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**School Characteristics and Academic
Performance in Uganda:
Evidence from 2001 Primary Leaving
Examinations Results**

by

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School Characteristics and Academic Performance in Uganda: Evidence from the 2001 Primary Leaving Examinations Results

James C. O. Nyankori and Veronica Wabukawo

Abstract

Effect of staffing, supplies and facilities on primary school performance in Uganda was estimated using OLS on district level data. Parameter estimates and significance tests show that textbooks have important influence on performance under prevailing levels staffing and facilities. In addition performance in schools in the northern region was lower than in the central region. This study suggests that considerable improvements in performance can be attained by additional expenditure on school textbooks.

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Introduction

A notable feature of public education policy reform in Uganda since 1990 has been increased access to primary education resulting from the Universal Primary Education (UPE) program of 1997 which raised total primary school enrollment from 2.9 million students in 8,550 primary schools in 1996 to 6.8 million students in 11,578 Schools in 2000 (Uganda Bureau of statistics, 2001; Murphy et al., 2002; Muhwezi, 2001). The expected long-term impact of Universal Primary Education is higher literacy rate and education attainment, which will depend on sustained growth in enrollment and academic performance as well as entry into post primary education.

However, emerging unanticipated consequences have raised policy questions addressing shortages of textbooks, classrooms and teachers (Murphy et al., 2002; Opolot, 2001), which have important implications for quality of public education in Uganda. Although completion rate increased from 35 percent before Universal Primary Education to 55 in 2000, student mathematics achievement declined from 48 percent in 1996 to 31 percent in 1999. Similarly, achievement in English declined from 92 percent to 56 percent (Murphy et al., 2002).

Gains in access and gender equity due to Universal Primary Education program may be offset by low academic achievement resulting from inadequate facilities, supplies and staffing. Moreover, the gap between school resource requirements and availability are higher in rural than urban schools with marked regional disparities (Opolot, 2001).

Policy makers need information to facilitate allocation of available resources and a critical question concerns the distribution of available resources to staffing, classrooms, textbooks, equipment and supplies. To get the greatest bang out of the limited resources it is important to characterize expenditure categories in terms of expected returns or academic performance such that the expenditure category with the highest likelihood of raising academic performance is allocated the highest share of the budget.

The purpose of this study is to evaluate the effects of school resources and location on performance at primary level under the prevailing conditions defined by district level number of teachers, classrooms, textbooks, equipment and supplies.

Background

Over the past quarter a century, the adult literacy rate in Uganda increased by 12% from 48% in 1975 to 60% in 2001. The number of schools and teachers increased fivefold from 2,204 primary schools in

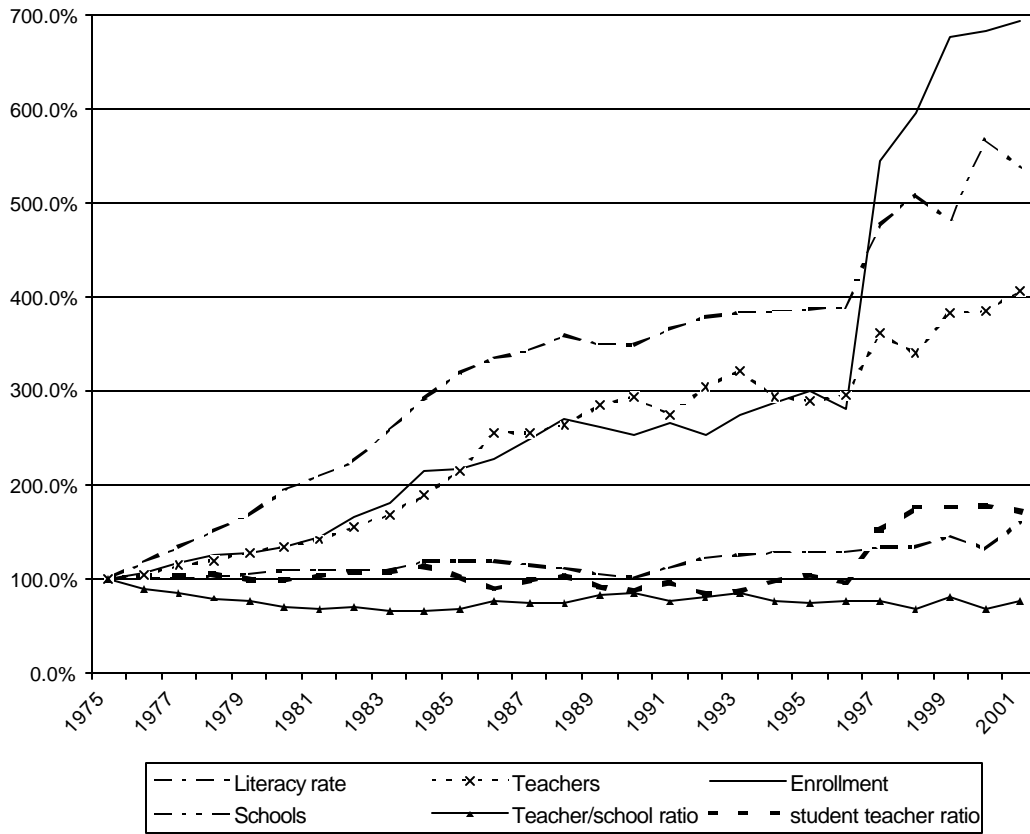
1975 to 11,840 in 2001 and the number of teachers more than quadrupled from 28,681 in 1975 to 116,241 in 2001.

Currently, regional distribution of primary schools is uneven with the central region having 34.7% of all primary schools in Uganda, which is nearly three times as much as the percentage of all primary schools in northern region (13.5%). Western and eastern regions follow the central region with 27.0% and 24.7% of all primary schools in Uganda, respectively.

However, eastern region has the highest regional student enrolment and accounts for 30% of all primary school enrolment in Uganda. Slightly over half of all primary school enrollments are in the central and western regions at 26.3% and 25%, respectively. The northern region with 18.8% has the lowest regional primary school enrolment.

Although the number of primary school teachers increased fivefold between 1975 and 2001 from 28,681 to 116,241, teacher-school ratio declined from 13.0 in 1975 to 9.8 in 2001. Furthermore, the student-teacher ratio increased by 70% from 34 students per teacher in 1975 to 58 students per teacher in 2001.

Figure 1 shows the growth rate of selected national indicators of primary education in Uganda: number of teachers, number of primary schools, total enrollment, pupils per teacher, teachers per school and adult literacy rate from 1975 to 2001.



Source: www.sesrtcic.org

Fig. 1. The growth rate of selected national indicators of primary education in Uganda (1975=100).

Data

The data used for the study are from Ministry of Education and Sports and published Primary Leaving Examination (PLE) results. The data include district level mean PLE scores of the top five students, number of schools, school enrolment, number of students per class, number of students per teacher, and number of students per textbook. Table 1 contains descriptive statistics of the variable used in the study.

Table 1 shows that the national mean PLE scores was 6.2 and ranged from 4 to 9.2, and there were on the average 58.5 students per teacher, 103.7 students per classroom and 3.7 students per textbook. The average regional PLE scores were 6.5 (central), 6.7 (eastern), 8.3 (northern) and 6.2 (western). Given the scoring system, the best regional scores were in western region, followed by central, eastern and northern in that order. However, the thirty one percent of the students scored in the highest-grade category (4-4.8), thirteen percent in the next category (5-5.6) and twenty one percent in the following category (6-6.8). The rest of the students' scores were in the next best three categories: seventeen percent in category (7-7.8) thirteen percent in category (8-8.8) and four percent in category (9-9.2).

Table 1: Statistical Description of Variables

Variables	Mean	Minimum	Maximum
Mean PLE scores of the top five students	6.2	4	9.2
Students per teacher	58.5	33	94
Students per classroom	103.7	36	186
Students per Textbook	3.7	2	6
Mean PLE scores of the top five students			
Central	6.5		
Eastern	6.7		
Northern	8.3		
Western	6.2		
Distribution of Top five PLE scores			
Mean Scores		District Percentages	
4 – 4.8		31	
5 – 5.6		13	
6 – 6.8		21	
7 – 7.8		17	
8 – 8.8		13	
9 – 9.2		4	

The Model

We used the mean aggregate scores of the top five students in each district as a measure of performance. To earn a PLE certificate a student must pass written examinations in english, mathematics, science and social studies at the end of the first seven years of formal education (or Primary Seven). The PLE score for each subject ranges from 1 to 9 such that the best and worst possible scores for the four subjects are 4 and 36 points, respectively.

For the present purposes, district performance, as measured by the mean scores of the top five students was explained in terms of selected school characteristics including the number of students per teacher, students per classroom, and students per textbook as well as regional location. The empirical model below expresses the mean district PLE scores ($SCORE$) in terms of student-teacher ratio (PT), student-classroom-ratio (PCL), student-textbook-ratio ($PTEXT$), and regional dummies ($EAST$, $NORTH$, and $WEST$).

$$SCORE_i = \mathbf{b}_0 + \mathbf{b}_1 PT_i + \mathbf{b}_2 PCL_i + \mathbf{b}_3 PTEXT_i + \mathbf{b}_4 EAST_i + \mathbf{b}_5 NORTH_i + \mathbf{b}_6 WEST_i + e_i$$

Where \mathbf{b}_0 is the constant term, $\mathbf{b}_1, \dots, \mathbf{b}_6$ are parameters, e_i is the random error term and $SCORE_i$ is the mean PLE score for district i , and for each district, i , PT_i is the student-teacher ratio, PCL_i is the student-classroom

ratio, $PTEXT_i$ is the student-textbook ratio, and $EAST_i, NORTH_i$ and $WEST_i$ are the regional locations. The model is estimated and used to test the following hypotheses:

1. $H_o: \mathbf{b}_1 = 0; H_A: \mathbf{b}_1 \neq 0;$

or the null hypothesis that student-teacher ratio has no effect on performance versus the alternative hypothesis that student-teacher ratio has effect on performance.

2. $H_o: \mathbf{b}_2 = 0; H_A: \mathbf{b}_2 \neq 0;$

or the null hypothesis that student-classroom ratio has no effect on performance versus the alternative hypothesis that student-classroom ratio has effect on performance.

3. $H_o: \mathbf{b}_3 = 0; H_A: \mathbf{b}_3 \neq 0;$

or the null hypothesis that student-textbook ratio has no effect on performance versus the alternative hypothesis that student-textbook ratio has effect on performance

4. $H_o: \mathbf{b}_7 - \mathbf{b}_4 = 0; H_A: \mathbf{b}_7 - \mathbf{b}_4 \neq 0;$

or the null hypothesis that there is no difference between the eastern and central regions versus the alternative hypothesis that there is a difference between eastern and central regions where the base region is central with coefficient of \mathbf{b}_7 .

5. $H_0: \mathbf{b}_7 - \mathbf{b}_4 = 0; H_A: \mathbf{b}_7 - \mathbf{b}_4 \neq 0;$

or the null hypothesis that there is no difference between the northern and central regions versus the alternative hypothesis that there is a difference between northern and central regions

6. $H_0: \mathbf{b}_7 - \mathbf{b}_5 = 0; H_A: \mathbf{b}_7 - \mathbf{b}_5 \neq 0;$

or the null hypothesis that there is no difference between the western and central regions versus the alternative hypothesis that there is a difference between western and central regions.

7. $H_0: \mathbf{b}_7 - \mathbf{b}_6 = 0; H_A: \mathbf{b}_7 - \mathbf{b}_6 \neq 0;$

or the null hypothesis that there is no difference between the eastern and central regions versus the alternative hypothesis that there is a difference between eastern and central regions. The empirical model was estimated using Ordinary Least Squares.

The results and inferences

The estimated coefficients of the PLE performance model are shown in table 2. \mathbf{b}_3 and \mathbf{b}_5 are positive and statistically significant at 1% and 5% levels of significance, respectively. The former, (\mathbf{b}_3), is the coefficient for *PTEXT* and the latter, (\mathbf{b}_5), for the regional dummy: *NORTH*.

The results indicate that an increase in the student-textbook ratio by one increases the PLE scores by 0.81525 and that the mean PLE score for *NORTH* is higher than the mean PLE score for *CENTRAL* by 1.5 points.

Since PLE results are reported on a 9-point scale with 1 being the highest and 9 the lowest possible subject scores such that the highest and lowest scores in the four mandatory subjects are 4 and 36, respectively, the results show that the higher the student-textbook ratio the poorer the performance. Similarly, the 1.5-point regional difference between *CENTRAL* and *NORTH* indicate that PLE performance in *NORTH* is poorer than in *CENTRAL*.

Table 2. Ordinary Least Squares Estimates of the Primary Leaving Examinations Performance Model

Variable	Coefficients	Pr > t
Intercept	3.01064	0.0611
PT	-0.01162	0.7292
PCL	0.00113	0.9184
PTEXT	0.81525	0.0143
EAST	0.82793	0.2911
NORTH	1.52045	0.0508
WEST	0.60839	0.3336

The computed student-textbook ratio elasticity of PLE scores is 0.488 indicating that for every one percent rise in student-textbook ratio the PLE scores fall by 0.486 percent. Table 3 contains simulated student-textbook ratios for each PLE score from 4 to 36. Under prevailing conditions the student-textbook ratio corresponding to the highest and lowest possible scores are 2.4 and 20.9, respectively. Therefore, increasing the supply of textbooks is an important policy option for improving performance in the Primary Leaving Examinations.

Table 3. Computed Elasticities: Student-Textbook Ratios and Mean PLE Scores

% Change in Student-Textbook Ratios	Student-textbook Ratio	Mean PLE Scores	Grade
-2	2.4	4	1
-1	3.0	5	1
0	3.6	6	1
1	4.2	7	1
3	4.8	8	1
4	5.4	9	1
5	6.0	10	1
6	6.6	11	1
7	7.2	12	1
8	7.8	13	2
9	8.4	14	2
10	9.0	15	2
11	9.5	16	2
12	10.1	17	2
13	10.7	18	2
14	11.3	19	2
15	11.9	20	3
16	12.5	21	3
17	13.1	22	3
18	13.7	23	3
19	14.3	24	3
20	14.9	25	3
21	15.5	26	3
22	16.1	27	3
23	16.7	28	3
24	17.3	29	3
25	17.9	30	4
26	18.5	31	4
27	19.1	32	4
29	19.7	33	4
30	20.3	34	4
31	20.9	35	4
32	21.5	36	FAIL

Conclusions

This study evaluated the impact of staffing, supplies and facilities on primary school performance. Staffing was measured by the student-teacher ratio, supplies by student-textbook ratio, facilities by student-classroom ratio and performance by Primary Leaving Examinations results. The results showed that student-textbook ratio was an important determinant of performance and that there were regional differences between schools in the northern and central regions. This study shows that increased availability of textbooks given the prevailing staffing and classroom levels has important influence on performance.

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