0315	0.0920	-0.315**	-0.0970
Distance to school	1.732**	0.233	-0.733	0.141
Parent's max education: up to grade 5	1.096	2.600	0.588	-1.506
Parent's max education: up to grade 8	0.855	2.439	4.644**	-0.616
Parent's max education: up to SSC (grade 10)	2.455	1.123	7.020***	1.365
Parent's max education: more than grade 10	-2.570	1.671	10.43***	5.332***
Wealth index	-0.154	0.246	0.853*	0.906***
Student's total number of family members	-0.0256	-0.0130	-0.0755	-0.0974
Constant	40.37**	70.42***	39.20***	22.76**
Observations	4,952	4,780	7,183	5,967
Adjusted R-squared	0.067	0.054	0.119	0.141

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using NSA 2017 data

#### 4.4 Explaining differences in performance between high and low performing schools

This subsection attempts to explain the difference in performance between high and low performing schools in NSA 2017 and LASI 2015 by analyzing how the various determinants of learning outcomes discussed in the previous section are related to school performance category (i.e., whether school is high performing or low performing). To identify the high and low performing schools in NSA 2017, the average scale scores for both grades and subjects were used to categorize the schools in five performance groups of approximately equal sizes. Then only the top and bottom groups of schools that taught both grades were analyzed.

Table 4.8 presents the average scale scores for the high and low performing schools in NSA 2017. The scores for the high performing schools are substantially higher in both grades and subjects, and the differences in scores between the two school types are statistically significant at the 1% level in all cases, even after adjusting for the clustering of the data. As the magnitude of the difference in scale score between the two school types is the greatest for grade 3 math, it is the focus of the analysis below. Table 4.9 presents the descriptive statistics for the different explanatory variables for these two types of schools.

**Table 4.8: Scale scores for high and low performing schools in NSA 2017**

<b>Subject</b>	<b>Low</b>	<b>High</b>	<b>Difference (high-low)</b>
Grade 3 math	86.2	112.5	26.3***
Grade 5 math	99.7	124.6	24.9***
Grade 3 Bangla	91.0	112.8	21.8***
Grade 5 Bangla	99.7	116.3	16.6***

Source: Authors' estimates using NSA 2017 data; \*\*\*significant at the 1% level; \*\*significant at the 5% level; \*significant at the 10% level;

As shown in Table 4.9, high performing schools are more likely to be either KG or GPS and less likely to have multiple shifts. Similarly, they have a higher number of school days, and have less of an issue with teacher adequacy (they have lower STRs, and headteachers of these schools are less likely to perceive teacher vacancy as a serious problem). The head teachers of high performing schools are also more likely to view their teachers as highly skilled and report that teachers read to enhance their skills. In terms of student characteristics, high performing schools have larger proportions of students reading supplementary books and receiving help with homework, and smaller proportions of students repeating grades. Interestingly, larger proportions of students in high performing schools help with household chores. The households of students in high performing schools are wealthier, are more likely to have more educated parents and fewer family members.

The Probit estimates for the four subject-grade combinations for NSA 2017 are shown in Tables 4.10. The dependent variable in these school level regressions is whether the school is in the high performing category. Focusing on the regression for grade 3 math, we see that the coefficients on most of the variables that were significantly different between the two types of schools in Table 4.2 remain significant in the Probit regression. Interestingly, however, the Probit results indicate that higher household wealth (average number of assets) does not have a statistically significant association with the likelihood that the school is high performing, now that other explanatory factors are also taken into account. Other variables that no longer have a significant association with the school's performance status include the headteacher's perception that teachers read to enhance skills and teacher vacancy in a problem. On the other hand, higher teacher qualifications (proportion of teachers with bachelors or higher degrees) and the head teacher's perception that overcrowding is a serious problem have statistically significant

relationships with the school's performance status. It is relevant to note that the results from the math grade 3 regression are consistent with the results from most of the other regressions in Table 4.10.

The Probit estimates for LASI 2015 are presented in Table 4.11. The coefficients on a number of school and teacher characteristics are statistically significant in this regression, suggesting that school characteristics matter more at the junior secondary level. For instance, schools where the head teacher is male, head teacher is aged below 40, SMC is active, teacher vacancy is not a serious problem, lack of library is not a serious problem, and teachers' skills are high are more likely be high performers. More teaching experience, as represented by higher average years of teaching, appears to decrease the likelihood of being a high performing school. There is, however, no consistent pattern to the relationship between teacher qualifications and performance status of the school, and teacher training has no relationship with the likelihood that a school is high performing. With regards to student and household factors, schools where students devote more time to their studies, and have a higher proportion of parents with more than grade 10 education are more likely to be in the high performing category. Similarly, for all three subjects in grade 6, the average age of the students is negatively associated with the probability that the school is high performing.

**Table 4.9: Descriptive statistics for high and low performing schools in grade 3 math for NSA 2017**

Variable	Low performing		High performing		Difference (High-Low)
	Mean	SD	Mean	SD	
Proportion of GPS Schools	0.61	0.49	0.74	0.44	0.13***
Proportion of KG Schools	0.02	0.15	0.11	0.31	0.09***
The school is in rural area	0.9	0.3	0.83	0.38	-0.07*
The school has multiple shifts	0.8	0.4	0.68	0.47	-0.12***
The school has library	0.51	0.5	0.58	0.49	0.07
Student-teacher ratio (STR)	42.67	37.25	33.83	15.83	-8.84**
Number of school days	235.92	21.37	243.49	21.24	7.57***
Head teacher is female	0.34	0.47	0.33	0.47	-0.01
Head teacher is aged 40 or above	0.77	0.42	0.78	0.41	0.01
The school has a SMC	0.98	0.16	0.98	0.15	0
The school has a PTA	0.91	0.29	0.92	0.27	0.01
Teachers absent less than 10% of the days	0.83	0.38	0.87	0.34	0.04
Teacher vacancy is a serious problem	0.46	0.5	0.29	0.45	-0.17***
Overcrowded classes is a serious problem	0.34	0.47	0.43	0.49	0.09
Teachers read to enhance skills	0.84	0.37	0.91	0.28	0.07**
Teachers' job satisfaction is high	0.43	0.49	0.45	0.5	0.02
Teachers' skill is high	0.42	0.49	0.51	0.5	0.09*
Prop. of teachers with bachelor's degree+	0.63	0.46	0.7	0.45	0.07
Proportion of female teachers	0.57	0.48	0.59	0.48	0.02
Average number of years of teaching	12.83	9.29	12.62	8.56	-0.21
Prop. of teachers with subject based training	0.38	0.46	0.38	0.46	0
Prop. of teachers who give homework	0.96	0.2	0.95	0.21	-0.01
Proportion of female students	0.47	0.5	0.43	0.5	-0.04*
Proportion of students speaking Bangla	0.99	0.07	0.99	0.09	0
Proportion of students repeating grade	0.2	0.4	0.1	0.31	-0.1***
Proportion of students receiving stipend	0.15	0.35	0.16	0.37	0.01
Prop. Of students taking private tutoring	0.35	0.48	0.36	0.48	0.01
Prop. Of student receiving homework help	0.81	0.4	0.86	0.35	0.05***
Proportion of students helping with household chores	0.88	0.32	0.92	0.27	0.04**
Proportion of students reading supplemental books	0.39	0.49	0.6	0.49	0.21***
Average number of days students is absent	2.54	3.33	2.1	3.71	-0.44
Prop of parents max education: up to grade 5	0.4	0.49	0.31	0.46	-0.09***
Prop of parents max education:: up to grade 8	0.24	0.43	0.26	0.44	0.02
Prop of parents max education:: up to grade 10	0.11	0.31	0.17	0.37	0.06***
Prop of parents max education:: more than grade 10	0.1	0.29	0.18	0.38	0.08***
Average number of assets	3.43	1.54	3.92	1.33	0.49***
Average number of family members	4.42	3.58	4	3.08	-0.42***
Observations	4950		5740		

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using NSA 2017 data



**Table 4.10: Probit estimates for high and low performing schools by grade and subject for NSA 2017**

<b>Variable</b>	<b>Grade 3 math</b>	<b>Grade 5 math</b>	<b>Grade 3 Bangla</b>	<b>Grade 5 Bangla</b>
<i>School characteristics</i>				
The school is in rural area	-0.361	-0.183	-0.676	-0.535
School type: GPS	1.468**	0.722	2.117***	1.520**
School type: NNGPS	0.978	0.651	1.984**	1.226*
School type: KG	2.214***	2.661***	2.475***	3.840***
The school has multiple shifts	-0.355	0.153	-0.195	0.491
The school has library	-0.0700	0.0490	0.0802	-0.0310
Student-teacher ratio (STR)	-0.0179**	-0.0125	-0.0125	-0.0206**
Number of school days	0.0138***	0.0159***	0.0163***	0.00336
Head teacher is female	0.0847	0.158	-0.210	-0.180
Head teacher is aged 40 or above	0.0206	0.410	0.472	0.666*
The school has a SMC	0.679	1.441**	0.490	1.274
The school has a PTA	0.991	1.654**	0.784	1.656*
Teachers absent less than 10% of the days	-0.359	-0.00299	0.0266	0.616*
Teacher vacancy is a serious problem	-0.410	-0.402	-0.559**	-0.617**
Overcrowded classes is a serious problem	0.747***	0.347	0.710**	0.598*
Teachers read to enhance skills	0.474	0.385	0.297	0.715*
<i>Teacher characteristics</i>				
Prop. of teachers with bachelor's degree+	0.503*	0.241	0.443	0.831***
Proportion of female teachers	0.0827	0.256	-0.218	0.400
Average number of years of teaching	-0.000379	0.0132	-0.0130	0.0580***
Prop. of teachers with subject based training	-0.315	0.297	0.421	-0.274
Prop. of teachers who give homework	0.929	-0.117	0.278	-1.095
<i>Student and household characteristics</i>				
Proportion of female students	0.772	-0.191	0.000718	0.365
Proportion of students repeating grade	-2.246***	-1.522**	-1.574**	-1.849**
Proportion of students receiving stipend	0.728	1.615***	0.672	1.481***
Prop. Of students taking private tutoring	-0.299	-0.817*	-0.182	-1.205***
Prop. Of student receiving homework help	0.214	-0.198	0.784	-0.414
Proportion of students helping with household chores	0.538	-1.773	0.0931	-2.556***
Proportion of students reading books other than textbooks at home	0.986**	1.411***	1.039***	1.211***
Average number of days students is absent	-0.0135	-0.0128	-0.0318	-0.136**
Average distance to school	-0.130	-0.212	0.356	-0.881*
Prop. of parent's max education: up to grade 5	1.863	0.907	-0.983	-0.645
Prop. of parent's max education: up to 8	3.527***	1.811	0.833	1.456
Prop. of parent's max education: up to 10	1.284	-0.170	-0.929	-0.694
Prop. of parent's max education: more than grade 10	2.032*	3.969***	-0.459	4.732***
Average number of assets	0.129	0.0114	0.218	-0.306*
Average number of family members	-0.263**	0.220***	-0.124	0.0944
Constant	-7.593***	-8.926***	-8.846***	-2.551
Observations	204	208	213	203

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using NSA 2017 data

**Table 4.11: Probit estimates for high and low performing schools by grade and subject for LASI 2015**

Variable	Grade 6 Bangla	Grade 6 English	Grade 6 math	Grade 8 Bangla	Grade 8 English	Grade 8 math
<i>School characteristics</i>						
The school is in rural area	-1.433**	-0.285	-0.967	0.707	0.808	1.133
The School is a Madrasah	-0.304	-0.0839	-0.101	-2.248***	-0.758	-0.910
Student-teacher ratio (STR)	0.00413	-0.0178	0.00783	-0.0473***	-0.00541	-0.00944
Head teacher is female	-1.620**	-0.311	-1.824*	-2.183	-1.937*	-1.939**
Head teacher is aged 40 or above	-1.203***	-1.135***	-1.730***	-2.428***	-0.994**	-1.887***
School's SMC is active	1.333***	0.691**	1.437***	0.781**	0.655*	1.040***
Teacher vacancy is a serious problem	-0.764*	-0.970***	-1.403***	-1.834***	-0.810**	-0.799*
Teachers' skills are high	1.486***	0.928***	1.432***	1.240**	0.395	-0.134
Lack of library a serious problem	-1.443***	-0.950***	-1.380***	-0.903**	-0.929***	-1.645***
<i>Teacher characteristics</i>						
Proportion of teachers with master's degree and higher	-0.688*	-0.612	-0.0570	1.297***	-0.350	1.626***
Proportion of female teachers	-0.492	-0.512	0.476	-0.523	-1.227**	0.00503
Average number of years of teaching	-0.0366	-0.344**	0.149	-0.459*	-0.415***	0.0915
Proportion of teachers with B.Ed. Degree	0.144	1.009**	-0.119	1.020**	1.093***	-0.345
Proportion of teachers with M.Ed. Degree	-0.0496	4.593**	-0.754	-3.592**	0.394	-0.0169
Proportion of teachers whose major is the subject taught	0.210	0.278	0.264	0.858**	-0.167	0.166
Proportion of teachers with subject based training	-0.694	-0.564	0.245	1.402*	0.276	0.931*
Proportion of teachers who have taken CPD ICT training	-0.173	0.247	-0.177	0.320	-0.183	-0.276
Proportion of teachers who seek guidance in learning	0.178	-0.0581	0.0337	-0.0780	0.860**	-0.349
<i>Student and household characteristics</i>						
Students' average age	-2.253***	-2.204***	-2.256***	0.374	-0.714	-0.599
Prop. of female students	1.897**	0.661	1.409	-0.575	0.0961	1.500
Prop. Of students repeating grade	-3.057	-1.218	-2.738	-2.425	0.0770	-4.281*
Proportion of students receiving stipend	0.679	0.864	0.541	3.399***	-0.0231	-0.377
Prop of students receiving tuition waiver	-0.959	0.0424	-0.439	-0.962	-1.019*	-1.497**
Prop. Of student receiving homework help	1.338*	0.615	1.095	3.508***	0.638	2.357**
Proportion of students helping with household chores	0.602	0.353	0.506	4.079***	1.890**	3.721***
Average time devoted to study	0.972**	0.850**	1.414***	3.699***	2.059***	3.777***
Prop. of students reading supplementary books at home	-1.354*	-0.172	-0.818	-0.720	-0.386	0.431
Average number of days students are absent in 2 weeks	0.0714	-0.0279	0.289	-0.110	0.171	-0.0772
Proportion of parent's max education: up to grade 5	6.282***	2.736*	4.794***	14.63***	3.891	1.997
Proportion of parent's max education: up to grade 8	1.927	0.736	1.166	2.638	-2.520	-6.611***
Proportion of parent's max education: up to grade 10	5.600***	2.028	2.345	4.863*	1.489	-1.393
Prop. of parent's max education: more than grade 10	9.209***	4.373**	7.066***	16.82***	7.313***	6.792***
Average number of assets	0.0643	0.398	0.292	0.171	0.319	0.252
Constant	17.69***	20.33***	15.30**	-38.19***	-5.736	-18.54**
Observations	157	176	167	166	183	173

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using LASI 2015 data

#### 4.5 Explaining differences in performance across school types

As discussed in Sections 3.2 and 4.2, among the different school types, KG schools have the best performance, followed by GPS and NNGPS. While KG schools and GPS are distinctly different in terms of governance structure, GPS and NNGPS have the same type of management (public). Hence, to gain a better understanding of why learning outcomes vary across students, it is useful to take a deeper look at the differences between KG schools and GPS as well as between GPS and NNGPS.

##### Descriptive statistics: differences in explanatory variables across school types

This subsection explores how the various determinants of learning outcomes differ across these three school types. Table 4.12 shows the descriptive statistics of the different explanatory variables for the KG schools, GPS and NNGPS for grade 5 Bangla. It is interesting to note that for almost all the characteristics listed, KG schools and GPSs have statistically significant differences. In particular, the difference is insignificant only for 4 of the 21 school and teacher related variables. When comparing GPS with NNGPS, as expected, we see that these two types of schools are similar in terms of a number of the school and teacher related characteristics, including governance structure (existence of SMCs and PTAs), teacher absence, teacher training, STR and some teacher activities (assigning homework, reading to enhance skills). Nevertheless, there are quite a few differences between these two types of schools as well.

Though most GPS cater to the rural population, an even higher proportion of NNGPS are found in rural areas. Double shift schools are a regular feature of primary schools of Bangladesh. But while 55% of students in KG schools study in double shift schools, around 73% of the GPS students and 96% of NNGPS students are in schools that run double shifts. In terms of teacher adequacy, KG schools have low STRs (14.2), while each teacher in GPS and NNGPS has to handle many more students (around 40). The number of school days is significantly higher in KG schools (254) compared to the number for NNGPS (238) and GPS (234). Head teachers and teachers are more likely to be females in GPS than in KG or NNGPS. Similarly, a younger head teacher (aged less than 40) is more likely to be found in a KG school than in a GPS or NNGPS. While PTAs are near universal in GPS and NNGPS, around 46% of KG students study in schools that do not have PTAs. Teacher absence rates are similar in all types of schools. Head teachers in KG schools are less likely to perceive teacher vacancy and overcrowded classes as serious problems. These problems are perceived to be more acute in NNGPS by their head teachers. Teacher job satisfaction is reported to be highest in GPS, followed by NNGPS and KG, respectively. This is not surprising considering that teachers in government schools have stable and secure jobs. The proportion of teachers with at least a bachelor's degree is highest in GPS, followed by KG and NNGPS. More experienced teachers are found in NNGPS, followed by GPS and KG schools.

When we look at the characteristics of students and their families in these three types of schools, we find that girls and students who repeat grades are less likely to be in KG schools than in GPS or NNGPS. Similarly, parents with higher educational qualifications are more likely to send their children to KG schools—while 40% of the parents of children in KG schools have more than 10 years of education, the corresponding figures are 15% for GPS and 10% for NNGPS. The figures for the average number of assets also suggest that KG schools target more affluent families, while GPS and NNGPS mostly cater to less affluent families.

We saw earlier that a key school characteristic (apart from school type) associated with higher student learning outcomes was teacher adequacy (lower STR and head teacher perception that teacher vacancy is not a serious concern). KG schools clearly have an advantage in this aspect. As for student characteristics that were found to be significantly associated with higher learning outcomes in our earlier analyses, we

see that NNGPS lag behind the other two school types in terms of student reading habit, and both GPS and NNGPS have larger percentages of students who have repeated a grade at some point. There are two family characteristics with statistically significant relationships with learning outcomes, namely parental education and household wealth. KG schools have an advantage over the other two school types, and GPS have an advantage over NNGPS in terms of both these characteristics.

**Table 4.12: Descriptive statistics for GPS, NNGPS and KG schools in grade 5 Bangla for NSA 2017**

Variable	Mean			Difference	
	GPS	NNGPS	KG	GPS-KG	GPS-NNGPS
The school is in rural area	0.85	0.93	0.55	0.3***	-0.08***
The school has multiple shifts	0.73	0.96	0.55	0.18***	-0.23***
The school has library	0.58	0.37	0.59	-0.01	0.21***
Student-teacher ratio (STR)	38.3	39.45	14.21	24.09***	-1.15
Number of school days	234.21	237.89	253.73	-19.52***	-3.68**
Head teacher is female	0.42	0.27	0.23	0.19***	0.15***
Head teacher is aged 40 or above	0.77	0.8	0.53	0.24***	-0.03
The school has a SMC	0.99	0.99	0.84	0.15***	0
The school has a PTA	0.96	0.95	0.54	0.42***	0.01
Teachers absent less than 10% of the days	0.85	0.85	0.87	-0.02	0
Teacher vacancy is a serious problem	0.37	0.49	0.15	0.22***	-0.12***
Overcrowded classes is a serious problem	0.42	0.34	0.16	0.26***	0.08**
Teachers read to enhance skills	0.88	0.85	0.89	-0.01	0.03
Teachers' job satisfaction is high	0.46	0.38	0.3	0.16***	0.08**
Teachers' skill is high	0.52	0.35	0.33	0.19***	0.17***
Prop. of teachers with bachelor's degree+	0.77	0.46	0.76	0.01	0.31***
Proportion of female teachers	0.75	0.65	0.52	0.23***	0.1***
Average number of years of teaching	13.36	15.57	7.87	5.49***	-2.21***
Prop. of teachers with subject based training	0.39	0.44	0.19	0.2***	-0.05
Prop. of teachers who give homework	0.95	0.95	1	-0.05***	0
Proportion of female students	0.48	0.53	0.38	0.1***	-0.05***
Proportion of students speaking Bangla	0.99	0.99	1	-0.01**	0
Proportion of students repeating grade	0.14	0.15	0.08	0.06***	-0.01
Proportion of students receiving stipend	0.16	0.15	0.09	0.07***	0.01
Prop. Of students taking private tutoring	0.48	0.48	0.53	-0.05	0
Prop. Of student receiving homework help	0.78	0.77	0.77	0.01	0.01
Proportion of students helping with hh chores	0.94	0.93	0.96	-0.02**	0.01
Proportion of students reading supplemental books	0.66	0.61	0.65	0.01	0.05**
Average number of days students is absent	1.75	1.99	2.45	-0.7*	-0.24
Prop of students whose parents are illiterate	0.1	0.14	0.02	0.08***	-0.04**
Prop of parent's max education: up to grade 5	0.32	0.37	0.13	0.19***	-0.05***
Prop of parent's max education: up to grade 8	0.26	0.27	0.2	0.06***	-0.01
Prop of parent's max education : up to grade 10	0.17	0.13	0.25	-0.08***	0.04***
Prop of parent's max education: more than grade 10	0.15	0.1	0.4	-0.25***	0.05***
Average number of assets	4.01	3.65	4.94	-0.93***	0.36***
Average number of family members	4.24	4.17	3.9	0.34*	0.07
Number	14423	5347	1954		

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Source: Authors' estimates using NSA 2017 data

### Contributions of differences in characteristics in explaining performance differences

To better understand the extent to which differences in the various explanatory factors discussed above explain the gap in learning outcomes between the different school types, we decompose these learning outcomes gaps using the standard Oaxaca-Blinder decomposition method (Blinder 1973; Oaxaca 1973; Oaxaca and Ransom 1994). This approach involves a two-step process where, in the first step, separate OLS regressions for the determinants of learning outcomes are run for each school type to obtain predicted mean scores as well as the regression coefficients for all the explanatory variables. In the second step, the mean gap in scores is decomposed into two components using the regression results from the first step: (a) “explained” portion which shows contributions of the differences in the levels of the various characteristics in explaining the gap, and (b) “unexplained” portion which shows contributions of differences in the returns to these characteristics.

**Table 4.13: Decomposition of predicted performance gap—(KG schools vs. GPS) and (GPS vs. NNGPS), 2017**

Explanatory factors (characteristics)	KG schools vs. GPS		GPS vs. NNGPS	
	Explained by differences in characteristics	Unexplained	Explained by differences in characteristics	Unexplained
Location	-1.893	10.487	0.166	-20.563
<i>School characteristics</i>				
Teacher adequacy	1.370	5.290	0.048	0.524
Overcrowding	-0.324	-2.321	0.180	-1.724
Double shift	0.274	-0.369	0.162	1.669
Other school characteristics	0.611	5.744	0.684	-1.803
<i>Teacher characteristics</i>				
Teacher qualifications	0.088	1.776	0.558	-0.120
Teacher short term training	0.245	-0.133	-0.015	1.254
Other teacher characteristics	-1.222	-2.735	-0.331	0.383
<i>Student characteristics</i>				
Student is female	-0.062	0.601	-0.013	0.145
Grade repetition	0.239	-0.028	0.048	-0.104
Reading habit	-0.038	-0.355	0.123	0.082
Stipend recipient	-0.071	0.049	0.006	0.100
Other student characteristics	-0.160	2.783	0.076	-5.498
<i>Household characteristics</i>				
Parental education	0.911	1.079	0.195	-1.262
Household wealth	0.610	-1.321	0.132	0.238
Other household characteristics	0.013	2.286	-0.015	-5.362
Constant	0.000	-20.631		32.961
<b>Total</b>	<b>0.591</b>	<b>2.203</b>	<b>2.002</b>	<b>0.918</b>
<b>% of total gap explained</b>	<b>21.153</b>	<b>78.847</b>	<b>68.566</b>	<b>31.434</b>

Source: Authors' estimates using NSA 2017 data

Predicted learning outcomes gap between KG and GPS is 2.794 (111.245 - 108.451); predicted gap between GPS and NNGPS is 2.920 (108.451 - 105.531). Note that these gap estimates are somewhat different from those in Table 3.3 because of differing sample sizes used in the Oaxaca-Blinder decomposition.

The decomposition of the performance gap in grade 5 Bangla between KG schools and GPS, and between GPS and NNGPS are presented in Table 4.13. In each case, the column “explained by differences in characteristics” shows the extent to which differences in the levels of the various explanatory factors can explain the difference in the predicted learning outcomes for students from the two types of schools being compared. As noted in the table footnote, the average predicted scale score for KG schools is 2.79 points higher than the score for GPS. Similarly, the average predicted score difference between GPS and NNGPS is 2.92.

Comparing KG schools with GPS, we see that around 21.15% of the predicted score difference can be explained by differences in the levels of the various characteristics. The remaining (78.85%) is unexplained in the sense that this part of the difference is related to the returns to the characteristics. Among other things, the differences in returns to the various characteristics could be related to the management approach and school processes, factors that could not be taken into account in this paper due to data limitations.

The figures in the “explained” column suggest that, among the school characteristics, the advantage KG schools have in terms of teacher adequacy (e.g., lower STR) and operations of double shifts (KG schools are less likely to operate double shifts) do contribute to the performance difference. Similarly, the lower percentage of teachers who have taken short-term training in KG schools puts them at an advantage. It is, however, surprising that having a smaller share of teachers with higher qualifications (bachelor’s degree or above) also positively contributes to the gap in favor of KG schools<sup>53</sup>. In terms of student characteristics, as expected, lower grade repetition contributes to the higher performance of KG schools while having a smaller share of female students hurts their performance. Higher parental education and household wealth are factors that contribute to the better performance of KG schools.

In stark contrast to the findings above, we see that around 68.57% of the predicted score difference between GPS and NNGPS can be explained by differences in the levels of the various characteristics. The implication of this finding is that actions aimed at bringing the NNGPS to the level of GPS in terms of resources and other characteristics can potentially contribute substantially to closing the gap between these two school types. This is a reasonable finding given that both types of schools are government schools with similar management structures.

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<sup>53</sup> Since KG schools can easily hire and fire teachers, it can be argued that teachers in these schools make an extra effort to help their students to improve their performance and make up for lower qualification.

## 5. Conclusion

### Summary of findings

This study has analyzed the trends and disparities in student learning outcomes at the primary and junior secondary levels in Bangladesh using nationally representative, temporally comparable sample-based national assessment data. It has also analyzed the determinants of student learning outcomes.

The analysis shows that the quality of primary education, as reflected in student learning outcomes, is low<sup>54</sup> and has been fluctuating over time without showing an improving trend since 2011. Scale scores for Bangla language and math in both grades 3 and 5 actually declined between 2013 and 2017, even though there were marginal (and non-significant) increases between 2015 and 2017 in grade 3 Bangla and grade 5 mathematics scores. The low and non-improving student outcomes are reconfirmed when we look at the percentage of students who were able to perform at their respective grade levels (or higher) in the NSA. Using this approach, the findings for grade 5 students appear particularly alarming: in all the years, less than 26% of these students achieved grade level proficiency in Bangla, and the percentage of students who achieved this level in mathematics declined from 30% in 2011 to 16% in 2017. Learning outcomes at the junior secondary level also leave much room for improvement. The LASI data show that in 2015, around 24%, 30%, and 7% of grade 6 students performed at below grade level in math, English, and Bangla, respectively.

On the positive side, near-gender parity in learning outcomes can be seen at the primary level (generally slightly in favor of girls), except in grade 3 Bangla where boys are performing significantly worse than girls. Gender parity can also be observed in Bangla in grades 6 and 8, and in English in grade 6. However, girls lag behind boys in both these grades in math and in grade 8 English. There are also notable disparities in learning outcomes between wealthier and poorer families, and urban and rural areas across all grades and subjects. At the primary level, we also observe significant difference in student learning outcomes across the different types of schools, with students from KG schools and GPSs performing much better than students from NNGPs and other schools. Furthermore, trends in the distributions of student outcomes in the NSA data indicate that disparities in student learning outcomes across students show no signs of reduction at the primary level.

As evidenced by the higher scores in higher grades, it is clear that some learning growth is taking place as students move up the grades. However, the average gain in scores across the grades is relatively small, and a significant percentage of students in the higher grades, both at the primary and junior secondary levels, are still performing at lower grade levels. For example, around 84% of grade 5 students continued to perform below their grade level in mathematics in 2017, indicating that more schooling is not necessarily translating into more learning. These findings suggest that many of the academically weaker students are getting left behind in terms of learning as they move up the grades. The phenomenon of students being left behind in the learning path is seen at the junior secondary level as well.

Delving deeper into the students' cognitive processing levels at the primary level, we find that while students perform relatively well in areas focused on knowledge (or content recall) and understanding, they face significantly more challenges in answering questions requiring application of higher-order

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<sup>54</sup> According to World Bank (2013), the NSA test items are less difficult compared to the ones used in the International Reading Literacy Study (PIRLS). Hence, there is a possibility that the low learning outcomes in the NSA rounds might actually be over-estimating the competencies of Bangladeshi students in reference to students from other countries.



thinking. For instance, students correctly answered more than 70% of the items measuring knowledge and understanding in grade 5 Bangla in 2017, but less than 50% of the items related to application and other higher-order thinking skills. Furthermore, the standard deviations of the scores for application and other higher-order skills are generally higher, implying a greater disparity in performance across students in these more challenging areas.

The analyses of determinants of student performance provide a number of insights into what might be influencing the quality of education, as reflected in learning outcomes, in Bangladesh. First, they show that variations across schools explain a large portion of the variation in student outcomes in all grades and subjects at both the primary and junior secondary levels. This finding implies that school quality matters, and is consistent with findings from other studies elsewhere (Goyal and Pandey 2008). Second, among the school characteristics of interest, school type and teacher adequacy are the key factors associated with learning outcomes. It is interesting to note that teacher experience and training do not have a significant positive relationship with learning outcomes either at the primary or at the secondary level. However, school leadership (more specifically, having a female head teacher) is related to learning outcomes at the junior secondary level. Third, certain student and home factors play an important role in determining learning outcomes. In particular, there is a consistent statistically significant positive relationship between reading habit and student performance. In fact, this is the only explanatory variable that is statistically significant at the 1% level in almost all the regressions for NSA 2013, 2015 and 2017<sup>55</sup>. Another key explanatory variable with a consistent relationship with learning outcomes is grade repetition. Similarly, there is some evidence that student effort and regular student attendance make a difference in learning, especially at the junior secondary level. Among the family characteristics, household economic status and parental education have a consistent statistically significant positive association with student learning outcomes. And fourth, while only a relatively small percentage of the performance difference between KG school and GPS is explained by differences in the levels of the various explanatory variables, over 68% of the difference between GPS and NNGPS can be explained by differences in the levels of these factors.

### Policy implications

The analyses in this paper make it amply clear that learning deficit starts in the early grades, with a significant portion of the students not having mastered the foundational skills needed to perform well in their later academic lives. Clearly, there is a strong need for focused interventions aimed at ensuring the acquisition of early grade reading and math skills by all students at the primary level. Since learning is cumulative, early disadvantages in cognitive skills become more accentuated as the children move up the grades. Hence a strong focus on foundational numeracy and literacy is essential from the perspective of equity as well.

The poor performance of students in areas requiring higher-order thinking skills and the relatively flat gains in learning when they move up the grades suggest that there may be a need for the government to revise the curricula as well as instructional approaches. To enable students to improve their higher-order thinking skills, it will be particularly important to properly align teacher training programs with appropriately revised curricula and have a good system of teacher support and feedback. At the same time, the instructional approach must pay special attention to ensuring that no child is left behind in terms

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<sup>55</sup> When the dependent variable was proportion of application and other higher order thinking skills, the coefficient for supplemental reading was statistically significant for grade 3 and 5 Bangla, but not for maths.

of learning. Inadequate alignment of different actors and activities is currently a challenge facing the primary education sector in Bangladesh (WB 2018c).

The finding that variations across schools explain a very large percentage of the variation in student learning outcomes points to opportunities for improving learning outcomes and reducing disparities through policy interventions focused on school quality. Variations in outcomes across schools are partly explained by the types of students attending them. While the government has little influence over the sorting of students across schools and the composition of students within schools, it can potentially help improve outcomes as well as reduce disparities in outcomes by reducing inequities in the quality of school inputs and processes. In particular, it can focus its investments more on locations and schools that show low learning outcomes as well as deficiencies in essential inputs such as teachers, teaching-learning materials and basic infrastructure. As indicated by our analyses of the differences between school types, there is a lot of scope for GoB to improve overall learning outcomes and reduce disparities in outcomes by investing further in NNGPS to bring them to the level of the GPS in terms of inputs and school processes. It can also do an in-depth study of the best performing schools (especially the best GPS) to identify effective school management practices<sup>56</sup> and school processes, and appropriately scale up these practices and processes in other schools as relevant. Our analysis of high and low performing schools indicates that a disproportionately small share of NNGPS and other schools fall in the high performing category. For example, although 21% of the schools in the sample are NNGPS, only 14% of the top-performing schools are NNGPS. Similarly, only 1% of high performing schools are in the “others” category (not GPS, NNPS or KG schools), but their share is 14% in the sample. It would, therefore, be important for policy interventions aimed at improving learning outcomes to give special emphasis to improving the quality of these types of schools.

Drawing upon the findings from the analyses of the determinants of learning outcomes, it would also be important for the government to implement interventions aimed at promoting the reading habit (especially at the primary level), providing special support to weaker students to minimize grade repetition, and providing more targeted financial support (stipends) to poor children to compensate for the disadvantages resulting from their economic status<sup>57</sup>.

Properly measuring and tracking student learning outcomes, especially in literacy and numeracy, is a key first step in designing and implementing interventions aimed at improving the quality of education. Hence, improving the quality of assessments is an important undertaking in itself from the perspective of enhancing education quality. Drawing upon GoB’s experience in implementing NSA and LASI, the remaining discussion focuses on how the national assessments of student learning can be strengthened in Bangladesh.

In the last ten years, GoB has made major strides in improving the quality of student assessments. While a systematic effort to periodically measure student learning outcomes began in 2006 with the implementation of NSA 2006, the first two iterations of NSA (2006 and 2008) were not standardized

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<sup>56</sup> Because of data limitations, the role of school management in determining learning outcomes has not been analyzed in this paper.

<sup>57</sup> We recognize that wealthier households can contribute to a child’s development in various ways (e.g., by minimizing the time children have to spend on household chores, freeing up the parents’ time to spend with their children, making more books and other reading/learning material available at home, etc.). Here, we are advocating for targeted cash transfers to poor households under the assumption that families are capable of making expenditure decisions that will maximize the benefits to the children.

across grades and years. Starting with NSA 2011, however, the assessments were designed to meet industry standards for comparability between years and across grades. Another improvement in the assessment approach was made in 2015 with the implementation of an embedded pilot items design. In this approach, a small number of pilot items for the next round are included in the actual assessment itself, thereby enhancing the quality of items included in future rounds of assessments. In the case of LASI, while the first two rounds (2012 and 2013) only represented institutions supported by the World Bank funded SEQAEP project, LASI 2015 and LASI 2017 used nationally representative samples. Additionally, LASI 2017 also included an assessment of grade 10 students to provide a better understanding of learning levels across different grades.

One major weakness of both NSA and LASI is that they have not been properly institutionalized. There is a need for establishing a dedicated assessment unit with the required expertise and authority to not only conduct the assessments but also provide policy inputs for education reforms aimed at improving the quality of the education system. The unit would be responsible for widely disseminating the assessment results, and for ensuring that they inform education policy decisions. It would need to work closely with government agencies responsible for curriculum and textbook development, teacher training, and examinations to have maximum policy impact. As of now, there has been little effort on the part of GoB to systematically utilize the findings from the various NSA and LASI rounds to inform curriculum reform, examination reform, or teacher training activities. Another issue related to institutionalization of national assessments in Bangladesh is the absence of a clear link between NSA and LASI data, making it difficult to look at the continuum of learning outcomes systematically across the primary and secondary levels. Close interaction between the NSA and LASI teams during the design of further rounds of these assessments will be necessary to address this issue.<sup>58</sup>

In order to make these assessments more useful for informing curriculum reform and teacher training, some new curriculum domains need to be introduced and the number of items in the different domains needs to be increased so that reporting by sub-strands is possible. For example, a test of the creative writing domain as part of the Bangla language assessment is recommended as it is an integral part of the curriculum. Similarly, there is a need to include more items related to the assessment of reading skills—a critical area that has not been given due attention in the previous rounds. The usefulness of these assessments can be enhanced if they can collect data for conducting more rigorous and detailed analysis of the determinants of student performance. This will require the introduction of more comprehensive background questionnaires covering the different input, process and context variables shown in Figure 2.1.

As Bangladesh accelerates its efforts to reach its goal of becoming an upper middle-income country, it will become increasingly important for GoB to understand how the country compares with other nations in terms of student learning. Hence, building upon the experience gained from conducting the various NSA and LASI rounds, Bangladesh should consider participating in international assessments such as the Program for International Student Assessment (PISA), Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS) in the future. In the meantime, linking items from TIMSS, PISA and PIRLS can potentially be used in NSA and LASI to get an understanding of where Bangladesh stands vis-a-vis other countries.

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<sup>58</sup> The need for linking the two assessments was recognized by GoB in 2015, and the possibility of introducing some linking items was discussed during the design of NSA 2015 and LASI 2015.

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## ANNEX 1: OVERVIEW OF THE EDUCATION SECTOR IN BANGLADESH<sup>59</sup>

The education system in Bangladesh is large and complex. It caters to approximately 17.3 million primary level students (grade1-5), 13.9 million secondary level students (grades 6-12), 4.5 million tertiary level students. These students are served by 133,904 primary level institutions, 34,036 secondary level institutions, and 5,983 tertiary institutions (Table A1.1).

**Table A1.1 : Number of students and institutions by education level**

Education Level	No. of students (%)	No. of institutions (%)
Primary (Gr. 1-5)	17,251,568 (49.8 %)	133,904 (77.0%)
Secondary (Gr. 6-12)	13,878,242 (37.2%)	34,036 (19.6%)
Tertiary	4,513,119 (13.0%)	5,983 (3.4%)
<i>Overall</i>	<i>34,642,929 (100%)</i>	<i>173,923 (100%)</i>

Source: BANBEIS 2018 [Bangladesh Education Statistics report 2018]

Note: Both secondary and tertiary levels include technical and vocational education (0.89 million students in 5,897 institutions)

There are two ministries responsible for overseeing the education system in the country—the Ministry of Primary and Mass Education (MoPME) and the Ministry of Education (MoE). MoPME handles pre-primary to grade 5, as well as non-formal education, and MoE is responsible for secondary education (grades 6-10), higher secondary education (grades 11-12), technical and vocational education, Madrasah education<sup>60</sup>, and tertiary education. The Directorate of Primary Education (DPE) is the implementing arm of MoPME. Similarly, the Directorate of Secondary and Higher Education (DSHE), Directorate of Madrasah Education (DME), and the Directorate of Technical Education (DTE) manage post-primary education under MoE. While MoE is responsible for policy formulation and allocating funding for tertiary education, the University Grants Commission (UGC) is responsible for coordinating university education, and for quality assurance of both public and private universities. Additionally, the National University (NU) is responsible for overseeing the large number of government and non-government colleges affiliated with it.

Different streams of education are offered at different education levels. There are mainly two streams at the primary level: general education (one year of pre-primary and grades 1-5)<sup>61</sup>, and Madrasah education or *ebtedayee*, which is equivalent to primary education under the general stream. There is a single national curriculum for the whole country under the general education stream, and the vast majority of the students (over 89%) are enrolled in this stream. In addition to institutions under the general education and Madrasah streams, there are also a small number of privately managed, relatively expensive, English medium schools offering classes from kindergarten to high school<sup>62</sup>.

<sup>59</sup> This annex is largely based on a section from Bhatta et al (2019) “Bangladesh Education Sector Public Expenditure Review” (the section was written by the authors of the current study).

<sup>60</sup> Islamic religious education.

<sup>61</sup> In addition, there are separate initiatives aimed at providing educational opportunities for out-of-school children (those who have never enrolled till age 8 or have dropped out of primary). Examples include the World Bank supported Reaching Out of School Children II (ROSC II) project of the government, and different non-government initiatives undertaken by organizations such as BRAC and Save the Children.

<sup>62</sup> Unlike schools under the general education stream which follow the national curriculum and generally use Bangla as the medium of instruction, English medium schools follow curricula from other countries such as the Cambridge International Education (CIE) curricula.

The General and Madrasah education streams are offered at the junior secondary (grades 6-8), secondary (grades 9-10) and higher secondary (grades 11-12) levels as well. However, a third stream—the vocational stream—is also available at the secondary and higher secondary levels. After grade 10, students in the vocational stream have the option of enrolling in either higher secondary vocational education or in four-year diploma programs offered by polytechnic institutes. Of the more than 13.8 million students enrolled at the secondary level, 83.5% are enrolled in the general stream, 13.8% in Madrasahs and 2.6% in vocational schools (see Annex A, Table A2.1 for details). Students who have completed higher secondary education in the general stream can pursue advanced degrees in universities or colleges. Similarly, the Madrasah stream offers tertiary level education (bachelor's and master's equivalent) for students who have completed higher secondary Madrasah education.

Students in the different streams take different completion exams at the end of the secondary and higher secondary levels. At the end of grade 10, students in the general and vocational streams take the Secondary School Certificate (SSC) and SSC-Voc exams, respectively, while those in the Madrasah stream take the *Dakhil* exam. Similarly, students in the general, vocational, and Madrasah streams take the Higher Secondary Certificate (HSC), HSC-Voc, and *Alim* exams, respectively, to complete their higher secondary education.

Different models of financing and service delivery are used at the primary and secondary levels, with most schools in the primary sector under government management. In 2017, around 56.7% of the 133,904 primary institutions in the country were government primary schools, fully financed and managed by MoPME through its Directorate of Primary Education (DPE 2017b). These schools cater to 77.7% of the primary level students. There are mainly two types of government primary schools, referred to as government primary schools (GPS) and new nationalized government primary school (NNGPS), comprising 29% and 19.5% of the total number of primary institutions, respectively. While both GPS and NNGPS are fully government supported and managed, the NNGPS typically do not have as much resources as GPS and are considered inferior in terms of quality. The remaining primary institutions are mostly non-government funded and privately managed, and are under the purview of other ministries and government authorities, such as the Ministry of Commerce, Ministry of Social Welfare, and the NGO Bureau. Among the different types of privately managed primary institutions, the most important are the kindergarten schools (KG), comprising 17.6% of the total number of primary institutions. These are overseen by the Ministry of Commerce, and cater to approximately 7.1% of the primary student population. The GPS, NNGPS and KG schools account for 74% of the primary institutions and serve around 85% of the student population. Though there are in total 25 different types of primary institutions, the remaining types (which include both government and non-government managed institutions) enroll only 15% of the primary level students.

In contrast, the majority of the 19,848 schools at the secondary level (grades 6-10) are publicly subsidized and privately managed. In 2017, for example, 98% of the secondary institutions were under private management, and 82% of these non-government secondary schools received Monthly Pay Orders (MPOs) from the government for the payment of teacher salaries (BANBEIS 2018). Furthermore, development partner assisted government projects such as the World Bank financed Secondary Education Quality and Access Enhancement Project and Transforming Secondary Education for Results Operation, and the ADB financed Secondary Education Sector Investment Program and Teaching Quality Improvement in

Secondary Education Project have also provided different types of support<sup>63</sup> to many of these non-government schools.

Most tertiary and TVET institutions are privately managed, but many of them receive government subsidies. Public sector TVET institutions, which enroll around 22% of the TVET student population, are fully financed by the government. However, a large number of private TVET institutions also receive subsidies from the government, mainly in the form of MPOs for teacher salary payments and through grants from donor supported government projects. At the tertiary level, public universities, which enroll around 25.5% of the total student population, are fully supported by government funds received through UGC. Government colleges affiliated to NU enrolling 37.9% of total tertiary level students also receive full funding from MoE. Nongovernment colleges, on the other hand, are largely privately funded and generate around 80% of their income from student fees. But they also have access to some public funds in the form of MPOs for teacher salaries and through donor funded government projects. Students are charged nominal tuition and examination fees in government higher secondary schools, government TVET polytechnics, public universities and NU affiliated government colleges. Private institutions charge substantially higher fees at all levels.

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<sup>63</sup> Examples of such support include infrastructure development (classrooms and WASH facilities), teacher training, and assistance for developing the reading habits of children.



**ANNEX 2: SHARES OF STUDENTS IN DIFFERENT PERFORMANCE BANDS AND GRADE-SUBJECT SPECIFIC PERFORMANCE LEVELS IN NSA AND LASI**

**Table A2.1: Minimum and maximum scale scores for NSA 2011, 2013, 2015, and 2017**

Subject	Scale score							
	2011		2013		2015		2017	
	Min	Max	Min	Max	Min	Max	Min	Max
Grade 3 Bangla	43.7	143.1	49.6	140.3	60.0	150.0	60.0	150.0
Grade 3 math	45.7	139.4	45.8	142.3	60.0	140.0	60.0	150.0
Grade 5 Bangla	50.6	159.3	67.1	151.2	60.0	154.0	60.0	175.0
Grade 5 math	58.2	155.9	76.5	154.7	60.0	150.0	60.0	160.0

Source: Authors' calculations using NSA 2011, 2013, 2015 and 2017

**Table A2.2: Minimum and maximum scale scores by grade and subject in LASI 2015**

Subject	Scale score			
	Grade 6		Grade 8	
	Min	Max	Min	Max
Bangla	188.1	609.0	134.5	630.5
English	99.5	597.7	137.4	602.2
Math	127.8	611.2	171.0	693.0

Source: Authors' calculations using LASI 2015

**Table A2.3: Shares of students below and at/above grade level proficiency in NSA 2011, 2013, 2015, and 2017**

Subject	2011		2013		2015		2017	
	Below grade 3	On/above grade 3	Below grade 3	On/above grade 3	Below grade 3	On/above grade 3	Below grade 3	On/above grade 3
Grade 3 Bangla	35%	65%	25%	75%	32%	68%	26%	74%
Grade 3 math	51%	49%	42%	58%	59%	41%	58%	42%
	Below grade 5	On/above grade 5	Below grade 5	On/above grade 5	Below grade 5	On/above grade 5	Below grade 5	On/above grade 5
Grade 5 Bangla	74%	26%	75%	25%	77%	23%	90%	10%
Grade 5 math	70%	30%	75%	25%	90%	10%	84%	16%

Source: Authors' estimates using NSA 2011, 2013, 2015 and 2017 data; standard deviations of scores shown in parentheses

**Table A2.4: Percentage of students in different performance bands by grade and subject, NSA 2017**

<b>Subject</b>	<b>Band 1</b>	<b>Band 2</b>	<b>Band 3</b>	<b>Band 4</b>	<b>Band 5</b>
Grade 3 Bangla	8%	18%	40%	30%	4%
Grade 3 math	24%	34%	29%	9%	4%
Grade 5 Bangla	1%	10%	36%	42%	10%
Grade 5 math	2%	18%	36%	29%	16%

Source: Authors' calculations using NSA 2017

Note: Band 2 or below corresponds to below grade 3 level proficiency. Band 5 is grade 5 proficiency level.

**Table A2.5: Shares of students below and at/above grade level proficiency in LASI 2015**

<b>Subject</b>	<b>Below grade 6</b>	<b>At/above grade 6</b>
Bangla grade 6	7%	93%
English grade 6	30%	70%
Mathematics grade 6	24%	76%
Bangla grade 8	2%	98%
English grade 8	11%	89%
Mathematics grade 8	7%	93%

Source: Authors' calculations using LASI 2015

Note: No information is available regarding which band corresponds to grade 8 level proficiency—hence the percentage of students achieving grade 8 level proficiency cannot be computed.

**Table A2.6: Percentage of students in different performance bands by grade and subject, LASI 2015**

<b>Subject</b>	<b>Band 2 or below</b>	<b>Band 3</b>	<b>Band 4</b>	<b>Band 5</b>	<b>Band 6 and above</b>
Grade 6 Bangla	7%	22%	36%	26%	9%
Grade 6 English	30%	29%	23%	13%	5%
Grade 6 math	24%	29%	26%	15%	6%
Grade 8 Bangla	2%	13%	30%	29%	25%
Grade 8 English	11%	41%	26%	14%	8%
Grade 8 math	7%	34%	36%	17%	7%

Source: Authors' calculations using LASI 2015

Note: Band 2 or below corresponds to below grade 6 level proficiency. No information is available regarding which band corresponds to grade 8 level proficiency.

**Table A2.7: Scale scores ranges by band for NSA and LASI**

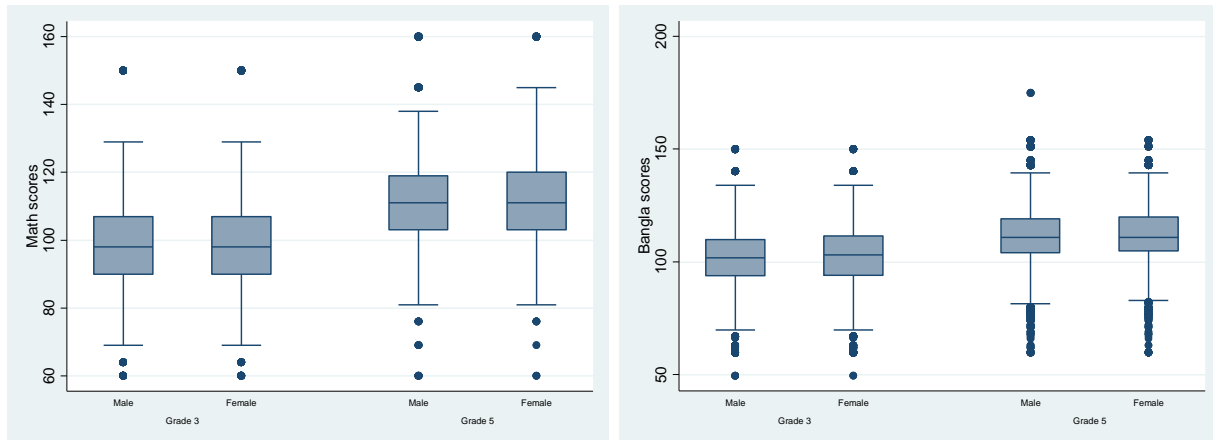
NSA scale score ranges		LASI scale score ranges		
Bangla	Math	Bangla	English	Math
Band 1 <85	Band 1 < 90	Band 2 < 316	Band 2 < 301	Band 2 < 331
85 ≤ Band 2 < 96	90 ≤ Band 2 < 101	316 ≤ Band 3 < 355	301 ≤ Band 3 < 340	331 ≤ Band 3 < 380
96 ≤ Band 3 < 108	101 ≤ Band 3 < 113	355 ≤ Band 4 < 395	340 ≤ Band 4 < 380	380 ≤ Band 4 < 430
108 ≤ Band 4 < 122	113 ≤ Band 4 < 124	395 ≤ Band 5 < 435	380 ≤ Band 5 < 420	430 ≤ Band 5 < 480
122 ≤ Band 5	124 ≤ Band 5	435 ≤ Band 6	420 ≤ Band 6	480 ≤ Band 6

Source: DPE (2014) and ACER (2016)

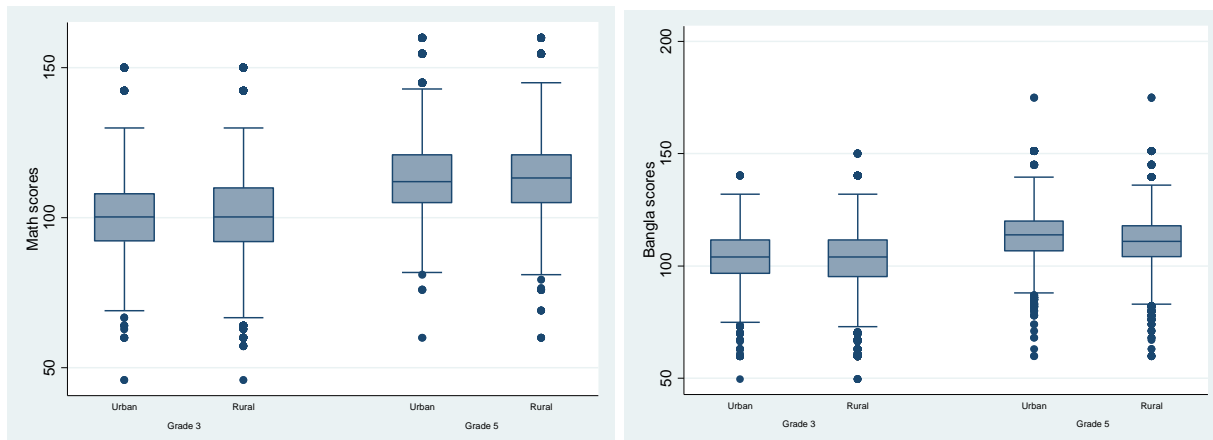
## ANNEX 3: DISTRIBUTIONS OF OUTCOMES IN NSA 2017 AND LASI 2015

### Annex 3.1: Distributions of student learning outcomes in NSA 2017

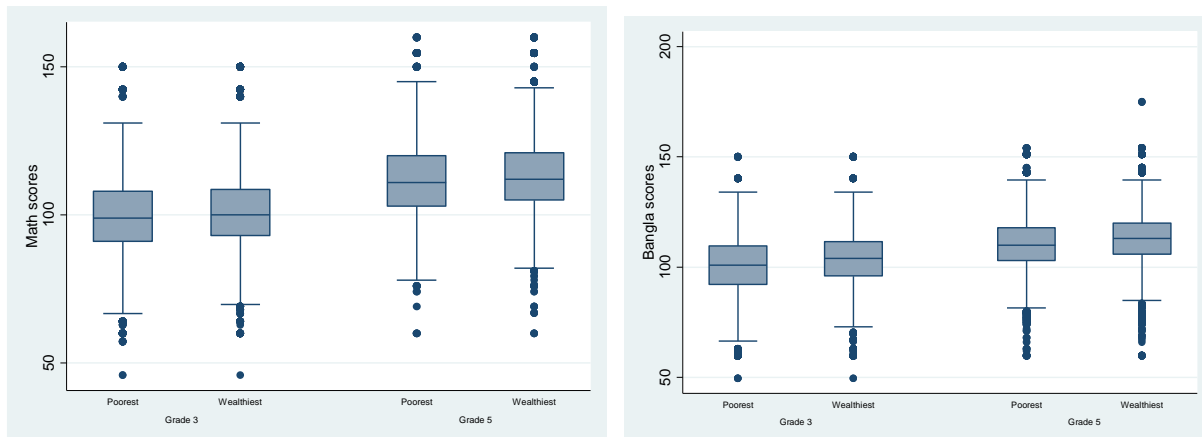
Distribution by gender (males vs. females), grade and subject



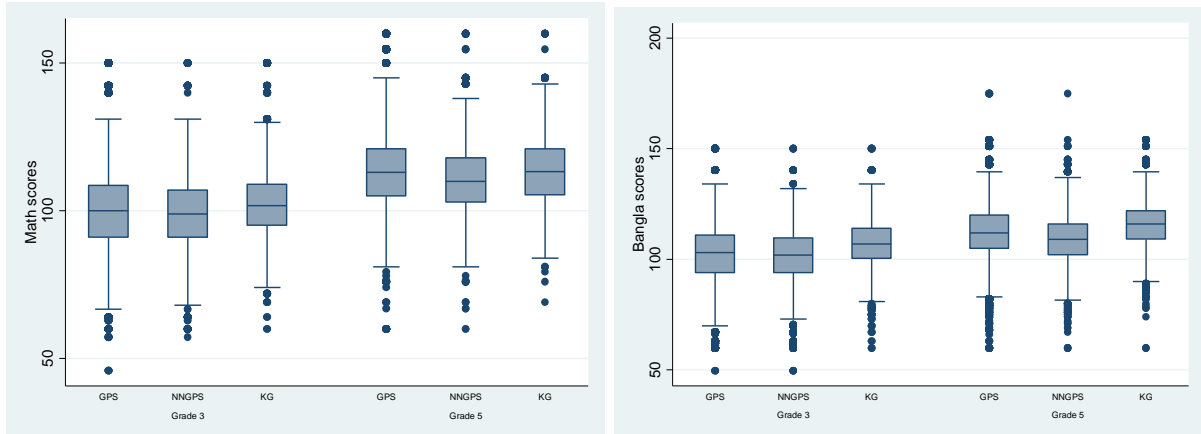
Distribution by location (urban vs. rural), grade and subject



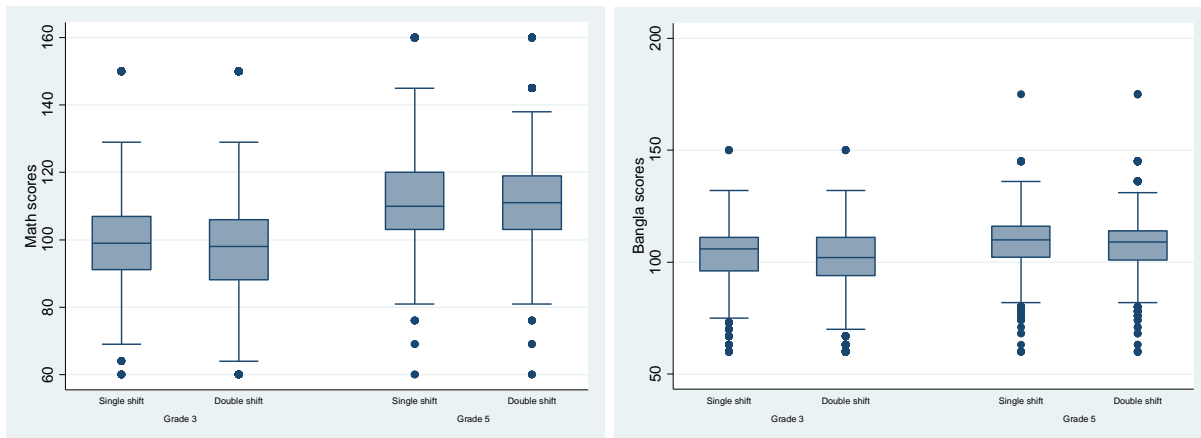
Distribution by wealth status (wealthiest vs. poorest), grade and subject



Distribution by school type (GPS vs. NNGPS vs. KG), grade, and subject

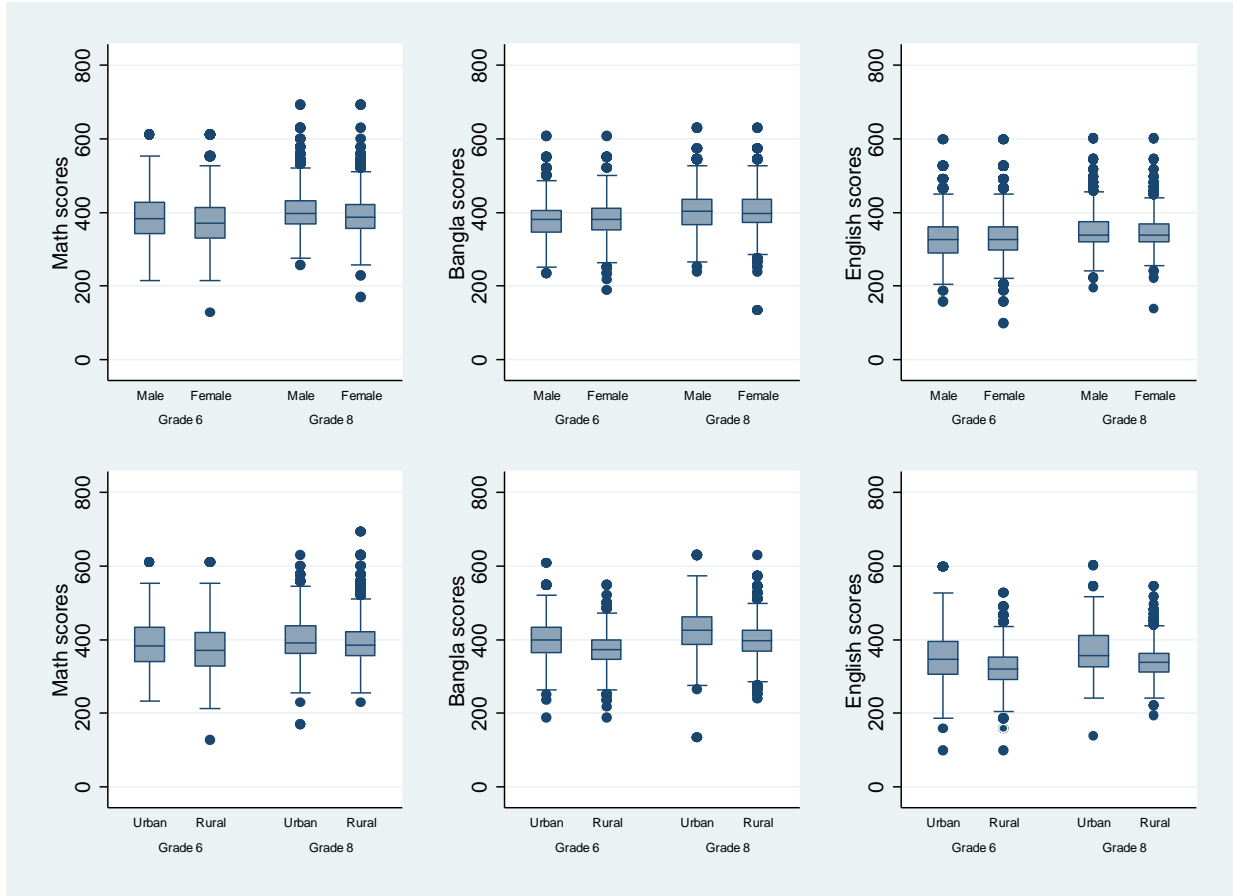


Distribution by school type (single shift vs. double shift), grade and subject

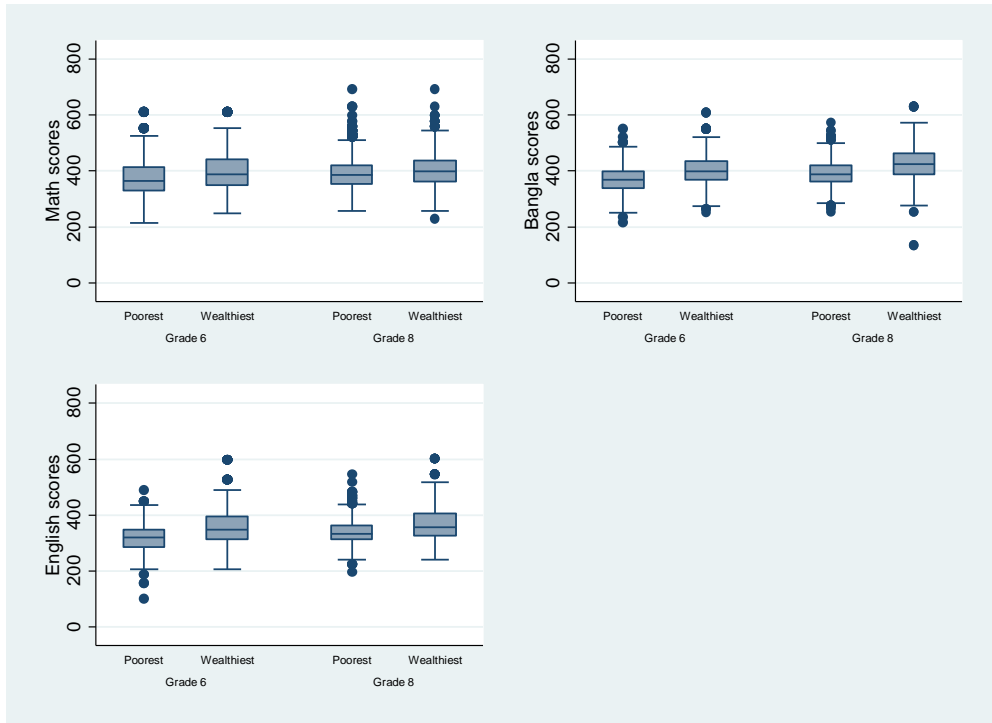


### Annex 3.2: Distribution of student learning outcomes in LASI 2015

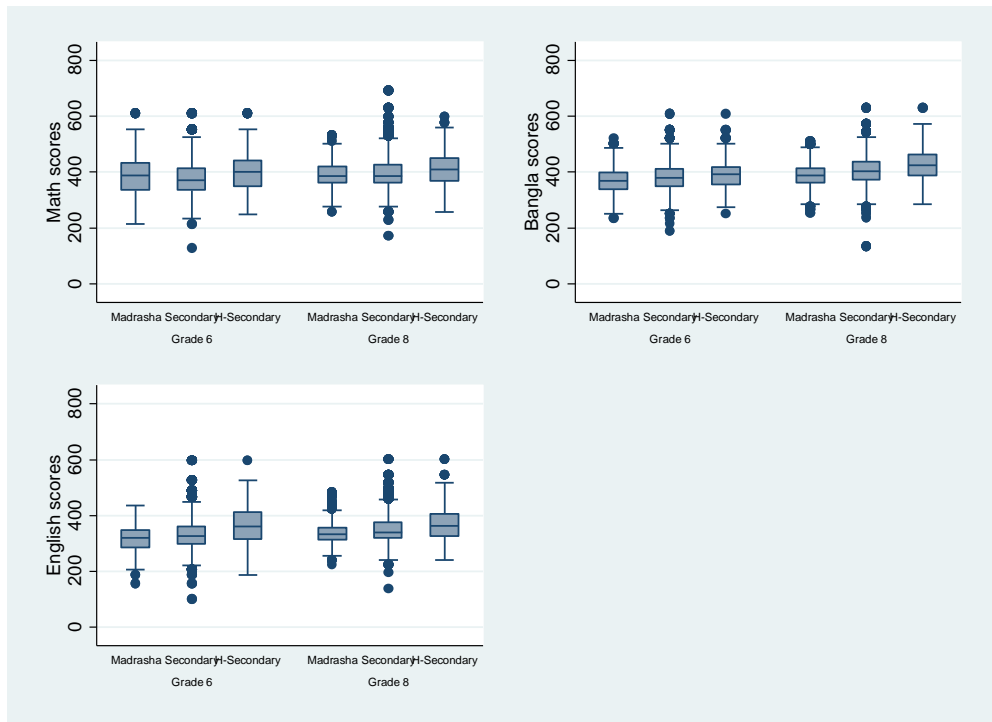
Distribution by gender, urban-rural location, grade and subject



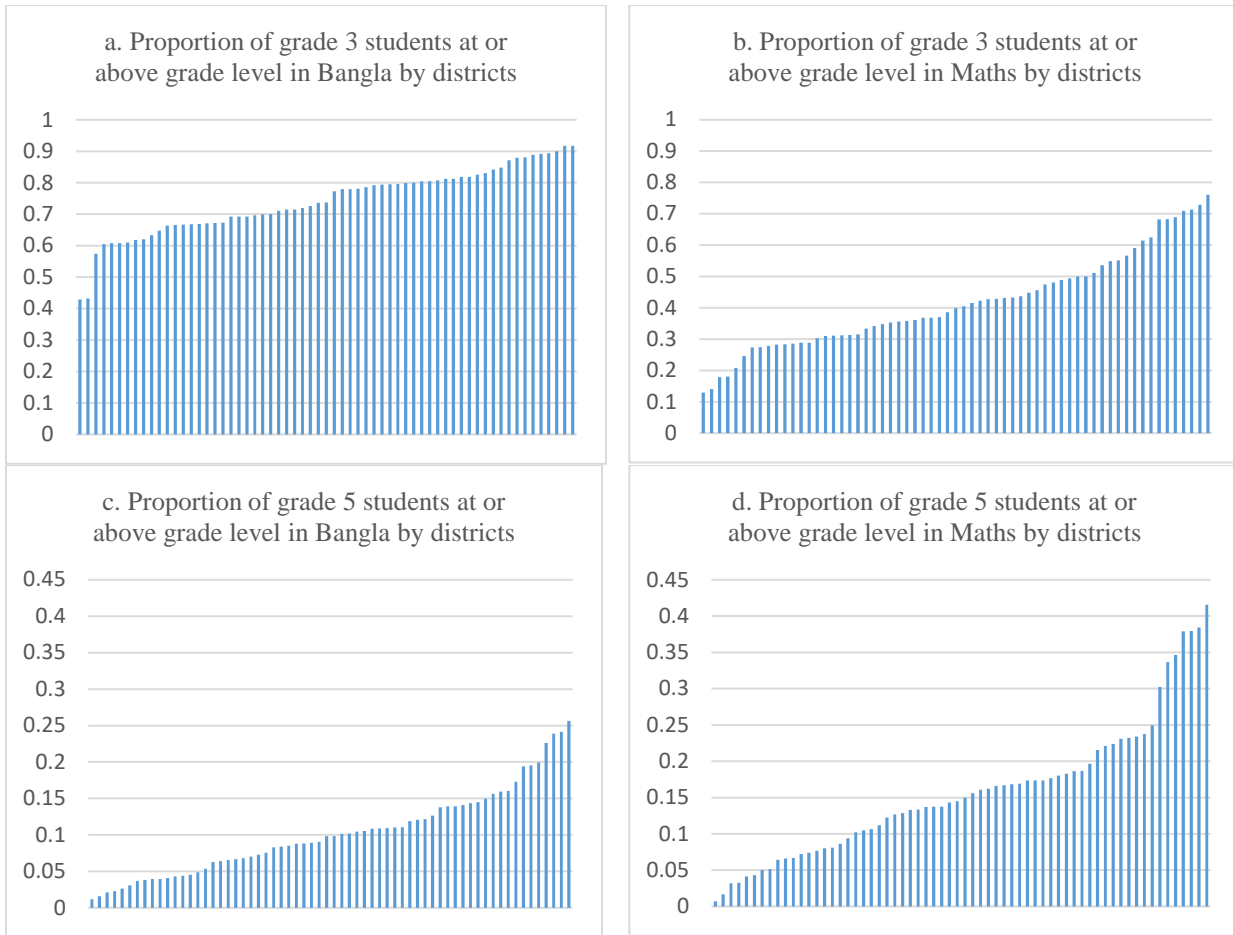
### Distribution by wealth status, grade and subject



### Distribution by school type, grade and subject



**Annex 3.3: Disparities across districts in the share of students performing at or above grade level**



Source: Authors' estimates based on NSA 2017 data

Note: The horizontal axis represents districts



## ANNEX 4: SUPPLEMENTARY REGRESSIONS RESULTS

**Table A4.1: Descriptive statistics (sample mean) for schools in LASI 2015**

Variable	Grade 6 Math	Grade 8 Math	Grade 6 Bangla	Grade 8 Bangla
Proportion of students in Secondary Schools	0.77	0.76	0.77	0.76
Proportion of students in Madrasah	0.19	0.19	0.19	0.19
Proportion of students in Higher Secondary School	0.05	0.05	0.05	0.05
The school is in rural area	0.77	0.76	0.77	0.76
Student-teacher ratio (STR)	36.1	36.72	36.1	36.72
Head teacher is female	0.08	0.08	0.08	0.08
Head teacher is aged 40 or above	0.83	0.84	0.83	0.84
The SMC is active	0.62	0.63	0.62	0.63
The school has a PTA	0.9	0.9	0.9	0.9
Teacher vacancy is a serious problem	0.25	0.25	0.25	0.25
Overcrowded classes is a serious problem	0.29	0.29	0.29	0.29
Teachers' job satisfaction is high	0.53	0.53	0.53	0.53
Teachers' skill is high	0.41	0.4	0.41	0.4
Lack of library is a serious problem	0.42	0.41	0.42	0.41
Prop. of teachers with master's degree+	0.35	0.32	0.38	0.38
Proportion of female teachers	0.11	0.07	0.36	0.37
Average number of years of teaching	3.54	3.79	3.65	3.84
Proportion of teachers with B.Ed. Degree	0.57	0.71	0.53	0.65
Proportion of teachers with M.Ed. Degree	0.05	0.07	0.03	0.04
Prop of teachers whose major is the subject taught	0.38	0.56	0.53	0.61
Proportion of teachers with subject based training	0.76	0.83	0.72	0.78
Prop. of teachers who have taken CPD ICT training	0.25	0.26	0.19	0.21
Prop. of teachers who seek guidance in learning	0.7	0.66	0.68	0.7
Average student age	11.89	13.77	11.89	13.77
Proportion of female students	0.57	0.54	0.57	0.54
Proportion of students repeating grade in junior secondary	0.06	0.06	0.06	0.06
Proportion of students receiving stipend	0.31	0.27	0.31	0.27
Prop. Of students taking private tutoring	0.53	0.57	0.53	0.57
Prop. Of student receiving homework help	0.55	0.43	0.55	0.43
Proportion of students helping with household chores	0.98	0.99	0.98	0.99
Average time (hours) devoted to study	4.29	4.48	4.29	4.48
Proportion of students reading supplemental books	0.8	0.83	0.8	0.83
Average number of days students is absent in two weeks	1.07	0.97	1.07	0.97
Prop. of parent's max education: up to grade 5	0.26	0.25	0.26	0.25
Prop. of parent's max education: up to grade 8	0.19	0.22	0.19	0.22
Prop. of parent's max education: up to grade 10	0.16	0.17	0.16	0.17
Prop. of parent's max education: more than grade 10	0.28	0.25	0.28	0.25
Average number of assets	3.97	4.06	3.97	4.06
Number of observations	13191	13688	13191	13688

Source: Authors' estimates using LASI 2015 data

Table A4.2: Probit estimates for NSA 2017 for grade level proficiency by grade and subject

VARIABLES	(1) Grade 3 Math	(2) Grade 5 Math	(3) Grade 3 Bangla	(4) Grade 5 Bangla
<i>School characteristics</i>				
The school is in rural area	0.147	0.163	-0.000363	-0.0422
School type: GPS	0.748***	0.374	0.589***	0.524**
School type: NNGPS	0.630**	0.146	0.612***	0.219
School type: KG	0.659**	-0.147	0.840***	0.481**
The school has multiple shifts	-0.116	-0.0322	-0.166	-0.0830
The school has library	-0.0547	0.00720	-0.0735	-0.0500
Student-teacher ratio (STR)	-0.00839***	0.00246	-0.00244	-0.00404
Number of school days	0.00118	0.00492**	0.000688	0.00129
Head teacher is female	-0.00902	0.0114	0.0499	0.146
Head teacher is aged 40 or above	0.0775	0.172	-0.0851	0.130
The school has a SMC	0.184	0.431	-0.317	0.0631
The school has a PTA	0.0920	-0.161	0.201	-0.200
Teachers absent less than 10% of the days	-0.0892	-0.0204	0.103	0.0499
Teacher vacancy is a serious problem	-0.120	-0.365***	-0.0872	-0.191*
Overcrowded classes is a serious problem	0.299***	0.201	0.144	0.0695
<i>Teacher characteristics</i>				
Prop. of teachers with bachelor's degree+	0.0788	0.208	0.0852	0.0303
Proportion of female teachers	0.000642	-0.102	0.0627	-0.140
Average number of years of teaching	-0.00428	-0.00283	0.00123	0.00901
Proportion of teachers with subject based training	-0.0133	0.0163	0.0698	-0.122
Proportion of teachers who give homework	0.214	0.0471	0.203	0.126
<i>Student and household characteristics</i>				
Student is female	-0.0755*	-0.00918	0.147***	0.00982
Student speaks Bangla at home	0.176	-0.205	-0.453	
Student has repeated grade	-0.304***	-0.203**	-0.267***	-0.188**
Student receives stipend	0.198**	0.189*	0.0309	0.104
Student takes private tutoring	-0.0794	-0.185**	0.0103	-0.0706
Student receives help with homework	-0.0197	0.0500	0.0236	-0.106
Student helps with household chores	0.0496	-0.165	-0.00895	-0.0724
Student reads books other than textbooks at home	0.170***	0.240***	0.264***	0.311***
Number of days student is absent	0.00189	-0.00372	0.00247	-0.0255**
Distance to school	0.0461	0.0269	-0.0521	-0.0253
Parents max education: up to grade 5	0.155**	0.164	0.0424	-0.0694
Parents max education: up to grade 8	0.226***	0.110	0.166**	-0.0945
Parents max education: up to SSC (grade 10)	0.238***	0.206*	0.285***	0.0816
Parents max education: more than grade 10	0.379***	0.277**	0.363***	0.340***
Wealth index	0.0425**	0.0673***	0.0387*	0.0664**
Student's total number of family members	-0.00714	-0.00165	-0.00568	-0.00890
Constant	-2.244***	-3.420***	-0.246	-2.166***
Observations	6,614	6,258	7,183	5,935

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Authors' estimates using NSA 2017 data

Table A4.3: Estimates for NSA 2013 scaled scores by grade and subject

VARIABLES	(1) Grade 3 Math	(2) Grade 5 Math	(3) Grade 3 Bangla	(4) Grade 5 Bangla
<i>School characteristics</i>				
The school is in rural area	0.603	2.670***	0.361	0.267
School type: GPS	0.304	5.354***	1.067	5.405***
School type: RNGPS	-1.077	2.858*	0.107	3.701**
School type: KG	-0.969	5.335***	1.199	6.777***
Student-teacher ratio (STR)	-0.0280	0.00141	-0.0434***	-0.00346
Head teacher is female	1.020	1.397	0.814	1.944**
Head teacher is aged 40 or above	1.980**	1.879*	0.582	1.693**
Head teacher's qualification is SSC	-1.427	-3.636*	-0.739	0.499
Head teacher's qualification is HSC	-2.069*	-1.996*	-0.562	-0.00181
Head teacher's qualification is post-graduate	-1.425	-0.557	-0.500	-0.121
The school has a SMC	0.229	-2.755	0.750	-1.383
The school has a PTA	0.943	0.853	0.0591	1.844**
Teachers' job satisfaction is high	0.0228	0.312	-0.764	0.237
Teachers' skills are rated high	-0.623	6.957***	-2.722	4.371***
Teacher vacancy is a serious problem	1.056	0.845	0.673	0.0231
Overcrowded classes is a serious problem	0.628	-0.0644	0.930	0.0525
Lack of library is a serious problem	0.169	0.833	0.264	0.738
<i>Teacher characteristics</i>				
Prop. of teachers with bachelor's degree+	-0.530	-0.195	0.149	0.299
Proportion of female teachers	-1.220	-4.961***	-0.284	-2.833**
Average number of years of teaching	-0.131*	-0.0759	-0.0829	-0.129**
<i>Student and household characteristics</i>				
Student's age (in years)	-1.103***	-0.541**	-0.731**	-0.419*
Student is female	-0.729**	-0.527*	0.616**	-0.181
Student is indigenous	-4.406***	-4.579***	-4.583***	-2.616**
Student has repeated grade	-1.224**	-1.868***	-1.351***	-2.207***
Student receives stipend	-0.311	-0.169	-0.483	-0.00998
Student helps with household chores	0.745	-1.490	0.0669	-0.753
Student reads books other than textbooks at home	2.463***	1.550***	1.751***	2.194***
Number of days student is absent	-0.0900***	-0.0306*	-0.0822***	-0.0386***
Parents max education: up to grade 5	0.524	1.308**	0.692	0.666
Parents max education: up to grade 8	0.845	1.756**	0.768	0.870
Parents max education: up to SSC (grade 10)	0.966	2.380***	0.948	1.802***
Parents max education: more than grade 10	2.292***	4.322***	2.519***	4.433***
Wealth index	0.0277	-0.0909	0.196	-0.0949
Constant	116.8***	114.3***	114.1***	113.1***
Observations	12,796	11,000	12,667	11,019
Adjusted R-squared	0.095	0.134	0.082	0.130

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1; Authors' estimates using NSA 2013 data

Table A4.4: Estimates for NSA 2015 scaled scores by grade and subject

VARIABLES	(1) Grade 3 Math	(2) Grade 5 Math	(3) Grade 3 Bangla	(4) Grade 5 Bangla
<i>School characteristics</i>				
School type: GPS	-1.615	-0.701	2.140	-1.695
School type: NNGPS	0.754	-2.555	1.823	-3.694
School type: KG	1.405		7.788***	1.175
Total number of students in the school	-0.00111	0.00249	-0.000298	0.00344**
Head teacher is female	1.025	-0.367	0.0827	2.414***
Head teacher is aged 40 or above	2.209**	1.238	2.580**	1.130
Head teacher's qualification is below SSC	3.620	-5.124*	7.360**	-4.917**
Head teacher's qualification is SSC	-1.589	0.790	1.669	1.682
Head teacher's qualification is HSC	1.167	1.258	0.627	1.373
Head teacher's qualification is post-graduate	1.350	0.751	1.539	0.991
The school has a SMC	-2.676	-4.515**	-1.140	-0.768
The school has a PTA	-0.250	2.723**	0.598	2.261*
<i>Teacher characteristics</i>				
Prop. of teachers with bachelor's degree+	-1.021	0.544	-0.0200	0.589
Proportion of female teachers	-1.364	-0.802	-0.728	-0.929
Average number of years of teaching	-0.0463	0.0253	-0.115**	0.00646
Proportion of teachers with Certificate in Education	0.226	0.365	1.632	-1.071
Proportion of teachers with subject based training	-0.171	-2.065**	1.246	1.410*
Proportion of teachers who give homework	-1.227	1.426	0.729	2.807**
<i>Student and household characteristics</i>				
Student is female	-0.551*	-0.703**	1.245***	0.646*
Student has repeated grade	-2.556***	-1.218**	-2.486***	-1.905***
Student receives stipend	0.135	1.048*	-0.108	-0.0573
Student helps with household chores	1.199	0.142	-0.0112	0.172
Student reads books other than textbooks at home	2.301***	2.236***	2.408***	1.176**
Number of days student is absent	-0.236***	-0.188**	-0.157**	-0.334***
Parents max education: up to grade 5	0.326	0.226	0.811	0.853
Parents max education: up to grade 8	0.743	0.754	2.155***	1.253**
Parents max education: up to SSC (grade 10)	1.038	1.253*	2.651***	2.300***
Parents max education: more than grade 10	1.100	3.203***	3.358***	3.995***
Wealth index	0.0694	-0.0463	-0.222	0.310
Constant	101.7***	109.0***	93.61***	105.6***
Observations	8,754	7,743	10,162	8,532
Adjusted R-squared	0.085	0.087	0.073	0.106

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1; Authors' estimates using NSA 2015 data

Table A4.5: Estimates for NSA scaled scores by grade and subject using pooled data for 2013, 2015 and 2017

Variable	Grade 3 Math	Grade 5 Math	Grade 3 Bangla	Grade 5 Bangla
<i>School characteristics</i>				
School type: GPS	2.095*	6.068***	1.302	3.940***
School type: NNGPS	0.939	3.615***	0.915	1.448
School type: KG	2.753**	5.543***	3.816***	7.227***
Head teacher is female	0.101	-0.231	0.324	0.994**
Head teacher is aged 40 or above	0.812	0.854	0.569	1.035**
The school has a SMC	-0.413	-1.377	-0.656	-0.356
The school has a PTA	0.745	1.231*	-0.0721	1.048*
<i>Teacher characteristics</i>				
Prop. of teachers with bachelor's degree+	-0.162	0.590	0.416	1.034**
Proportion of female teachers	-0.699	-1.546***	0.192	-0.390
Average number of years of teaching	-0.0235	-0.00174	-0.0367	0.000388
<i>Student and household characteristics</i>				
Student is female	-0.499***	-0.193	1.048***	0.477***
Student has repeated grade	-2.645***	-2.242***	-2.501***	-2.358***
Student receives stipend	0.509	0.886**	0.159	0.516*
Student reads supplementary books at home	2.528***	1.990***	2.211***	2.089***
Number of days student is absent	-0.108***	-0.0403**	-0.0848***	-0.0470***
Student helps with household chores	0.680	-1.600***	0.401	-0.408
Parents max education: up to grade 5	0.644*	0.822**	0.963***	0.878***
Parents max education: up to grade 8	1.257***	1.230***	1.732***	1.411***
Parents max education: up to SSC (grade 10)	1.751***	1.827***	2.606***	2.367***
Parents max education: more than grade 10	2.875***	3.813***	3.793***	4.489***
Wealth index	0.109	-0.0821	0.154	0.101
Year dummy: 2015	-6.893***	-6.492***	-4.629***	-2.954***
Year dummy: 2017	-6.990***	-5.141***	-2.987***	-7.833***
Constant	102.5***	112.2***	102.0***	109.6***
Observations	36,710	31,795	39,474	32,398
Adjusted R-squared	0.102	0.100	0.075	0.146

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Authors' estimates using NSA 2013, 2015, 2017 data

Table A4.6: Estimates for LASI Grade 6 Bangla scaled scores

VARIABLES	(1)	(2)	(3)
School characteristics			
The school is in rural area	-14.46***	-10.29***	-7.846**
The School is a Madrasah	-11.09***	-12.41***	-8.644**
Student-teacher ratio (STR)	-0.155***	-0.153**	-0.123**
Head teacher is female	19.06***	24.75***	22.14***
Head teacher is aged 40 or above	-0.339	-1.299	-0.766
Teacher vacancy is a serious problem	1.987	1.118	0.0696
Teachers' skills are high	4.474	2.813	2.007
Lack of library a serious problem	-6.316**	-4.625	-3.147
Teacher characteristics			
Proportion of teachers with master's degree and higher		1.651	0.734
Proportion of female teachers		5.034	5.263*
Average number of years of teaching		0.710	0.559
Proportion of teachers with B.Ed. Degree		2.519	2.398
Proportion of teachers with M.Ed. Degree		29.98***	24.55***
Proportion of teachers whose major is the subject taught		3.549	2.651
Proportion of teachers with subject based training		-0.170	0.304
Proportion of teachers who have taken CPD ICT training		1.122	0.921
Proportion of teachers who seek guidance in learning		-0.137	-0.649
Student and household characteristics			
Student's age			-3.972***
Student is female			2.395
Student has repeated grade at junior secondary level			-12.94***
Student receives stipend			-1.980
Student received tuition waiver			-1.115
Student receives help in homework			-2.285*
Student helps with chores			1.492
Time devoted to study			6.938***
Student reads supplemental books			4.872***
Number of days student is absent in 2 weeks			-1.903***
Parents education: up to grade 5			-0.237
Parents education: up to grade 8			2.811
Parents education: up to grade 10			6.309***
Parents education: grade 11 or higher			10.10***
Wealth index			2.209***
Constant	399.4***	383.9***	384.4***
Observations	12,624	10,645	10,570
Adjusted R-squared	0.144	0.168	0.235

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Authors' estimates using LASI 2015 data

Note: divisions not shown (students in Rajshahi and Barisal performed significantly better than in other divisions); Estimates for head teacher's perception on whether the SMC is active, PTA is present, overcrowded class is a serious problem; teacher's job satisfaction is high and distance to school (in minutes) for students, student helps with household chores, and student receives help with homework are not statistically significant at 10% level in most cases are not shown

Table A4.7: Estimates for LASI Grade 6 English scaled scores

VARIABLES	(1)	(2)	(3)
<i>School characteristics</i>			
The school is in rural area	-14.35***	-11.45**	-8.020*
The School is a Madrasah	-15.25***	-13.03**	-9.667*
Student-teacher ratio (STR)	-0.199**	-0.151*	-0.126
Head teacher is female	25.19***	28.04***	25.61***
Head teacher is aged 40 or above	-5.019	-2.454	-3.457
Teacher vacancy is a serious problem	0.351	-1.781	-2.757
Teachers' skills are high	6.209	5.712	5.484
Lack of library a serious problem	-11.95***	-11.06***	-9.698***
<i>Teacher characteristics</i>			
Proportion of teachers with master's degree and higher		10.44**	8.772*
Proportion of female teachers		-10.79**	-10.42**
Average number of years of teaching		-1.745	-1.470
Proportion of teachers with B.Ed. Degree		10.12**	9.229**
Proportion of teachers with M.Ed. Degree		11.48	10.81
Proportion of teachers whose major is the subject taught		3.512	3.081
Proportion of teachers with subject based training		-5.522	-5.351
Proportion of teachers who have taken CPD ICT training		0.00846	0.0729
Proportion of teachers who seek guidance in learning		8.835**	7.894**
<i>Student and household characteristics</i>			
Student's age			-4.253***
Student is female			2.042
Student has repeated grade at junior secondary level			-13.02***
Student receives stipend			0.462
Student received tuition waiver			0.706
Student receives help in homework			-0.419
Student helps with chores			1.663
Time devoted to study			5.954***
Student reads supplemental books			0.0645
Number of days student is absent in 2 weeks			-1.035*
Parents education: up to grade 5			3.702*
Parents education: up to grade 8			3.502
Parents education: up to grade 10			5.057**
Parents education: grade 11 or higher			15.79***
Wealth index			2.010***
Constant	342.2***	327.5***	332.7***
Observations	12,624	11,365	11,282
Adjusted R-squared	0.157	0.195	0.239

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1; Authors' estimates using LASI 2015 data

Table A4.8: Estimates for LASI Grade 6 Math scaled scores

VARIABLES	(1)	(2)	(3)
<i>School characteristics</i>			
The school is in rural area	2.515	1.750	3.791
The School is a Madrasah	2.374	5.963	6.947
Student-teacher ratio (STR)	-0.253***	-0.248***	-0.227***
Head teacher is female	18.85*	18.84	17.81
Head teacher is aged 40 or above	-6.675	-1.093	-0.528
Teacher vacancy is a serious problem	-7.066	-7.561	-9.121*
Teachers' skills are high	11.87**	12.50**	11.59**
Lack of library a serious problem	-10.50**	-10.02*	-7.890
<i>Teacher characteristics</i>			
Proportion of teachers with master's degree and higher		5.788	4.147
Proportion of female teachers		-1.939	-1.873
Average number of years of teaching		0.678	0.671
Proportion of teachers with B.Ed. Degree		7.209	4.808
Proportion of teachers with M.Ed. Degree		-17.80*	-16.31*
Proportion of teachers whose major is the subject taught		5.601	4.073
Proportion of teachers with subject based training		-5.569	-3.912
Proportion of teachers who have taken CPD ICT training		-2.867	-3.242
Proportion of teachers who seek guidance in learning		3.986	3.744
<i>Student and household characteristics</i>			
Student's age			-4.185***
Student is female			-8.965***
Student has repeated grade at junior secondary level			-16.43***
Student receives stipend			-2.037
Student received tuition waiver			-4.536
Student receives help in homework			-1.034
Student helps with chores			0.0263
Time devoted to study			7.132***
Student reads supplemental books			4.771
Number of days student is absent in 2 weeks			-2.585***
Parents education: up to grade 5			4.035
Parents education: up to grade 8			3.749
Parents education: up to grade 10			7.167**
Parents education: grade 11 or higher			15.54***
Wealth index			1.972**
Constant	378.2***	357.9***	368.1***
Observations	12,624	10,995	10,911
Adjusted R-squared	0.162	0.182	0.229

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Authors' estimates using LASI 2015 data



Table A4.9: Estimates for LASI Grade 8 Bangla scaled scores

VARIABLES	(1)	(2)	(3)
<i>School characteristics</i>			
The school is in rural area	-15.12***	-12.41***	-8.863**
The School is a Madrasah	-14.77***	-19.57***	-17.02***
Student-teacher ratio (STR)	-0.0990	-0.110*	-0.0611
Head teacher is female	9.314	6.832	6.859
Head teacher is aged 40 or above	4.173	1.075	1.104
Teacher vacancy is a serious problem	-3.233	-2.796	-4.110
Teachers' skills are high	9.331***	6.874**	6.288**
Lack of library a serious problem	-11.08***	-9.642***	-7.668***
<i>Teacher characteristics</i>			
Proportion of teachers with master's degree and higher		13.32***	10.98***
Proportion of female teachers		-2.835	-2.039
Average number of years of teaching		-1.543	-1.474
Proportion of teachers with B.Ed. Degree		1.688	1.623
Proportion of teachers with M.Ed. Degree		18.85	16.98
Proportion of teachers whose major is the subject taught		12.77***	11.63***
Proportion of teachers with subject based training		-0.760	-1.640
Proportion of teachers who have taken CPD ICT training		1.855	1.692
Proportion of teachers who seek guidance in learning		-0.128	-0.312
<i>Student and household characteristics</i>			
Student's age			-4.258***
Student is female			2.324
Student has repeated grade at junior secondary level			-13.04***
Student receives stipend			-2.813**
Student received tuition waiver			-1.402
Student receives help in homework			-4.039***
Student helps with chores			5.294
Time devoted to study			9.206***
Student reads supplemental books			1.915
Number of days student is absent in 2 weeks			-1.898***
Parents education: up to grade 5			1.204
Parents education: up to grade 8			2.015
Parents education: up to grade 10			6.511***
Parents education: grade 11 or higher			18.31***
Wealth index			1.068**
Constant	428.2***	415.4***	414.4***
Observations	13,070	11,434	11,323
Adjusted R-squared	0.133	0.167	0.236

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1; Authors' estimates using LASI 2015 data

Table A4.10: Estimates for LASI Grade 8 English scaled scores

VARIABLES	(1)	(2)	(3)
<i>School characteristics</i>			
The school is in rural area	-16.20***	-16.78***	-13.00***
The School is a Madrasah	-9.360**	-9.256**	-7.993*
Student-teacher ratio (STR)	-0.0808	-0.0406	-0.0219
Head teacher is female	12.31	13.76*	13.06*
Head teacher is aged 40 or above	0.0173	0.435	-0.242
Teacher vacancy is a serious problem	-3.006	-4.773	-5.087
Teachers' skills are high	9.969***	11.65***	10.75***
Lack of library a serious problem	-4.680	-2.237	-0.701
<i>Teacher characteristics</i>			
Proportion of teachers with master's degree and higher		9.027**	7.691*
Proportion of female teachers		-3.448	-3.734
Average number of years of teaching		-2.327*	-2.088*
Proportion of teachers with B.Ed. Degree		10.07**	9.815**
Proportion of teachers with M.Ed. Degree		7.088	5.669
Proportion of teachers whose major is the subject taught		2.339	1.509
Proportion of teachers with subject based training		-9.804**	-9.512**
Proportion of teachers who have taken CPD ICT training		-3.307	-3.828
Proportion of teachers who seek guidance in learning		3.933	3.411
<i>Student and household characteristics</i>			
Student's age			-3.079***
Student is female			-2.462
Student has repeated grade at junior secondary level			-8.059***
Student receives stipend			-3.447***
Student received tuition waiver			-1.061
Student receives help in homework			-2.781*
Student helps with chores			6.572
Time devoted to study			3.363***
Student reads supplemental books			1.808
Number of days student is absent in 2 weeks			-1.120**
Parents education: up to grade 5			2.411
Parents education: up to grade 8			2.455
Parents education: up to grade 10			5.594***
Parents education: grade 11 or higher			19.43***
Wealth index			0.885
Constant	352.6***	353.2***	363.0***
Observations	13,070	11,906	11,788
Adjusted R-squared	0.133	0.170	0.211

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1; Authors' estimates using LASI 2015 data

Table A4.11: Estimates for LASI Grade 8 Math scaled scores

VARIABLES	(1)	(2)	(3)
<i>School characteristics</i>			
The school is in rural area	9.304*	13.00**	14.33***
The School is a Madrasah	-10.06**	-8.058	-9.261*
Student-teacher ratio (STR)	-0.114	-0.0912	-0.0836
Head teacher is female	11.39	10.43	11.54
Head teacher is aged 40 or above	-3.636	0.635	0.247
Teacher vacancy is a serious problem	-0.761	-0.0472	0.372
Teachers' skills are high	11.48***	9.756**	8.863**
Lack of library a serious problem	-8.011**	-6.306	-5.053
<i>Teacher characteristics</i>			
Proportion of teachers with master's degree and higher		24.09***	23.69***
Proportion of female teachers		-18.97**	-17.46**
Average number of years of teaching		1.365	1.387
Proportion of teachers with B.Ed. Degree		-4.617	-4.288
Proportion of teachers with M.Ed. Degree		1.118	-0.441
Proportion of teachers whose major is the subject taught		3.555	4.016
Proportion of teachers with subject based training		-7.098	-7.177
Proportion of teachers who have taken CPD ICT training		1.476	1.334
Proportion of teachers who seek guidance in learning		1.554	0.912
<i>Student and household characteristics</i>			
Student's age			-2.950**
Student is female			-13.51***
Student has repeated grade at junior secondary level			-6.223**
Student receives stipend			-1.735
Student received tuition waiver			-6.420**
Student receives help in homework			0.381
Student helps with chores			7.248
Time devoted to study			5.933***
Student reads supplemental books			3.612*
Number of days student is absent in 2 weeks			-2.013***
Parents education: up to grade 5			3.231*
Parents education: up to grade 8			3.506*
Parents education: up to grade 10			3.648*
Parents education: grade 11 or higher			14.43***
Wealth index			0.502
Constant	388.6***	381.8***	388.7***
Observations	13,070	11,528	11,415
Adjusted R-squared	0.155	0.201	0.243

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Authors' estimates using LASI 2015 data