School Governance and Primary Education Learning Outcomes in Uganda

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Abstract

While Uganda has implemented several education policies and programmes, learning outcomes at the primary education level remain dismal and below the national development targets. At the same time, household education spending has been growing despite the diverse income inequalities across regions, which continues to impede better learning outcomes at the Primary level. This paper, therefore, examines the determinants of learning outcomes in primary education (in grades three and six) with a specific focus on school governance and community factors. This study has employed a logit model that utilises regional dummies by time-fixed effects and clustering using school-specific registration numbers to deal with unobserved heterogeneity. Our study finds that faith-founded schools, the frequency of school inspections, pupil age, gender, school type (day or boarding), school location, region, frequency of School Management Committees (SMC) meetings per term and school ownership significantly determine proficiency in numeracy and literacy at the primary level. Based on the results, the study recommends promoting early school enrollment, prioritising boarding schools in government schools, and strengthening internal controls in schools. The finding of our paper is handy and will inform policy-makers by independently prescribing specific interventions at lower and upper primary.

Keywords: Primary Education, Outcomes; Logit; Governance; Uganda

JEL Classification Codes: I21, C25, I26, B23, I28

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1. Background

Primary education is the foremost and fundamental right of every child. It is the first step in making the character of a child. The role of primary education is to ensure broad-based learning for the child, including the development of social, cognitive, cultural, emotional and physical skills. During the 1970s and 1980s, most policy-makers concerned with education in developing countries limited their attention to enrolment rates. Over the years, however, it became clear that school access was insufficient to ensure a decent level of essential learning. Although the gains in enrolment have been impressive in many parts of the world, low quality and high dropout rates have led to the deceptive result that many children leave school again without having obtained a sustainable level of basic reading, writing and numeracy skills. (Michaelowa, 2001).

Ensuring education quality is a necessary complement to enrolment: quality and quantity have to go hand in hand. Education is also given priority to the Sustainable Development Goal 4 (SDG4), of which Sub-Sahara African countries commit to lead the implementation of its agenda in 2030 (Byaro & Kaluwa, 2021). But unfortunately, achieving "quality education for all" is far from being realised in most countries in sub-Saharan Africa (SSA). However, many children in the sub-region enrolled in primary schools during the 1990s and left schools without attaining the minimum proficiency in literacy and numeracy (World Bank, 2006). Globally, governments account for 79% of total education spending, households 20%, and donors for 0.3% (12% in low-income countries). The analysis by United Nations estimates that worldwide spending on education at USD 4.7 trillion, of which USD 3 trillion (65% of the total) is spent in high-income countries and USD 22 billion (0.5% of the total) in low-income countries (UN, 2019) but learning outcomes at primary remain low. These expenditures can influence the quality and quantity of education outputs (Nsanja *et al*, 2021)

Parental involvement in education is an essential issue for governments and non-governmental organisations in many developing countries. Parental involvement in schools is often associated with enhanced student achievement, behaviour and well-being, as well as with democracy and empowerment (Epstein & Hollifield, 1996; Epstein, 2001; Fan & Chen, 2001; Ho Sui-Chu & Willms, 1996; Jeynes, 2005; Sheldon & Epstein, 2002). At the national, regional and local levels, policies are designed to increase the involvement of parents (Suzuki, 2002). However, previous studies have shown that the implementation and effects of these policies are not always successful. Poor socio-economic circumstances can impede parental involvement in education. Involving parents can be difficult when parents and schools do not have the required knowledge, skills and means (Aronson, 2002; Peña C Delores, 2000; Prew, 2010).

Over the years, Uganda's national budgetary allocation to education has grown from Ugshs.767.09 billion to Ugshs 1,801 billion in 2007/08 and FY 2013/14, excluding external funding. Although education sector funding has been increasing in nominal terms, further analysis shows that GoU's contribution to the sector budget as a proportion to the total national budget reduced from 20% in FY 2007/08 to 13.3 % in FY 2013/14. Expenditures on UPE increased from Ushs 388.8 billion in FY 2007/08 to Ushs 603.7 billion in FY 2011/12 and reduced slightly to Ushs 514 billion in FY 2012/13. (MoFPED, 2013). In 2020/21, however, the government increased the education sector budget by 248.5 billion from the 2019/20 budget allocation of 3,397.6 million. Still, the %age of the sector's budget to the national budget was reduced by 0.3 %. The policy-makers and

researchers are increasingly concerned with low education quality in the era of increased education spending. They have realised that poor education outcomes can have detrimental effects on a country's economic and social development (Kasirye, 2009).

To streamline school governance and improve the implementation of UPE, the government reintroduced School Management Committees (SMCs) in 1998 as a legal entity representing and safeguarding government interests and formally took control of decentralised education in 19997. The key responsibilities of SMCs include; the supervision of teachers and pupils' attendance and monitoring the utilisation of school funds. However, studies have shown that most SMCs fail (Namara 2020, MoES 2017, Nannyonga and Nanziri 2013, Prinsen and Titeca 2008). Moreover, supervision and inspection of schools are generally still inadequate despite the decentralisation of education management, and community participation in primary education has declined since the launch of UPE (NPA 2015). However, Ocan (2017) confirmed that the involvement of communities in school activities remains low.

While the implementation of the UPE resulted in considerable gains in terms of access to primary education, with enrolment increasing from 2.6 million children in 1995 to 7.2 million in 2005 and 8.2m in 2018, many children enrolled in primary school are not learning and do not have the competencies they require in literacy and numeracy (UWEZO, 2019; NPA, 2018a). Evidence from the National Assessment of Progress in Education (NAPE) test results shows that in 2010, the average achievement score in literacy at the P3 and P6 levels was 47 % and 40 %, respectively. In addition, 60 % of learners in P3 and about 70 % in P6 scored below the 50 % literacy proficiency level for their respective grades. In numeracy, the average student achievement in P6 in 2010 was only 40 %; worse still, 70 % of learners in this grade performed below the 50 % mark (Mulindwa & Marshall, 2013). According to the NDP III, there is poor quality and efficiency of primary education as evidenced by low literacy rates (49.9 % at P.3, and 53.1 % at P.6), low numeracy rates (55.2) % at P.3, and 50.9 % at P.6) and low survival rates in primary at 38 % in 2018 due to high dropout (NPA, 2020a).

Similarly, the NAPE 2015 reports that in 2014 and 2015, the proportion of grade three learners rated proficient in literacy declined from 64.2 and 60.2 % in 2014 and 15, respectively. Specifically, about 71.7 and 60.2 % of the grade three pupils reached the defined levels of numeracy and literacy in English, respectively. However, as pupils advance to grade six, the proficiency levels of numeracy and literacy in English are reduced by 52.6 and 51.9 %, respectively. This implies that slightly more than half of the pupils in P.6 acquired most of the competencies specified in the national curriculum (NAPE 2015).

Compared to 2017/18, NAPE (2018), the proportion of girls rated proficient in numeracy was about 56.1 % compared to the boys at 54.3 %. In the same year, learners in private schools rated proficient in numeracy was 85.1 % compared to learners in government schools at 50.1 % (See Figure 1.1). Clearly, the proportion of learners rated proficient in private schools (85.1%) was higher than that of learners in government schools in Numeracy. Relatedly learners in urban schools were rated more proficient in numeracy at 68.4 % compared to those in rural areas at 51.2 %. The proportion of grade three girls rated proficient in literacy was 52.5 % compared to boys at 47.4%. Important to note that there are wide disparities in proportions of pupils rated proficient in literacy between privately owned schools (83.3 %) and government schools (44.2 %).

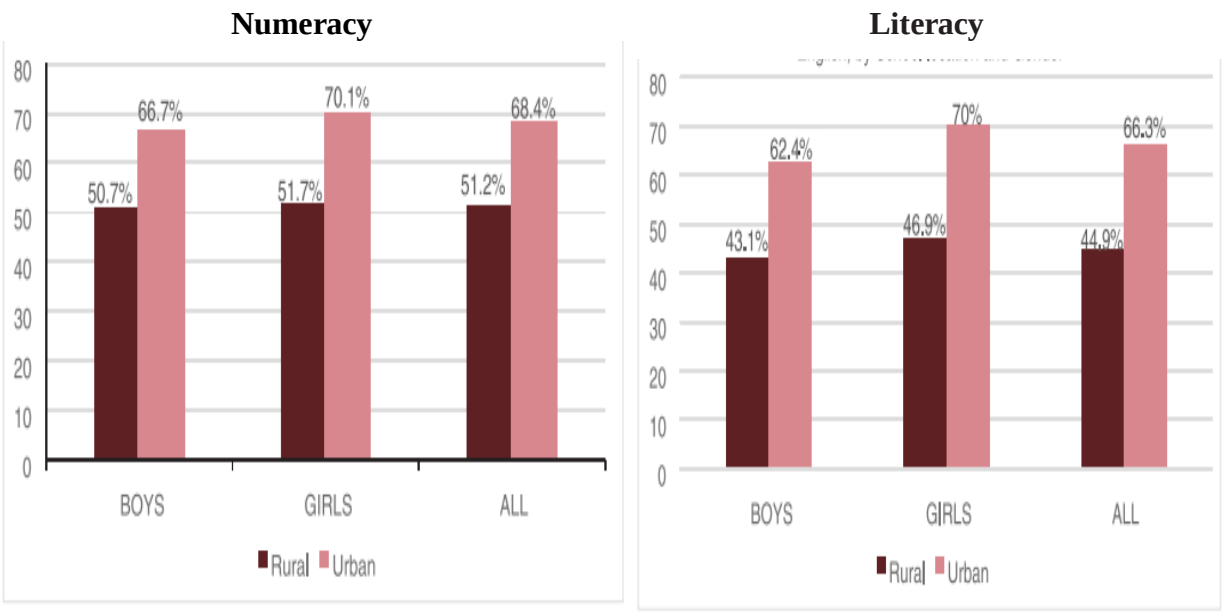

Figure 1.1: Achievement of P.3 learners in Numeracy and Literacy in English, by School location and Gender.
Source: NAPE 2017/18

In grade six, the NAPE 2017/18 Report shows that slightly more than half the learners were rated proficient in numeracy. More specifically, the proportion of the boys rated proficient in numeracy was 10.3% higher than the girls at 45.6%. In terms of Literacy in English, girls (53.5%) were slightly more than the boys (52.7%). In line with theory, learners in urban schools were rated proficient in numeracy (67.6%) compared to learners in rural-based schools (46.2%). A similar trend was observed in Literacy in English, where the proportion of learners rated proficient (75.9%) in urban schools was higher than that of schools located in rural areas (46.7%). Regarding school ownership, grade six pupils in private schools are rated more proficient in numeracy (78.6%) than those in government schools (See Figure 1.2). A similar disparity was also observed in Literacy in English, where grade six pupils rated proficient (83.6%) in private schools was higher than that of pupils in government-owned schools (NAPE 2018)

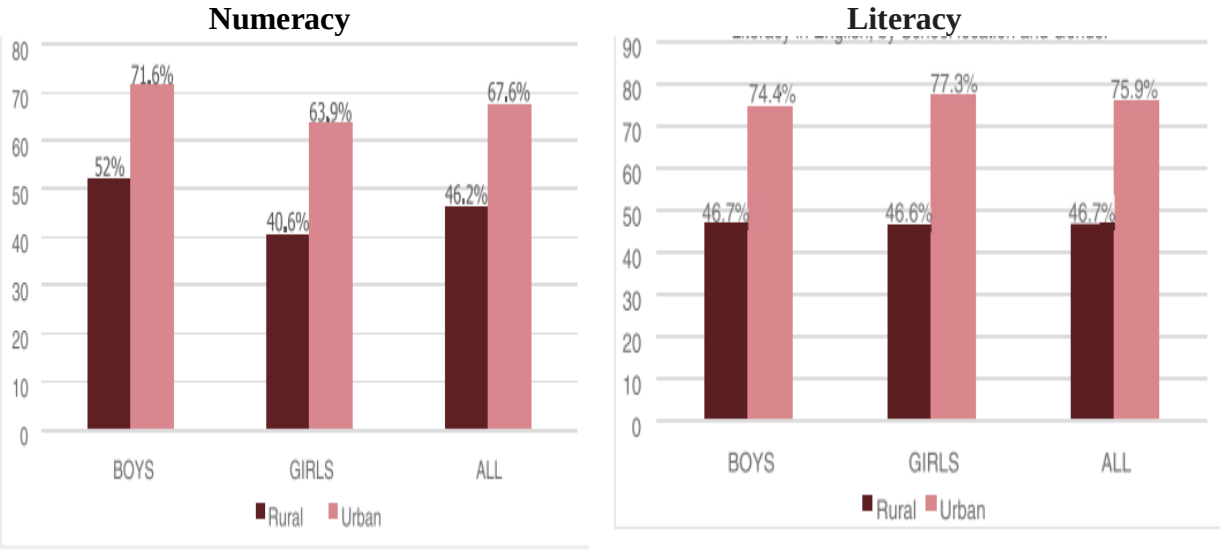

Figure 1.2: Achievement of P.6 learners in Numeracy and Literacy in English, by School location and Gender.
Source: NAPE 2017/18

As noted, Primary learning outcomes are not proportional to the increasing government expenditure at primary. In addition, while several studies have examined the determinants of learning achievements in Uganda (Kasirye, 2009; Nannyonjo, 2007; Muvawala, 2012; Ochwo, 2013), these have not considered governance factors on pupil learning outcomes but primarily focus on the standard inputs on the pupils' educational outcomes. In addition, given the continuous changes in Uganda's primary education in policy, legal and regulatory frameworks, all results and policy recommendations from previous studies have become obsolete and may not apply to the prevailing environment.

The remainder of this study is organised as follows. Section 2 provides the theoretical and empirical literature underpinning the study. Section 3 discusses the methodology and models for estimation thereof. Penultimately, empirical results and their interpretation are covered in Section 4 before providing a conclusion in section 5.

2. Theoretical Literature

2.1 Systems Theory

According to silver (1983), a helpful starting point for analysing schools as systems is the specification of the purposes of schools. For example, a school's goals include advancing students' knowledge skills (instruction), shaping students' attitudes and behaviour (control) and satisfying staff members' needs. In addition, all complex systems require maintenance (support service) and coordination (administrative service). These are subsystems in the school system. Finally, all these subsystems must be functional for the learning process to go smoothly, thereby improving performance.

2.2 Expectancy Theory

The unique and fascinating feature of motivation destination between people's expectations regarding the results of their actions and the perceived utility of those results for attaining or avoiding other outcomes motivation can be conceptualised as the combination of two major elements: one's expectancy that an action will have a particular outcome in relation to different valued outcomes. Motivation to perform an act is a combination of one's expectation that the move will have a specific result and the perceived utility of that outcome concerning other effects. The core of expectancy theory relates to how a person perceives the relationship between effort, performance and rewards.

2.3 Education Production Function Theory

The production function framework employed by studies discussed in Hanushek (1986) and Hedges et al. (1994) identify broadly how the school characteristics affect educational attainment – they are inputs in the process of being schooled. These studies view the relationship between school (and family) characteristics and educational attainment as deterministic (Wilson, 2001). If an input changes, then the individual's educational attainment will change by an amount determined by the technology and the level of the other inputs. The individual is not viewed as a decision maker who is choosing the level of education, nor do the returns to schooling play an explicit role within this framework. However, the human capital accumulation literature gives reason to believe that the individual is a decision maker choosing a level of schooling and that the returns to education are an essential factor in that decision.

2.4 Empirical Literature

There is a vast and growing literature on analysing issues of education outcomes; Hanushek and Woessman (2008) provide a recent review of this literature. Examples of empirical studies in the recent past include Namara (2020), Muvawala (2012), Kasirye (2009), Nannyonga (2007); Glewwe et al., (2004); Woessman (2003); Glewwe et al. (2001); Krueger (1997) and Case and Deaton (1999). The main focus for most of the above studies is on the effect of class size (as a measure of school quality) on learning outcomes.

Namara (2020) used exploratory, descriptive data from 104 school managers and district officials to examine the role of decentralised governance in the performance of primary schools in three eastern Uganda districts. Her results indicate that decentralised governance has increased school monitoring and supervision, strengthened payroll management and introduced SMCs. The author also finds that decentralised governance positively correlates to development by enhancing the supply side of governance. Ochwo (2013) also studied pupil, teacher and school factors influencing student achievement on the primary leaving examination in Wakiso district. The findings revealed no significant differences between boys and girls in English achievement but significant differences between boys and girls in mathematics achievement, with boys having higher scores. In another study, Nannyonjo (2007) analysed factors influencing learning achievement in grade six from an education input side using data from the Uganda National Examination Board (UNEB) and National Assessment of Progress in Education (NAPE) and found that pupil age, the language spoken by the pupil at home, class size, teacher qualification, and school administration were among the critical factors influencing pupil achievement.

Kasirye (2009) and Byamugisha (2010), analysing SACMEQ data collected in 2007 among 2,452 Primary Six pupils across Uganda, also found pupil age as a critical factor influencing pupil achievement. However, Kasirye and Byamugisha identified other key factors affecting achievement, such as pupil sex—with boys outperforming girls and parental education—with pupils with more educated parents doing better than otherwise. According to Muvawala (2012), Investing in software inputs has a higher positive impact on learning outcomes than hardware educational inputs. This the author found while examining the determinants of learning outcomes in primary schools using a Generalised Method of Moments (GMM) estimation technique. The author also relaxed the strict assumption of policy exogeneity and exploited the first-panel dataset to have been constructed on Uganda's primary schools. The study showed that some traditional educational inputs yield the expected positive influence on learning outcomes, notably, provision of textbooks, inspection frequency, teacher houses, teacher numbers, teacher training, and the proxy for a school environment.

In his follow-up study, Heyneman and Loxley (1983) compared the impact of family and school factors on pupil achievement in developing and developed countries. They concluded that family socio-economic status factors have less influence on pupil achievement than school factors (namely, physical resources and teacher quality) in developing countries. Heyneman and his colleague further concluded that "the poorer the national setting in economic terms, the more powerful this [school factors] effect appears to be" (Heyneman and Loxley 1983). This conclusion is usually referred to as the "Heyneman-Loxley effect" in educational debates. It is often used to justify the importance of providing school inputs for improved quality of education in developing countries. Similar studies later supported this effect (Fuller & Clarke 1994).

Away from Kruger, Filmer et al. (2015) assessed the effects of critical teacher factors on pupil learning achievements using data from 1,869 schools from five sub-Saharan countries, including Uganda. The authors found that increasing teachers' subject-matter knowledge increases pupil achievement. Another interesting empirical study by Taniguchi et al. (2013) used data from ten rural public schools to examine home and individual factors affecting test scores among primary-going pupils in Uganda. The researchers found that living with the mother, socio-economic status, and pupil age were significantly associated with pupils' mathematics scores.

3 Methodology

3.1 Theoretical Model

The study adopted an education production function framework based on where learning achievement (the outcome) results from a combination of various inputs. Education economists recognise that the production function theory needs modification when applied to schools. But generally, they believe that the basic idea of using capital, labour, and other inputs to produce specific outputs can be valuable (Muvawala, 2012). The result is a theoretical economic model of the behaviour of schools that yields observations and hypotheses related to school organisation, management and governance, which are essential to delivering quality education services (Boissiere, 2004).

The framework adopted in this study is similar to that specified by Orazem and King (2008) and Glewwe and Kremer (2006), as well as other studies investigating determinants of the quality of education in developing countries. In this framework, it is assumed that a household maximises a

utility function whose main arguments are: each child's learning and consumption of other goods. In addition, we assume that the utility of a child's schooling is subject to various constraints, particularly budget and credit constraints. Formally, the utility function can be specified as:

$$U_i = u(A_i, C_i) \quad (1)$$

where A_i is the child's academic achievement and C_i is household consumption possible after sending a child to school. The child's learning achievement depends on the child's characteristics such as age, gender and school inputs, including classrooms and teacher houses. This can be formally expressed as:

$$A_{ik} = a(S_i, Q_k, X_i, I_i\ G_i) \quad (2)$$

where A_{ik} is the child's academic performance from attending school k, S_i is years of schooling of the child; Q_k is a vector of school quality; X_i represents the child-specific factors, I_i represents a household's school-related expenditures, e.g., on school uniforms and exercise books and G_i is a vector of governance factors. At the same time, the amount of school and other goods consumed is limited by budget constraints. This is expressed as

$$Y_i - \sum P_1 I_i - \sum P_2 C_i = 0 \quad (3)$$

where Y_i is the total income available to the household and P_1 represents school-related costs such as school fees, costs of educational materials, and the opportunity cost of attending school. On the other hand, P_2 represents the prices paid for the consumption of non-school goods. The specification in Eq (1.2) does not consider school prices (e.g., school fees and costs of scholastic materials) since they only indirectly affect learning through their impact on years of schooling and school inputs. To introduce such school-related charges in our framework, we assume that there is only one school available in the community; in this case, parents can influence the characteristics and inputs of this particular school. In this case, years of schooling and school inputs can be expressed as functions of school-related costs and other factors, as indicated below.

$$S_i = f(Q_k, Y_i, X_i, P_1 P_2) \quad (4)$$

$$I_i = g(Q_k, Y_i, X_i, P_1 P_2) \quad (5)$$

Substituting Eq (1.2) and Eq (1.4) into Eq (1.5), we get the reduced form expression of academic achievement as a function of school quality, child characteristics, school-related inputs, governance, and community-related variables (Eq 6).

$$A_{ik} = h(Q_k, Y_i, X_i, G_i, P_1 P_2) \quad (6)$$

The measures of the education learning outcomes are the individual student test scores on math and reading tests. In particular, we use the standardised test scores for reading and mathematics as the dependent variable.

3.2 Econometric Model

Following Glewwe and Kremer (2006), we can distinguish several specific school-related factors: school characteristics, infrastructure, learning materials, teachers and management. In a formal mathematical notation (see, for instance, Nannyonjo, 2007), the reduced form specification we will estimate in this study can be expressed as and this specifies a level of achievement, usually measured by students' test scores, as the typical output, and characteristics of the teaching and learning environment as the standard inputs (Todd and Wolpin 2003):

$$A_{ijk} = a + b_i P_i + c_i S_i + d_i C_i + e_i G_i + \varepsilon_i \quad (7)$$

where A_{ijk} is the test score performance of student i in subject j (literacy and numeracy)in the k^{th} school. P_i, S_i, C_i, and G_i, denote vectors of observable characteristics, denotes the estimated constant b_i ; through k_i denote the estimated coefficients and residual ε_i indicates all unobserved characteristics. Where P_i=vector of pupil characteristics; S_i = vector of specific school characteristics; C_i = vector of community characteristics; G_i = vector of governance characteristics; While ε_j represents unobserved pupil, school, and family factors that impact learning.
The econometric model for the study was specified as follows;

$$y_i = \beta' x_i + \varepsilon_i \quad (8)$$

Where;
β is a vector of parameters to be estimated
y_i.is the dependent variable – Numeracy and Literacy Scores
$\beta' = (\beta_0, \beta_1 \ldots\ldots\ldots \beta_{10})$,
x_i = A vector of Control variables

Since the dependent variable is dichotomous, the logit model was adopted for this study. The Linear Probability (LPM) model could not be applied because it is always heteroskedastic, and its simplistic assumption of linearity cannot apply to a dichotomous variable in primary education learning outcomes that consider whether adequate proficiency is achieved for both numeracy and literacy at the primary education level. Furthermore, the fact that the predicted probabilities can lie outside the [0 1] interval under the LPM was ignored. The logit and probit models give qualitatively similar results. However, the logit model was adopted for this study over the probit due to its comparative mathematical simplicity and its provision of the odds ratios that the probit model could not provide (Gujarati and Porter, 2009).

The logistic regression analysis has also investigated the relationship between binary or ordinal response probability and explanatory variables (Trueck & Rachev, 2009). In addition, logistic regression is well suited for problems when the predictor variable is binary or has multiple categorical levels or even when there are numerous independent variables in the problem. Also, logistic regression measures the relevance of a predictor (coefficient size) and its direction of the association, either positive or negative (Maddala 1983).

From the equation as shown in equation 8, $y_i = \beta' x_i + \varepsilon_i$

$$y = \begin{cases} 1 & Adequate\ Literacy\ or\ \ Numeracy \\ 0 & Indequate\ Literacy\ or\ Numeracy \end{cases}.$$

Let y_1 and y_0 be the learning outcomes, where:
$y_1 = \beta' x_1 + \varepsilon_1$ and
$y_0 = \beta' x_0 + \varepsilon_0$

We do not observe y_1 and y_0, but we observe y where:
$y = 1\ if\ y_1 > y_0$ and
$y = 0\ if\ y_1 \leq y_0$

Otherwise, if the utility gained from obtaining adequate learning outcomes is greater than the utility of obtaining inadequate results, that is $y_1 > y_0$ then $y = 1$ and vice versa. The probability of observing pupils obtaining adequate learning outcomes is, therefore;

$P(y = 1) = F(\beta' x)$ Because the expected value of y given x is just the probability. Where:

$$F(\beta' x) = \Lambda(\beta' x) = \frac{e^{\beta' x}}{1 + e^{\beta' x}} \quad (9)$$

Marginal effects:
Unlike linear models, the marginal effect of a change in x on $E[\![y]\!]$ is not simply β.
Because

$\frac{\partial E[y]}{\partial x} = \frac{\partial F(\beta' x)}{\partial (\beta' x)} * \frac{\partial (\beta' x)}{\partial x} = \partial(\beta' x)\beta$, with

$$f(\beta' x) = \frac{\partial \Lambda(\beta' x)}{\partial (\beta' x)} = \frac{\partial}{\partial (\beta' x)} \left[\frac{e^{\beta' x}}{1 + e^{\beta' x}} \right] = \Lambda(\beta' x) * [(\beta' x)1 - \Lambda(\beta' x)] \quad (10)$$

Giving marginal effect as,

$$f(\beta' x)\beta = \Lambda(1 - \Lambda)\beta \quad (11)$$

Odds ratio:
The odds ratio represents the constant effect of a predictor x, on the likelihood that one outcome will occur. The odds ratio is given by,

$$\frac{P(y=1)}{P(y=0)} = e^{\beta' x_i} \quad (12)$$

the odds ratio gives the number of times a pupil is likely to achieve adequate learning outcomes at primary compared to one who gets inadequate outcomes. (Cameron and Trivedi, 2005; Green, 2012; Johnston and Dinardo, 1996; Maddala, 1992; Wooldridge, 2016).

3.3 Econometric Estimation Issues

3.3.1 Unobserved heterogeneity

Unobserved heterogeneity is significant in non-linear regression models such as the binary logit model and short panels (Holm et al., 2008). According to Wooldridge, estimates of the effect of independent variables on the binary outcome will be biased if the researcher does not observe all the relevant independent variables that affect the outcome (Wooldridge 2002). This, therefore, means that bias from any unobserved heterogeneity is vital in non-linear regression models compared to linear models in which effects of the independent variables will be biased even if the unobserved heterogeneity is not correlated with the observed independent variables (Bretagnolle and Huber-Carol 1988; Abramson et al. 2000; Ejrnæs and Holm 2006). First, the study 120tilizes regional dummies by time-fixed effects to deal with unobserved heterogeneity. Including region-by-time fixed effects in addition to a unit of analysis, fixed effects can ensure the researcher is only estimating coefficients using variation across observations within a given region-time (Gormley & Matsa, 2012). The study also controls unobserved heterogeneity by clustering using school-specific registration numbers, ensuring that pupils in the same school are impacted by their respective fixed school factors.

3.3.2 Multicollinearity

Multicollinearity is a statistical phenomenon in which two or more predictor variables in a multiple logistic regression model are highly correlated. The Variance-Inflating Factor (VIF) was adopted for this study to test for multicollinearity. Multicollinearity leads to significant standard errors of the estimators. The VIF shows how the presence of multicollinearity inflates the variance of an estimator. As R^2 approaches 1, and the VIF approaches infinity. That is, as the extent of collinearity increases, the variance of an estimator increases, and in the limit, it can become infinite. If there is no collinearity between variables, VIF will be 1 (Gujarati and Porter, 2009).

$$VIF = \frac{1}{1-R^2} \quad (13)$$

3.4 Data Sources

This study pulled data from three cross-section datasets for a broader scope of analysis that includes pupil, school, community and governance-related factors from three unique datasets. *First,* NAPE 2015 data enriched the study with pupil-related factors of age, gender, school location (rural or urban), school ownership status and literacy and numeracy scores per pupil. *Second,* NPA data on the independent and comprehensive evaluation of the Universal Primary Education (UPE) programme undertaken in 2015. It is important to note that the NPA data collection exercise covered both private and secondary schools. *Third,* the Education Management Information System (EMIS) provides key Performance Indicators of the education sector.

To develop a school-level cross-sectional dataset on government and private primary schools in 2015, schools in the NPA data sets were mapped to those in the NAPE using the school's name, registration number and district the school is located. Because EMIS is a large dataset, all mapped schools from the two data sets we found; hence other variables were extracted from EMIS using the same criteria. After All, three datasets, at primary three and six, the final cross-sectional dataset used for analysis had a total of seventy-four (74) schools from fifty-one (51) districts with a total number of 1,459 and 1405 pupils for P.3 and P.6, respectively.

3.5 Variable Description

Table 1: Description of the Variable

Variables	Coding (Categories)	Data Source	The basis for the categorisation
Dependent Variable			
Proficiency in Numeracy and Literacy at P.3 and P.6 as a measure of learning outcomes	0= 0-50 Inadequate 2= 51-100 Adequate	NAPE 2017	MoES Categorization
Pupil Factors			
Pupil Gender	1= Boys 2= Girls	NAPE 2017	MoES Categorization
P.3 Pupil Age	1= 6-9 years 2= 10 years 3= 11-12 years 4= 13-16 years	NAPE 2017	MoES Categorization
P.6 Pupil Age	1= 10-12 years 2= 13 years 3= 14 years 4= 15-19 years	NAPE 2017	MoES Categorization
School Factors			
School Status (Day or Boarding)	0= Boarding School 1= Day school	NAPE 2017	MoES Categorization
Total Classrooms	0= Less than 9 Classrooms/Blocks 1= More than 9 classrooms/Blocks	EMIS, 2017	MoES Basic Minimum Requirement (BRMs)
Urban Schools	0= Rural 1= Urban	NAPE 2017	MoES Categorization
Privately Owned Schools	0=Government 1=Private	NAPE 2017	MoES Categorization
Headteacher Academic Qualification	0= Secondary 1= GIII and GV 2= Diploma 3= Degree and above	NPA, 2017	UBOS and MoES Categorization
School Registration Status	0= Not Registered 2= Registered	NPA, 2017	MoES Categorization
Number of Teacher Houses	0= Less than eight Teacher houses 1= Nine and Above Teacher Houses	EMIS, 2017	MoES Categorization
Governance Factors			
Number of School Inspections	0= Twice 2= More than twice	NPA, 2017	UBOS and MoES Categorization.
Frequency of SMC Meetings	1= Once 2= Twice	NPA, 2017	MoES Categorization
Founding body	1=Faith based school 0= otherwise	EMIS, 2017	MoES Categorization

School Ownership	1= Government 2= Private	NAPE 2017	MoES Categorization
Community Factors			
Distance from School to the Nearest Trading Centre	0= Less than 1 km 1= Between 1.1-3 km 2= Above 3.1 km	EMIS, 2017	UBOS and MoES Categorization
Distance from School to the Nearest Water Source	0= 1 Kilometer 1= 1 Kilometers 2= Above 3 km	EMIS, 2017	UBOS and MoES Categorization
Regional Dummy	0=Central 1=West 2=East 3=North	NAPE 2017	UBOS and MoES Categorization

Source: Author

4.1 Results and Discussion

1.4.1 Descriptive Statistics

The descriptive statistics indicate that 1,405 and 1,459 observations for P.6 and P.3 were considered. The mean falls within maximum and minimum values of all the variables, thus a good measure of central tendency as presented in Annex A1.3. The result further shows that the standard deviation for each variable is less than the mean, thus indicating the absence of outliers.

4.2 Bi-variate Analysis

Correlation coefficients were calculated to determine if there is any linear relationship between literacy and numeracy on the one hand and the continuous and discrete variables it is expected to be correlated with on the other hand. Table A1.2 in the Appendices presents the correlation coefficients together with their level of significance indicated by a star on each correlation coefficient whose p-value is greater or equal to a 10% significance level. The results reveal the absence of multicollinearity between variables since all the correlation coefficients in this study are below the standard measure of 0.7, as tabulated in Appendix A1.1.

4.3 Regression Results
4.3.1 Marginal Effects

Table 1.3 presents the marginal effects regression results for determinants of learning outcomes at primary six for numeracy and literacy. Annex A1.4 presents corresponding odds ratios. The odds ratios are just a confirmation of what has been discussed in table 1.3, but this time with a clearer picture of the magnitude of the impact of a variable (Haipern and Visintainer, 2003). Further Analyses are undertaken, and Annexes A1.5 and A1.6 present marginal effects results for the determinants of numeracy and literacy disaggregated by gender, respectively.

Table 2: Marginal Effects(dydx) for Determinants of Numeracy and Literacy in Uganda

VARIABLES	Primary 3		Primary 6	
	Numeracy	Literacy	Numeracy	Literacy
Pupil Related Factors				
Pupil Gender **(Ref: Male)**	-0.000963	0.00226	-0.101***	0.0296
	(0.0194)	(0.0326)	(0.0261)	(0.0273)
Pupil Age (Ref: 6-9 Years**)**				
10 Years	0.0295	-0.0426		
	(0.0247)	(0.0378)		
11-12 Years	0.0417	-0.0205		
	(0.0297)	(0.0501)		
13-16 Years	0.0477	0.0188		
	(0.0604)	(0.0777)		
Pupil Age (Ref: 10-12 Years)				
13 Years			-0.0156	-0.121**
			(0.0402)	(0.0498)
14 Years			-0.0893**	-0.149***
			(0.0433)	(0.0518)
15- 19 Years			-0.0933*	-0.157***
			(0.0493)	(0.0590)
School Related Factors				
Day School (Ref: Boarding)	-0.195***	-0.219**	-0.153***	-0.249***
	(0.0725)	(0.0959)	(0.0570)	(0.0718)
Total Classrooms (Ref: 0= Less than 9 Classrooms**)**				
More than 9 classrooms/Blocks	-0.0336	0.0328	0.0467	-0.000717
	(0.0687)	(0.0894)	(0.0609)	(0.0732)
School Location (Ref: Rural)				
Urban Schools	0.00583	0.00200	0.0980	0.152*
	(0.0837)	(0.102)	(0.0837)	(0.0846)
Headteacher Qualification (Ref: Secondary)				
GIII and GV	-0.0564	-0.0785	0.0102	0.0209
	(0.0910)	(0.144)	(0.0917)	(0.106)
Diploma	0.0767	0.0539	0.0393	0.0356
	(0.0915)	(0.122)	(0.0997)	(0.126)
Degree and above	0.0323	0.0515	-0.0150	-0.00566
	(0.0923)	(0.125)	(0.0832)	(0.114)
School Registration Status (Ref: Not Registered)				
Registered	-0.147	-0.209	-0.0380	0.0957
	(0.106)	(0.156)	(0.103)	(0.107)
Teacher Houses (Ref: Less than eight Teacher houses)				
Nine and Above Teacher Houses	-0.0421	-0.0246	-0.00513	0.0337
	(0.0978)	(0.112)	(0.0902)	(0.125)
Governance Factors				
Frequency of School Inspection (Ref: Twice)				
More than twice	-0.122**	-0.111**	-0.618*	-0.582**
	(0.0691)	(0.0990)	(0.0807)	(0.187)
SMC Meetings Termly (Ref: Once)				
Twice	0.0162	-0.0211	-0.0824	-0.0418
	(0.0786)	(0.121)	(0.0678)	(0.0680)
School Founding Body (Ref: Government)				
Faith founded School	0.0981*	0.123*	0.0109	0.0870

	(0.0511)	(0.0711)	(0.0621)	(0.0705)
School Ownership (Ref: Gov't)				
Privately owned	0.283***	0.564***	0.0631	0.245*
	(0.0976)	(0.156)	(0.108)	(0.136)
Community Factors				
Distance from School to the Nearest Trading Centre (Ref Category: Less than 1 km)				
Between 1.1-3 km	-0.0142	-0.0258	0.0359	-0.0147
	(0.0616)	(0.0699)	(0.0623)	(0.0741)
3.1 km and above	-0.0352	-0.0778	0.120	0.112
	(0.0878)	(0.117)	(0.114)	(0.120)
Distance from School to the Nearest Water Source (Ref Category: Less than 1 km)				
2 Kilometers	0.00290	0.0634	0.00656	0.177
	(0.0819)	(0.0991)	(0.0884)	(0.0954)
3 Kilometers	-0.0127	-0.152	0.147	0.0502
	(0.0904)	(0.123)	(0.124)	(0.134)
Regional Dummy (Ref: Central)				
West	0.0265	-0.0834	0.147	-0.00927
	(0.111)	(0.140)	(0.103)	(0.121)
East	-0.167**	-0.228*	0.0384	-0.0306
	(0.0814)	(0.135)	(0.0811)	(0.116)
North	-0.129*	-0.281***	0.0930	-0.0256
	(0.0744)	(0.109)	(0.0796)	(0.105)
Observations	1,409	1,409	1,365	1,365

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's Computation

Pupil gender has a significant impact on learning outcomes at primary six. From table 2, female pupils are less likely to achieve an adequate numeracy outcome than their male counterparts. Being a female reduces the pupil's probability of achieving an adequate numeracy outcome at primary six by 0.101 compared to male pupils. As noted by Kibera & Kibera (2007), the most important predictor of the learning achievement test mean scores in relative terms are the gender of the pupil. This finding is consistent with Kasirye (2009), who found that female pupils are significantly disadvantaged in reading and numeracy, but the most substantial disadvantage is math. This finding also agrees with previous research on the covariates and their effects, for example, Nannyonjo 2007, Papworth B 2014, Martin & Marsh 2008, Marsh et al. 2008; Martin 2003, 2007; Proctor et al. 2009.

Pupil age significantly impacts learning outcomes, and the sign is positive for both numeracy and literacy models as expected at primary six. The results in table 2 indicate that at P.6, pupils aged 13, 14, and 15-19 years old are less likely to achieve an adequate literacy score, unlike hood at 12.1, 14.9, and 15.7 % compared to those aged 10-12 years. Moreover, P.6 pupils aged 14 are also less likely to achieve adequate numeracy scores by 8.9 %. This is because pupils in this age group, 10-12, are still young and easily comprehend the required literacy and numeracy competencies. These results are consistent with Kasirye (2009), who found that younger pupils (10–12 years) attained higher scores than older ones.

Further, the results may be explained by the massive late entry into school and the possibility that the weaker students take more time before enrolling. Indeed, a recent study shows that the introduction of UPE reduced delayed entry into the school by only 3% (Grogan, 2009).

Furthermore, older pupils may be repeaters and, as such, inherently poor performers (Kasirye 2009). Nannyonjo (2007) found that older pupils are likely to be repeaters, are more likely to be working and therefore have less time to devote to out-of-school study, and are likely to be irregular in attendance due to the need to participate in other household activities or work on market days, and might be receiving less parental support on academic work due to inability of parents, or may simply be slow learners.

In addition, the above results are in line with Kibera & Kibera (2007), who found that the pupils' bio-data in terms of age showed that a large proportion of pupils were older than they should have been classes 4 and 6, respectively. Also, Ishiguro K (2018) and Papworth B (2014) found that pupil age significantly negatively influenced learning outcomes; thus, enrollment age had a significant equilateral influence. Previous research has also shown that older students generally decline in academic and non-academic measures, for example, motivation and engagement (Martin, 2007, 2009).

School Status (Day or Boarding) significantly impacts primary three and six learning outcomes across numeracy and literacy. Studying in day school reduces the pupils' probability of achieving adequate numeracy and literacy outcomes for P.3 and P.6 pupils by 0.195, 0.219, 0.153 and 0.249 %age points, respectively, compared to pupils in boarding. This is because boarding schools allow for more interactions between the teachers and pupils, paving the way for grasping concepts in literacy and numeracy during additional study hours like night preps and weekends. It is important to note that the impact is higher for pupils in P.6 than those in P.3.

According to previous literature, Cree (2000) describes the complex interaction between the boarders' home culture and the school culture as a source of academic, social, emotional, physical, and spiritual development. Boarding schools often have unique customs and practices (e.g., Cookson, 2009; Cree, 2000; Duffell, 2000; White, 2004; Williams, 2011). The study findings are consistent with Papworth B (2014), who found higher learning outcomes in favour of boarders and hence concluded that while all schools, to some extent, act as agents of socialisation, the boarding context appears to provide a unique atmosphere of activities, interactions, values and culture to develop the students in its care.

Results in Table 2 confirm that P.6 pupils in schools located in urban areas are more likely to achieve adequate literacy scores by 15.2 % compared to pupils in rural-based schools. These results are consistent with the finding of Nannyonjo (2007), who found that pupils in rural schools were likely to score 9.7 % less in English and 6% less in mathematics than their urban counterparts. This is not surprising as pupils from rural areas in Uganda are likely to be from families with less education and are more likely to be involved in household help, for example, fetching water and collecting firewood Nannyonjo (2007). Besides, they are less likely to have reliable lighting, which helps to increase hours of academic focus. The finding also aligns with Muvawala (2012) and Wairimu & Ndungu (2011), whose study favour urban-based schools.

Inspecting a school more than twice significantly reduces the probability of pupils achieving adequate numeracy and literacy outcomes by 0.122 and 0.111 %age points at P.3 and by 0.618 and 0.582 %age points at P.6, respectively. These findings are discordant with those by Muvawala (2012), who found a significant positive impact on inspection frequency. Since the introduction of

UPE, the inspection mandate in government schools has been strong and empowered with substantial results given the low enrollment numbers with no internal control systems that are strong in private schools.

However, while school inspection remains one of the most critical interventions for improving and upholding education standards that are said to be on the steady decline given the increase in primary school enrollment, which partly explains the negative impact at P.6. The inspectorate function in Uganda is in a fragile state to execute its mandate as required. According to NPA (2018b), the legal and institutional architectures perpetuate a weak and disjointed inspectorate; schools are not inspected as needed; the inspectorate is acutely understaffed and underfunded, and there is inadequate school improvement planning within the schools meaning that the recommendations from the routine inspections are not addressed or followed up. Indeed NPA (2018b) concluded that the current state of assessment in the country is a significant threat to the attainment of UPE quality objectives and to the current strategic direction that emphasises universal access to quality education as the critical pathway to a quality human capital which is fundamental to our national development.

Pupils in faith-based founded schools have an increased probability of achieving adequate numeracy and literacy scores of 9.8 and 12.3 % at P.3, respectively. This finding is consistent with Nannyonjo 2007. This is possibly explained by the fact that P.3 is regarded as a foundation class for upper primary; hence religious founded schools find it easier to appeal to and guide young pupils on religious foundations, thereby instilling moral ethics.

School ownership significantly impacts learning outcomes. Pupils studying in privately owned schools are more likely to achieve adequate numeracy and literacy outcomes at P.3 than in government-owned schools. Private schools increase the probability of attaining sufficient numeracy and literacy scores of primary three pupils by 0.283 and 0.564 %age points compared to those government-owned schools. At P.6, the likelihood of achieving adequate literacy is higher by 0.245 %age points for pupils in private schools compared to those in Government owner schools. The findings are consistent with Nitin Jain (2020), whose study revealed a significantly higher likelihood of superior learning outcomes for students studying in private schools and no positive spill-over effect of incentives to enrol in government schools on the learning outcomes of their students. The findings are also consistent with Wairimu & Ndungu (2011), Wadhwa, W. (2009).

Pupils in schools located in the eastern regions are less likely to achieve proficiency in literacy and numeracy in primary three by 17 and.27.3 %, respectively, compared to those in the central region. These results are consistent with the finding of Nannyonjo, who found the Eastern region has the lowest at 25.7 % among all the areas. Specifically, the coefficients for pupil test scores in the Eastern region were negative and significant at a 1 % level of significance. Furthermore, this study shows that pupils in the Eastern region scored 9.4 % and 4.1 % less in English and mathematics than those in the Central region (Nannyonjo, 2007). The results are partly explained by the high social and economic indicators like poverty in the eastern region. The 2019/20 UNHS report shows that the eastern region has the second poorest (25.9%) after the northern region (35.9%). High poverty indicates that most learners partially attend school in addition to participating in different economic activities or a lack of financial resources to purchase the necessary scholastic materials.

5. Conclusion

The study has examined how school governance factors impact learning outcomes at the primary level (both three and six) in Uganda using a rich data set comprised of three sources, EMIS 2017, NAPE 2015 and a UPE data set collected during the program's comprehensive evaluation. The study employed a logit model given its advantageous odds ratios in addition to the marginal effects and used regional dummies and school clustering to control for unobserved heterogeneity.

Overall, the study results revealed school founding, frequency of SMC meetings per term, the number of school inspections body, pupil age, gender, school type (whether day or boarding), school ownership, school location, and region significantly determine numeracy and literacy proficiency at primary. But, much more importantly, the study adds to the vast literature since it differs from the other studies for Uganda by separately estimating equations of determinants of literacy and numeracy outcomes at primary three and six and incorporating governance and community variables.

The results of the study significantly apply to primary three and six pupils. There is little doubt that the results of this study are robust and should apply to classes in both lower and upper primary education in Uganda. It may also guide other countries struggling with similar problems to those in Uganda to try and achieve the Sustainable Development Goal (SDG) 4 of ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. Perhaps the Uganda government should also consider fiscal decentralisation at all levels of education. This is because Kazungu & Mabula 2013, found that fiscal decentralization had a positive effect on the quality of public service provision, including education. Finally, based on the study results, the study recommends promoting Early School Enrollment, Prioritise Boarding Schools in Primary schools and Strengthen Internal Controls in Schools.

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6. APPENDICES

Table A1.1: Variance Inflation Factor (VIF)

VIF for Numeracy Model (P.3)

Variable	VIF	1/VIF
School Location	2.192	.456
School Ownership	2.004	.499
School Registration Status	1.654	.605
Distance from School to the nearest Trading Centre	1.628	.614
Termly SMC meetings	1.556	.643
Total Number of Classrooms	1.463	.684
School Founding Body	1.448	.691
Distance between the nearest water source and School	1.403	.713
Headteacher Academic Qualification	1.39	.72
Regional Dummy	1.36	.735
Frequency of School Inspection	1.341	.745
Teacher Houses	1.277	.783
School Status (Day/Boarding)	1.264	.791
Pupil age	1.118	.895
Pupil Gender	1.027	.974
Mean VIF	**1.475**	.

VIF for Literacy Model (P.3)

Variable	VIF	1/VIF
School Location	2.192	.456
School Ownership	2.004	.499
School Registration Status	1.654	.605
Distance from School to the nearest Trading Centre	1.628	.614
Termly SMC meetings	1.556	.643
Total Number of Classrooms	1.463	.684
School Founding Body	1.448	.691
Distance between the nearest water source and School	1.403	.713
Headteacher Academic Qualification	1.39	.72
Regional Dummy	1.36	.735
Frequency of School Inspection	1.341	.745
Teacher Houses	1.277	.783
School Status (Day/Boarding)	1.264	.791
Pupil age	1.118	.895
Pupil Gender	1.027	.974
Mean VIF	1.475	.

VIF for Literacy Model (P.6)

Variable	VIF	1/VIF
School Location	2.25	.444
School Ownership	1.981	.505
School Registration Status	1.668	.6
Distance from School to the nearest Trading Centre	1.642	.609
Termly SMC meetings	1.547	.647
Total Number of Classrooms	1.511	.662
School Founding Body	1.468	.681
Distance between the nearest water source and School	1.392	.718
Headteacher Academic Qualification	1.37	.73
Regional Dummy	1.36	.735
Frequency of School Inspection	1.315	.76
Teacher Houses	1.283	.779
School Status (Day/Boarding)	1.261	.793
Pupil age	1.187	.843
Pupil Gender	1.027	.974
Mean VIF	**1.484**	**.**

VIF for Numeracy Model (P.6)

Variable	VIF	1/VIF
School Location	2.25	.444
School Ownership	1.981	.505
School Registration Status	1.668	.6
Distance from School to the nearest Trading Centre	1.642	.609
Termly SMC meetings	1.547	.647
Total Number of Classrooms	1.511	.662
School Founding Body	1.468	.681
Distance between the nearest water source and School	1.392	.718
Headteacher Academic Qualification	1.37	.73
Regional Dummy	1.36	.735
Frequency of School Inspection	1.315	.76
Teacher Houses	1.283	.779
School Status (Day/Boarding)	1.261	.793
Pupil age	1.187	.843
Pupil Gender	1.027	.974
Mean VIF	**1.484**	**.**

A1.2 Bivariate Analysis

Table A1.2: Pearson Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	P.3 Literacy	1														
2	P.6 Literacy	0.1119*	1													
3	P.3 Numeracy	0.5581*	0.1198*	1												
4	P.6 Numeracy	0.1087*	0.3047*	0.1013*	1											
5	School Location (Ref: Rural)	0.0553*	0.1613*	0.0281	0.0861*	1										
6	Privately School (Ref: Gov't)	0.2179*	0.1278*	0.1310*	0.0920*	0.0636*	1									
7	Headteacher Qualification (Ref: Secondary)	0.0118	-0.0713*	-0.00100	-0.0620*	-0.2016*	-0.2880*	1								
8	Day School (Ref: Boarding)	-0.1780*	-0.2432*	-0.1742*	-0.1365*	-0.2586*	-0.0872*	-0.0556*	1							
9	School Founding Body (Ref: Government)	0.0180	-0.0936*	0.0157	-0.0501	-0.1735*	-0.4254*	0.3065*	0.0832*	1						
10	Total Classrooms (Ref: Zero)	0.0424	0.0621*	-0.0357	0.0487	0.3657*	-0.1119*	0.1828*	-0.1467*	0.0123	1					
11	School Registration Status (Ref: Not Registered)	-0.2051*	-0.0561*	-0.1434*	-0.1021*	-0.2139*	-0.5133*	0.2504*	0.0803*	0.1687*	-0.0534*	1				
12	Pupil age P.3	-0.0771*	-0.0425	0.0146	-0.0302	-0.1669*	-0.1885*	0.0219	0.0830*	0.0354	-0.1077*	0.1501*	1			
13	Pupil age P.6	-0.1653*	-0.0893*	-0.0929*	-0.0261	-0.1508*	-0.1837*	-0.0132	0.0725*	0.0606*	-0.1391*	0.1320*	0.1538*	1		
14	Pupil gender P.6	0.0370	0.0466	0.0524	-0.0817*	0.0469	0.0731*	-0.0391	-0.0220	-0.0594*	0.0260	-0.0144	-0.0435	-0.1326*	1	
15	Pupil gender P.3	0.0107	0.0144	-0.00380	0.0712*	0.0569*	0.00560	0.0426	0.00120	-0.0281	0.0599*	-0.0319	-0.1298*	0.00230	-0.0377	1
16	SMC Meetings Termly (Ref: Once)	0.1222*	0.0942*	0.0932*	0.0362	0.2346*	0.4442*	-0.0891*	-0.2240*	-0.2146*	0.0564*	-0.3684*	-0.1112*	-0.1010*	0.0585*	0.0293
17	Frequency of School Inspection (Ref: Twice)	0.0138	-0.0535*	-0.0421	-0.0192	-0.00340	-0.1612*	0.2794*	-0.1600*	0.2892*	0.1234*	0.0186	-0.0718*	-0.0114	0.0133	-0.0134
18	Teacher Houses (Ref: Less than eight Teacher houses)	-0.00930	0.0571*	-0.00660	0.0265	0.0644*	-0.0491	0.1681*	-0.2427*	0.0138	0.2250*	0.1440*	0.0223	0.0429	0.00220	0.0111
19	Distance from School to the Nearest Trading Centre (Ref Category: Less than 1 km)	-0.0951*	-0.0339	-0.0603*	0.0341	-0.5061*	-0.0273	0.0422	-0.00500	0.0778*	-0.1194*	0.0420	0.1301*	0.1466*	-0.0600*	-0.0301
20	Distance from School to the Nearest Water Source (Ref Category: Less than 1 km)	-0.0616*	-0.0778*	-0.0314	-0.0305	-0.2417*	-0.0461	0.00340	0.0657*	-0.0165	-0.3482*	0.1778*	0.0582*	0.0248	0.0113	-0.0337
	Region	-0.2563*	-0.0287	-0.1574*	0.0221	0.1495*	-0.1248*	-0.00420	0.0652*	-0.1282*	0.0296	0.1115*	0.1220*	0.2243*	-0.0474	0.00320
		16	**17**	**18**	**19**	**20**	**21**									
16	SMC Meetings Termly (Ref: Once)	1														
17	Frequency of School Inspection (Ref: Twice)	0.1166*	1													

18	Teacher Houses (Ref: Less than eight Teacher houses)	0.0915*	0.1688*	1												
19	Distance from School to the Nearest Trading Centre (Ref Category: Less than 1 km)	-0.1623*	0.0409	0.0370	1											
20	Distance from School to the Nearest Water Source (Ref Category: Less than 1 km)	0.0968*	0.1115*	-0.2132*	0.0856*	1										
21	Region	-0.0762*	-0.2010*	0.1342*	0.1606*	-0.1765*	1									

Notes: 1) Standard errors in parentheses; 2) * significant at 10%

Source: Author's Computation

Table A1.3: Summary of Descriptive Statistics

Variable	Mean	Std.Dev	Min	Max	N
P.3 Literacy Scores	1.7202	.9221	0	3	1419
P.3 Numeracy Scores	2.1310	.8387	0	3	1419
P.6 Literacy Scores	1.9281	.9687	0	3	1419
P.6 Numeracy Scores	1.8900	.8930	0	3	1419
P.3 Pupil Gender	1.4781	.4996	1	2	1418
P.3 Pupil Age	1.8188	.9787	0	3	1419
P.6 Pupil Gender	1.5223	.4996	1	2	1365
P.6 Pupil Age	1.4524	1.1939	0	3	1419
Urban	.5348	.4989	0	1	1419
School Ownership	1.1775	.3823	1	2	1419
Headteacher Education Qualification	2.1423	1.0241	0	3	1419
School Status (Day/Boarding)	.6899	.4626	0	1	1419
School Registration Status	1.8033	.5204	0	2	1419
Teacher Houses	.1127	.3164	0	1	1419
Total Number of Classrooms	.4369	.4961	0	1	1419
Teacher Gender	1.4686	.4991	1	2	1419
Frequency of School Inspection	1.7744	.5093	0	2	1419
Termly SMC meetings	1.2621	.4399	1	2	1419
School Founding body	.6060	4887	0	1	1419
Distance to Nearest Trading Centre to School	.6765	.7078	0	2	1419
Distance between the nearest water source and School	.3805	.6365	0	2	1419
Region	1.7984	1.2001	0	3	1419

Source: Author's Computation

Table A1.4: Logistic Estimates (Odds Ratios) for Determinants of Numeracy and Literacy in Uganda

VARIABLES	Primary 3		Primary 6	
	Numeracy	**Literacy**	**Numeracy**	**Literacy**
Pupil Related Factors				
Pupil Gender **(Ref: Male)**	0.994	1.009	0.650***	0.650***
	(0.129)	(0.135)	(0.0702)	(0.0702)
Pupil Age (Ref: 6-9 Years**)**				
10 Years	1.218	0.840		
	(0.196)	(0.130)		
11-12 Years	1.321	0.919		
	(0.265)	(0.189)		
13-16 Years	1.376	1.080		
	(0.559)	(0.344)		
Pupil Age (Ref: 10-12 Years)				
13 Years			0.936	0.936**
			(0.159)	(0.159)
14 Years			0.685**	0.685**
			(0.126)	(0.126)
15- 19 Years			0.673*	0.673*
			(0.139)	(0.139)
School Related Factors				
Day School (Ref: Boarding)	0.271***	0.408**	0.523***	0.523***
	(0.135)	(0.159)	(0.125)	(0.125)
Total Classrooms (Ref: 0= Less than 9 Classrooms**)**				
More than 9 classrooms/Blocks	0.799	1.144	1.219	1.219
	(0.368)	(0.419)	(0.315)	(0.315)
School Location (Ref: Rural)				
Urban Schools	1.040	1.008	1.516	1.802*
	(0.582)	(0.421)	(0.538)	(0.538)
Headteacher Qualification (Ref: Secondary)				
GIII and GV	0.686	0.725	1.044	1.044
	(0.412)	(0.426)	(0.406)	(0.406)
Diploma	1.669	1.247	1.182	1.182
	(1.028)	(0.625)	(0.500)	(0.500)
Degree and above	1.240	1.235	0.938	0.938
	(0.768)	(0.634)	(0.331)	(0.331)
School Registration Status (Ref: Not Registered)				
Registered	0.374	0.426	0.851	0.851
	(0.270)	(0.271)	(0.372)	(0.372)
Teacher Houses (Ref: Less than eight Teacher houses)				
Nine and Above Teacher Houses	0.755	0.904	0.978	0.978
	(0.492)	(0.413)	(0.375)	(0.375)
Governance Factors				
Frequency of School Inspection (Ref: Twice)				
More than twice	0.444*	0.634*	0.900**	0.710**
	(0.204)	(0.256)	(0.308)	(0.308)
SMC Meetings Termly (Ref: Once)				
Twice	1.114	0.917	0.705	0.705
	(0.583)	(0.456)	(0.204)	(0.204)
School Founding Body (Ref: Government)				
Faith founded School	1.995*	1.663*	1.671	1.701
	(0.765)	(0.489)	(0.275)	(0.275)
School Ownership (Ref: Gov't)				
Privately owned	7.343***	10.29***	1.206	1.346*
	(5.042)	(6.631)	(0.595)	(0.595)
Community Factors				
Distance from School to the Nearest Trading Centre (Ref Category: Less than 1 km)				
Between 1.1-3 km	0.910	0.900	1.165	1.165

	(0.374)	(0.258)	(0.308)	(0.308)
3.1 km and above	0.790	0.727	1.664	1.664
	(0.463)	(0.349)	(0.803)	(0.803)
Distance from School to the Nearest Water Source (Ref Category: Less than 1 km)				
2 Kilometers	1.020	1.297	1.028	1.028
	(0.558)	(0.526)	(0.386)	(0.386)
3 Kilometers	0.919	0.536	1.865	1.865
	(0.557)	(0.271)	(0.986)	(0.986)
Regional Dummy (Ref: Central)				
West	1.194	0.711	1.869	1.869
	(0.888)	(0.409)	(0.825)	(0.825)
East	0.328**	0.392*	1.177	1.177
	(0.175)	(0.218)	(0.406)	(0.406)
North	0.423*	0.316**	1.484	1.484
	(0.210)	(0.144)	(0.502)	(0.502)
Constant				
	50.91***	11.09**	1.997	1.997
	(72.68)	(11.44)	(1.506)	(1.506)
Observations	1,409	1,409	1,365	1,365

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Author's Computation

Table A1.5: Marginal Effects(dydx) for Determinants of Numeracy in Uganda Disaggregated by Pupil Gender

VARIABLES	Numeracy P. 3		Numeracy P.6	
	Girls	Boys	Girls	Boys
Pupil Related Factors				
Pupil Age (Ref: 6-9 Years**)**				
10 Years	-0.0187	0.107**		
	(0.0491)	(0.0518)		
11-12 Years	-0.00921	-0.0385		
	(0.0498)	(0.0454)		
13-16 Years	-0.0366	-0.124**		
	(0.0518)	(0.0534)		
Pupil Age (Ref: 10-12 Years)				
13 Years			-0.0368	-0.00957
			(0.0521)	(0.0531)
14 Years			-0.0370	-0.0247
			(0.0490)	(0.0609)
15- 19 Years			0.00961	-0.131*
			(0.0831)	(0.0744)
School Related Factors				
Day School (Ref: Boarding)	-0.187***	-0.206***	-0.185***	-0.144*
	(0.0713)	(0.0777)	(0.0615)	(0.0807)
Total Classrooms (Ref: 0= Less than 9 Classrooms**)**				
More than 9 classrooms/Blocks	-0.167	-0.123	-0.107	-0.0311
	(0.118)	(0.107)	(0.123)	(0.105)
School Location (Ref: Rural)				
Urban Schools	-0.0449	0.0394	0.0416	0.175
	(0.0852)	(0.0851)	(0.0732)	(0.117)
Headteacher Qualification (Ref: Secondary)				
GIII and GV	-0.0103	-0.114	0.00119	0.0301
	(0.0940)	(0.105)	(0.0908)	(0.135)
Diploma	0.0863	0.0773	0.0497	0.0859
	(0.105)	(0.104)	(0.109)	(0.130)
Degree and above	0.0342	0.0331	-0.0993	0.0547
	(0.0962)	(0.0939)	(0.0915)	(0.102)
School Registration Status (Ref: Not Registered)				
Registered	-0.167	-0.123	-0.107	-0.0311
	(0.118)	(0.107)	(0.123)	(0.105)
Teacher Houses (Ref: Less than eight Teacher houses)				
Nine and Above Teacher Houses	-0.000189	-0.102	-0.0400	0.0566
	(0.0982)	(0.106)	(0.0992)	(0.107)
Governance Factors				
Frequency of School Inspection (Ref: Twice)				
More than twice	-0.150**	-0.0954	-0.0113	-0.0649
	(0.0670)	(0.0719)	(0.0749)	(0.112)
SMC Meetings Termly (Ref: Once)				
Twice	0.0493	-0.0156	-0.0181	-0.153**
	(0.0775)	(0.0876)	(0.0853)	(0.0720)
School Founding Body (Ref: Government)				
Faith founded School	0.090**	0.110**	0.105*	0.00629
	(0.0626)	(0.0545)	(0.0608)	(0.0746)

School Ownership (Ref: Gov't)				
Privately owned	0.0311	0.134	0.116	0.117
	(0.0949)	(0.107)	(0.108)	(0.0996)
Community Factors				
Distance from School to the Nearest Trading Centre (Ref Category: Less than 1 km)				
Between 1.1-3 km	-0.0353	0.0134	0.0384	0.0417
	(0.0668)	(0.0639)	(0.0592)	(0.0766)
3.1 km and above	-0.000808	-0.0858	0.143	0.0782
	(0.0929)	(0.0919)	(0.0989)	(0.164)
Distance from School to the Nearest Trading Centre (Ref Category: Less than 1 km)				
2 Kilometers	-0.00781	0.00419	-0.0884	0.102
	(0.0808)	(0.0786)	(0.0813)	(0.107)
3 Kilometers	0.0112	-0.0149	0.159	0.140
	(0.1000)	(0.0870)	(0.116)	(0.149)
Regional Dummy (Ref: Central)				
West	-0.0432	0.138	0.124	0.200
	(0.111)	(0.129)	(0.105)	(0.132)
East	-0.172**	-0.154*	0.115	-0.00662
	(0.0843)	(0.0882)	(0.0847)	(0.0899)
North	-0.153**	-0.0559	0.135	0.0504
	(0.0767)	(0.0788)	(0.0842)	(0.102)
Observations	735	674	652	713

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's Computation

Table A1.6: Marginal Effects(dydx) for Determinants of Literacy in Uganda Disaggregated by Gender

VARIABLES	P.3 Literacy		P.6 Literacy	
	Boys	Girls	Boys	Girls
Pupil Related Factors				
Pupil Age (Ref: 6-9 Years**)**				
10 Years	-0.0833	0.0262		
	(0.0539)	(0.0464)		
11-12 Years	-0.0550	0.0156		
	(0.0572)	(0.0664)		
13-16 Years	-0.0794	0.139		
	(0.0887)	(0.100)		
Pupil Age (Ref: 10-12 Years)				
13 Years			-0.184***	-0.104*
			(0.0707)	(0.0629)
14 Years			-0.131*	-0.196***
			(0.0767)	(0.0584)
15- 19 Years			-0.180**	-0.159**
			(0.0725)	(0.0762)
School Related Factors				
Day School (Ref: Boarding)	-0.194**	-0.209*	-0.380***	-0.221***
	(0.0954)	(0.117)	(0.0878)	(0.0752)
Total Classrooms (Ref: 0= Less than 9 Classrooms**)**				
More than 9 classrooms/Blocks	0.00208	0.0348	-0.0541	0.0303
	(0.0897)	(0.102)	(0.0937)	(0.0825)
School Location (Ref: Rural)				
Urban Schools	-0.0899	0.152	0.113	0.133
	(0.0944)	(0.122)	(0.0982)	(0.103)
Headteacher Qualification (Ref: Secondary)				
GIII and GV	-0.0990	-0.101	0.0405	0.148
	(0.155)	(0.181)	(0.131)	(0.114)
Diploma	0.156	-0.0550	0.0974	0.0594
	(0.138)	(0.129)	(0.166)	(0.119)
Degree and above	0.0409	0.0960	-0.0865	0.0534
	(0.137)	(0.119)	(0.137)	(0.118)
School Registration Status (Ref: Not Registered)				
Registered	-0.232	-0.145	0.162	0.0395
	(0.165)	(0.165)	(0.105)	(0.127)
Teacher Houses (Ref: Less than eight Teacher houses)				
Nine and Above Teacher Houses	0.0422	-0.144	-0.0474	0.0593
	(0.105)	(0.138)	(0.145)	(0.132)
Governance Factors				
Frequency of School Inspection (Ref: Twice)				
More than twice	-0.162	-0.0598	-0.0448	-0.163
	(0.0993)	(0.127)	(0.113)	(0.112)
SMC Meetings Termly (Ref: Once)				
Twice	0.0235	-0.0595	0.0499	-0.0483
	(0.133)	(0.124)	(0.0911)	(0.0778)
School Founding Body (Ref: Government)				
Faith founded School	0.0876***	0.0530	0.0344**	0.0904
	(0.0793)	(0.0928)	(0.0761)	(0.0796)
School Ownership (Ref: Gov't)				
Privately owned	0.195	0.344*	0.148	0.122
	(0.165)	(0.200)	(0.140)	(0.143)
Community Factors				
Distance from School to the Nearest Trading Centre (Ref Category: Less than 1 km)				
Between 1.1-3 km	-0.104	0.0540	-0.0241	0.0572

	(0.0734)	(0.0823)	(0.0886)	(0.0810)
3.1 km and above	-0.0971	0.0149	0.0769	0.102
	(0.115)	(0.145)	(0.132)	(0.120)
Distance from School to the Nearest Trading Centre (Ref Category: Less than 1 km)				
2 Kilometers	0.0295	0.122	-0.173	-0.187*
	(0.101)	(0.119)	(0.107)	(0.0975)
3 Kilometers	-0.0505	-0.272*	0.0834	0.0471
	(0.131)	(0.146)	(0.166)	(0.129)
Regional Dummy (Ref: Central)				
West	-0.163	-0.132	0.0189	-0.0187
	(0.150)	(0.180)	(0.156)	(0.131)
East	-0.159	-0.445**	0.122	-0.0554
	(0.141)	(0.180)	(0.132)	(0.107)
North	-0.222*	-0.448***	-0.0262	-0.0446
	(0.115)	(0.164)	(0.121)	(0.0975)
Observations	735	674	652	713

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Author's Computation