

Preliminary and Incomplete Draft

School Management in Uganda

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June 2016

This paper explores the relationship between measures of school management quality and student test scores. Data on management practices from interviews with Ugandan secondary school head teachers is combined with individual level panel test score data from two high-stakes examinations. We find that the overall average quality of management is similar to the other low and middle- income countries for which comparable data exists (India and Brazil). Management matters for school performance in Uganda – with a standard deviation improvement in management performance being associated with a 0.05 – 0.2 standard deviation improvement in test scores. Observable characteristics of schools and headteachers explain little of the variation between schools in test scores.

This paper was made possible by funding provided by the DFID-funded RISE project, the ESRC, and Ark. Data was generously provided by the Uganda Examinations Board (UNEBC) and Ark. Phil Elks and Sabina Morley at Ark led the design and implementation of the initial school survey, carried out pre-testing of the World Management Survey schools instrument in Uganda, adapted with instrument with me, and have provided substantial comments. Thanks to Andy McKay, Iftikhar Hussain, and colleagues at the Center for Global Development in Europe for helpful comments.

1. Introduction

Substantial variation exists in the productivity of schools both within and between countries in terms of the learning that they produce per school year, and this learning matters – both cross-country and micro-level evidence suggest that it is the skills and knowledge acquired not just years of schooling that matters for economic growth and individual earnings (Hanushek, 2013) (Hanushek et al., 2015). A new literature on “The New Empirical Economics of Management” (Bloom et al., 2014) demonstrates that improved measures of management practices can explain variation in productivity across various sectors, including manufacturing, retail, healthcare, and education. Focusing on schools, (Bloom et al., 2015a) find a positive relationship between school-average student test scores and school management scores in 7 countries. Management-focused interventions have been shown to improve school learning outcomes in experimental studies (Blimpo et al., 2015), (Tavares, 2015), (Lassibille, 2014), (Beasley and Huillery, 2014). Such interventions focused on improving school management are in fact amongst the most effective of all education interventions in developing countries for which there is rigorous evidence (Glewwe and Muralidharan, 2015).

Management is conceived of by Bloom et al as an overall bundle of activity in four main areas; target-setting, performance monitoring, operational management, and people management. Various other studies have focused on the effect of some of these specific areas of management on school performance, such as improved performance monitoring ((de Hoyos et al., 2015)), improved teacher management ((Duflo et al., 2015), (Muralidharan and Sundararaman, 2011), (Atherton and Kingdon, 2010)), and improved operations management, for example by tailoring teaching to the right level of individual students ((Pritchett and Beatty, 2015), (Duflo et al., 2011), Banerjee et al 2011).

Schools operate within an overall system, in which goals, resources, and incentives are provided to schools by a principle (government in the case of public schools and parents in the case of private schools). An important factor determining the ability of schools to effectively optimise their operations in order to make best use of the available resources to achieve the delegated objectives is the amount of operational autonomy given to them. Research on charter schools and equivalent autonomous government schools (Dobbie and Fryer, 2013) (Eyles and Machin, 2014) suggests that providing operational autonomy to schools on academic and staffing decisions within an effective education system that provides clear objectives and accountability can improve performance, but greater autonomy may not produce the same results if schools are not held accountable for performance. (Hanushek et al., 2013) and (Contreras, 2015) both look across countries at changes in the level of school autonomy, finding that increases in school autonomy leads to better performance in high income countries but worse performance in low-income countries.

This paper links an internationally comparable composite measure of school management quality for 199 Ugandan secondary schools with individual student panel test score data for 40,080 students at two points in time, allowing for the estimation of the marginal effect of measured school management quality on student test scores, after controlling for their own prior attainment. This lagged dependent variable dynamic OLS “value-added” framework is also used to evaluate the effects of different ownership and management structure, comparing public schools with pure private schools, and with public-private partnership (PPP) schools (both individual domestic PPP schools and a chain of 19 internationally managed PPP schools).

2. The School System in Uganda

Uganda introduced free universal primary schooling in 1997, and free secondary schooling in 2007. Enrolment rates have risen in response - the net enrolment rate at primary level is now above 90%, but the primary completion rate is only around 54%, and the secondary rates are lower; around 23% net enrolment and 29% junior secondary completion rate (2013, World Bank WDI).

The official age for school entry is 6 years old (median age currently in the first grade is 7 years old in 2012 survey data¹). There are 7 grades of primary school (P1-P7), followed by 4 years of lower secondary (S1-S4) and 2 years of senior secondary (S5-S6).

The Uganda National Examinations Board (UNEB) administers exams at the end of the last year of primary school (grade 7) to pupils in both public and private schools (the Primary Leaving Exam or PLE). It is a requirement to pass this exam in order to progress to secondary school. Of 627,000 students enrolled in the last grade of primary (P7) in 2014, 586,000 (93%) registered and sat the PLE, and 517,000 (82%) passed. Students take exams in 4 subjects; English, Maths, Science, and Social Studies. Within each subject a score is given between 1 and 9, in which a score of 1-2 is a Distinction, 3-6 is a Credit, 7-8 is a Pass, and 9 is a Fail. UNEB reported 909 cases of exam malpractice in 2015 (cheating by collusion, external assistance or impersonation), down from 1,344 cases in 2014.

At secondary level, Ordinary level exams (Uganda Certificate of Education or UCE) are taken after 4 years in a minimum of eight subjects, and Advanced level exams taken after 2 further years in three subjects. The Uganda Certificate of Education (UCE) comprises six mandatory subjects administered in English; these are Mathematics, English language, Biology, Chemistry, Physics, and a choice of either Geography, or History, or Religious education. The two final optional subjects can include cultural subjects (such as Music); technical subjects (such as Carpentry); or other subjects such as Accounting, Business and Computer science.

Universal Secondary Education (USE) programme

The Universal Secondary Education (USE) programme offers free places at registered schools for eligible pupils. Most government schools are registered for USE, with the exception of a minority of elite schools that opt out. Due to the limited number of government secondary schools when the programme was introduced, private schools were also made eligible to register as part of a public-private partnership (PPP) in sub-counties in which there were no participating public secondary schools, where those government schools are over-crowded, or where pupils must travel very long distances to reach the closest government school within the sub-county. These requirements are borne out in the 2013 EMIS data – a sub-county is twice as likely to have a PPP school if there is no government school. To qualify, schools must be registered and certified low-fee schools (those charging 75,000 Ugandan Shillings (UGX) or less), and these schools must meet a set of criteria including having adequate infrastructure, a board of governors with government and parent membership, and sufficient qualified teaching staff.

For students to qualify, they must have a score of 28 or better in their PLE exam,

¹ 2011-12 Third wave of the Uganda National Panel Survey

corresponding to an average passing grade in each of the four tested subjects. In our sample, 6% of students at government USE schools and 8% of students at private USE (PPP) schools failed to meet this threshold. The majority of students enrolled are funded through USE.

Table 1: Enrolment at Government and PPP Schools

	Government	PPP	Total
Number of Schools	943	880	1,823
Total Enrolment	550,886	456,483	1,007,369
USE Enrolment	478,554	394,922	873,476

Government schools are entitled to 41,000 UGX per term per student (in addition to other transfers to schools including teacher salaries), and private schools to 47,000 UGX per term per student, on condition that they do not charge any other non-boarding fees. In practice, despite transfers from government and fees being prohibited for USE students, parents still report substantial fees paid to both government and private schools. Median reported annual household spending on school fees per child at secondary school was 360,000 UGX for private schools and 150,000 UGX at government schools (this includes registration fees and contributions to school development funds). Similar amounts are spent on books and uniforms in government and private schools.

Table 2: Median Annual School Fees (UGX)

	Government	Private	Total
Student receives USE subsidy	93,000	172,500	105,000
Does not receive USE subsidy	270,000	360,000	330,000
Total	150,000	360,000	240,000

Source: Uganda National Panel Survey Wave 3 2011/12

Partnering private schools also become eligible to receive other support from the government including the provision of textbooks and other teaching materials.

Participating schools have control over the student selection process; they may enroll as many students as they want, and can continue to enroll non-USE students (private students) for whom fees may be charged. Many schools, both government and private, operate more demanding PLE entrance criteria than the official minimum score of 28.

Barrera-Osorio et al 2015 study the effects of entering the USE programme on private schools using a randomized roll-out, finding positive impacts on enrolment growth and student performance (on low-stakes tests). Despite the official eligibility requirements, they find no impact of USE registration on school governance arrangements, but do find an impact on selection of better performing students at entrance.

Public and Private Schools

Overall there are around 1,007 government secondary schools, and 1,785 private secondary schools. Government schools have on average nearly twice as many students as private schools.

Table 3: Number and Size of Government and Private Schools

Ownership	Schools	Mean Students / School	Total Students	% Female
Government	1,007	611	615,333	45.3
Private	1,785	357	636,671	49.5
Total	2,792	448	1,252,004	48.0

Source: 2013 EMIS

Teacher recruitment is managed centrally for public schools. Schools submit vacancies to the Ministry of Education, who then allocate teachers to schools. Teachers are paid directly to their bank account by the Ministry of Public Service, making it difficult for schools to vary pay according to performance (MoES 2014). In the private sector teachers are paid substantially lower wages and schools are free to follow their own recruitment procedures. Government teacher starting salaries according to the Public Service Payscale are 511,000 UGX per year. Data is not available for private sector teachers, but across all occupations, median monthly wages were 330,000 UGX in the public sector and 99,000 UGX in the private sector for those in paid employment aged 14-64 in the 2012/13 National Household Survey (UBOS 2015).

3. Data

Management Survey

We measure school management quality using an adapted version of the Bloom et al (2015) and (Lemos and Scur, 2016) school management surveys. Open-ended questions are asked, with answers then scored against a descriptive rubric on a 1-5 scale for 20 question areas. These areas are grouped into four main components; target-setting, monitoring, operations (planning and leading teaching), and people (teacher) management.

- Operations (planning and leading teaching): this covers the leadership of teaching in a school, the use of differentiated teaching for a range of students, how schools use data and assessment to guide practice, and how education best-practices are adapted;
- Monitoring: this includes how the school tracks and monitors performance; whether there are systems and processes in place to identify and fix problems; and how stakeholders are involved in ongoing quality improvement (students, teachers, community);
- Target setting: this includes how school targets are linked to student outcomes; specific targets for departments and teachers, how appropriate the targets are;
- People: how teachers are recruited, managed, supported and retained.

Each score may depend on a series of individual questions that help build up an overall description of the concept being measured. This approach combines a rich open-ended discussion of management practices allowing for probing and clarification where necessary, with a quantitative framework to allow for comparison between schools. Scoring inevitably still depends on a subjective judgment by individual interviewers. Substantial time was spent in training, discussing in detail the level descriptors, and calibrating scores across interviewers across a range of practice interviews. Interviews were double-scored in training, with a correlation of above 0.9 between scores from different enumerators.

The original survey tool includes a rubric with level descriptors for 1 (worst), 3, and 5 (best). The approach proposed by Lemos and Scur (2016) designed specifically for developing countries includes both a horizontal and vertical expansion of the tool, with level descriptors for half point levels at the bottom end of the scale (1, 1.5, 2, 2.5, 3, 4, 5) in order to capture variation in countries where scores are clustered at the lower end of scale, and including 3 separate sub-areas within each of the 20 question areas. During our piloting we decided to expand the original rubric to include level descriptors for each of the levels 1 - 5, and to allow enumerators to score 0.5 points where they felt that responses fell between the two level descriptions, rather than describing explicitly what the 0.5 points were in the rubric. We also opted to maintain the shorter set of 20 areas rather than expanding to 60, on the grounds that any possible sacrifice in precision here could be outweighed by preventing respondent fatigue. During pre-testing and piloting we also opted to further simplify the original list of 20 areas to a combined and shortened list of 11 areas, to reduce excessive duplication and repetition of questioning and to limit the length of time required from a school head teacher. These changes are summarized in Table 4 below.

Table 4: Summary of Management Survey Sections

Original WMS	Adapted Uganda Instrument	Rationale
A. Operations		
Standardisation of Instructional Planning	Original category retained	Original categories retained. New category added to capture important school management role missing from original survey
Personalisation of Instruction and Learning		
Data-Driven Planning		
Adopting Educational Best Practices		
	Instructional Leadership (New category)	
B. Monitoring		
Continuous Improvement	Original category retained	1 category retained unchanged, the remaining 4 categories combined into 1. In pre-testing we found that these questions/categories were very repetitive and overlapping and combined aspects of the categories into questions within a single category
Performance Tracking	Categories combined	
Performance Review		
Performance Dialogue		
Consequence Management		
C. Target Setting		
Target Balance	Categories combined	1 category retained unchanged. 2 categories combined into 1 where there is overlap. Some aspects of target interconnection were not relevant in this context – for example there are no district or national targets with which school targets could be interconnected. 2 categories omitted. In pre-testing we found that these questions/categories were very repetitive providing little new information
Target Interconnection		
Target Stretch	Original category retained	
Target Time Horizon	Categories omitted	
Target Clarity & Comparability		
D. People Management		
	Recruitment (new category)	Category added from Lemos & Scur (2016)
Rewarding High Performers	Original category retained	
Fixing Poor Performers		
Promoting High Performers	Categories combined	Categories combined due to overlap and repetition in questions.
Continuing Professional Development		
Retaining High Performers		
Attracting High Performers	Original category retained	

The management survey was carried out in January 2016 by telephone from a call centre in Kampala, from a nationally representative sample of 305 schools (stratified by ownership and district), from which an overall response rate of 65% was obtained (199 schools). We used lists of school leader phone numbers held by the Ministry of Education. 29% of these numbers failed to connect or were not answered. Only 6% refused to participate in the survey. This response rate is substantially higher than that found in other countries, from a high of 58% in Brazil to just 8% in the UK).

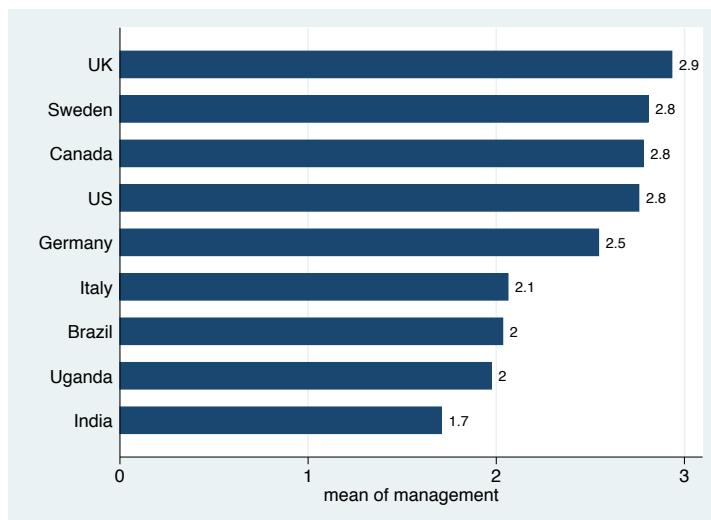
Interviews lasted between 60 and 90 minutes. Around 10% of interviews were double-scored by a research manager, with an average variation in double-marked overall scores of 0.1-0.2 points.

Surveys benefit from being “double-blinded” in the sense that interviewers are not influenced by their physical impressions of the school or knowledge of school performance, and respondents were not aware of the rubric against which they were being graded.

Work by (Bloom et al., 2012) and also by (Garlick et al., 2016) has verified that telephone surveys generate data that is statistically indistinguishable from in-person interviewing.

On average schools in our nationally representative sample of Ugandan secondary schools score 2.0 points, placing them above India and very slightly below Brazil, a result that seems plausible, despite some adaptations to our survey instrument. In Bloom et al 2015, schools perform worse than manufacturing and retail firms, and even the highest performing country the UK has a mean school management score of 2.9.

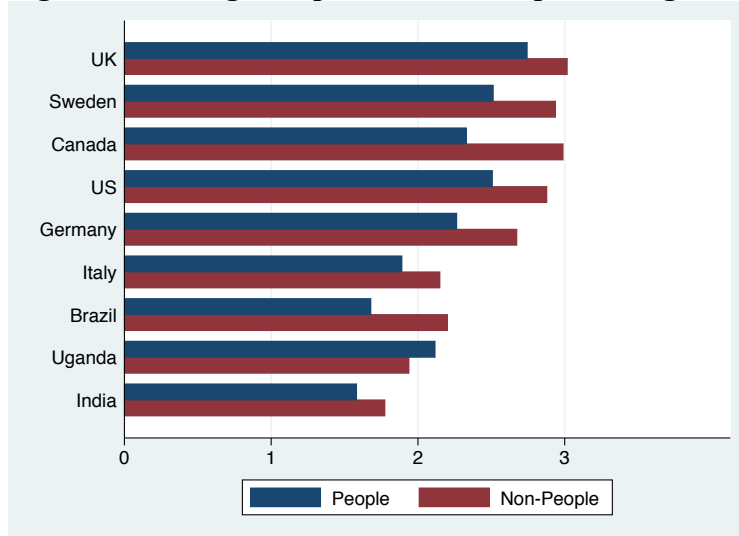
Figure 1: Average Management Score by Country



Source: Author’s analysis of Uganda School Management Survey & Bloom et al 2015

Uganda performs better on people management than other aspects of management (Figure 2), consistent with an observed reasonable amount of flexibility for school leaders in hiring and salary decisions. In general, tenured teachers are allocated to public schools, but schools are sometimes able to influence these allocations, and also sometimes able to hire additional teachers from other resources.

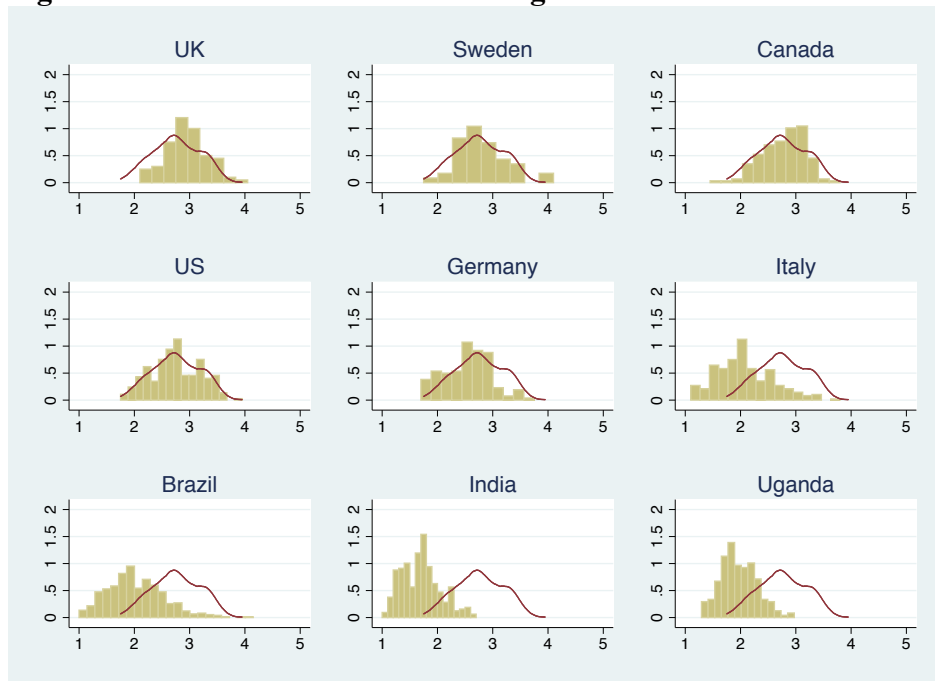
Figure 2: Average People and non-People Management Score by Country



Source: Author’s analysis of Uganda School Management Survey & Bloom et al 2015

The distribution of schools in Uganda is roughly symmetrical, with very few schools in Uganda scoring above a 3, which is similar to the distribution in India, but notably different to that in Brazil and Italy where despite low average management scores, there is an upper tail of high performance.

Figure 3: Distribution of School Management Scores within Countries



Source: Author’s analysis of Uganda School Management Survey & Bloom et al 2015.

Note: Bars denote schools within countries. Red line denotes the smoothed US distribution.

Looking across school type, mean management scores are not statistically significantly different for government, private, and PPP schools for either the aggregate score or any of the sub-components. The difference in overall management quality between elite government schools and others is present in their operations management (teaching quality control), target setting, and monitoring, but they are not better than average on teacher management. Mean scores are 0.4 points higher for elite government schools, and 1 point higher for a chain of internationally supported PPP schools (PEAS)

School autonomy

Alongside the management survey, head teachers were asked who has the main responsibility for deciding on budget allocations, selecting teachers for hire, setting teacher salaries, deciding who to admit, which courses to offer, the content of courses, and which textbooks to use. Where the head teacher, school owner, or governing board are primarily responsible, this is coded as the school having autonomy over that area, whereas where the Ministry of Education is primarily responsible the school is not autonomous.

On overall budget autonomy, almost all private schools and the majority of government schools claim to have school level autonomy. On salaries and hiring, almost all private schools report having autonomy, compared with 70% of government schools. Private schools are also more likely to report autonomy on admissions, course choice, and textbook choice. On course content only around a quarter of schools, whether public or private report having autonomy, with content most commonly being determined by the Ministry of Education.

School Characteristics

Data on school characteristics is available from two sources, the 2013 government Education Management Information System (EMIS) data and our own more detailed nationally representative school survey of 335 schools carried out in June 2015. The sample of schools was stratified across Uganda's 4 regions and across school type (public and private). 10 districts were sampled from each of the Central, Western, and Eastern regions, and 6 from the less populated Northern region. For each district 10 schools were randomly sampled, of which 4 were government schools and 6 private schools.

The school survey was carried out primarily to gather information on student test scores (discussed further below), but the opportunity was also taken to gather some basic demographics on students (including gender and when they enrolled in school), on head teachers and teachers, and school resources. Additionally the average socioeconomic status of schools was estimated with a household asset survey administered to students in the fourth grade of secondary school (S4). This data is not linked to individual UCE test score results as those students had already left the school, but instead gives an estimate of school-average socioeconomic status to the extent that this is persistent.

In the sample there are 82 regular government schools, 7 elite government schools (high fee-charging, high socioeconomic status students), 62 public-private partnership (PPP) schools, 48 fully private schools, and an additional sample of 19 public-private partnership schools part of the internationally-owned "PEAS" chain. Public schools are on average larger than private schools, though PPP schools are closer in size to public schools as they receive a

government subsidy per pupil place. Schools of all types report charging tuition (and other) fees, despite this not being officially permitted for government schools and PPP schools. Of the fully private schools, around half are non-profit. 95% of schools use academic selection criteria. Students at elite government schools are 0.95 standard deviations above average socioeconomic status, and students at private schools are 0.15 standard deviations above. The majority of schools (55%) are religious. The majority of government schools are in rural areas, with private schools and PPP schools more prevalent in rural and peri-urban areas. Head teachers in government schools are more likely to have postgraduate qualifications, have more experience, have teachers with more experience, and are less likely to hold a second job, than private school head teachers.

Test Score Data

We collected linked UCE and PLE scores directly from all management survey schools for 2014, and for 2013 for a sub-sample of half of these schools. This gives a total of 22,797 students across 2 years from 199 schools.

For the outcome UCE score we take the aggregate score across 8 subjects, and then invert it and standardize it to mean 0 and standard deviation 1 to allow for easier interpretation of estimated coefficients (in each subject, 1 is the best possible score, corresponding to a score of 80-100% on the exam, and 9 is the worst possible score, corresponding to a 0-39%).

PLE scores are available for each student for each of the four individual subjects (English, Maths, Science, and Social Studies).

Table 5: School Characteristics

	Gover nment (USE)	Elite Gover nment	PPP (Private USE)	Private	PEAS (PPP)	All
Number of Schools	82	7	62	48	19	218
<i>Management</i>						
Aggregate Score	2.0	2.4	2.0	1.9	3.1	2.1
- Operations	2.0	2.4	1.9	2.0	3.3	2.1
- Monitoring	2.1	2.4	2.0	1.9	3.0	2.1
- Target-Setting	1.7	2.4	1.8	1.6	2.9	1.8
- People	2.1	2.2	2.1	2.1	3.2	2.2
<i>Test Scores</i>						
Number of Students	11,741	1,583	6,118	3,353	1,085	23,880
Value-Added (z-score)	-0.07	0.32	-0.01	0.12	0.10	0.00
UCE (z-score)	-0.12	1.03	-0.16	0.25	0.09	0.00
<i>School Characteristics</i>						
Mean Students (2015)	565	552	427	278	.	452
SES Index (z-score)	0	0.95	-0.04	0.15	.	-0.03
% Female Students	0.41	0.60	0.44	0.50	0.50	0.45
Total Fees* (UGX)	76	127	86	116	105	92
% For Profit	0	0	0.38	0.49	0	0.23
% With Academic Selection	0.98	1	0.98	0.90	0.84	0.95
% Religious	0.65	0.86	0.60	0.46	0.05	0.55
% Urban	0.06	0.14	0.16	0.17	.	0.12
% Rural	0.83	0.57	0.55	0.48	.	0.65
% Heads with 2nd Job	0.09	0	0.12	0.30	.	0.13
% Heads with postgrad	0.40	1	0.18	0.13	.	0.28
Heads Yrs Experience	9.7	18.7	8.7	7.3	.	9.1
Teacher exp. 2-5 yrs	0.20	0	0.47	0.46	.	0.34
Teacher exp. 5-10 years	0.69	0.43	0.45	0.50	.	0.56
Teacher exp. 10+ years	0.11	0.57	0.08	0.04	.	0.10
<i>School Autonomy</i>						
Admissions	0.71	0.86	0.89	1	1	0.86
Budget	0.89	1	1	1	1	0.96
Salaries	0.67	0.57	1	0.98	1	0.86
Hiring	0.71	0.43	0.97	0.98	1	0.86
Content	0.24	0.50	0.25	0.23	0.41	0.27
Courses	0.57	0.67	0.70	0.80	0.80	0.67
Textbooks	0.42	0.40	0.54	0.63	0.78	0.53
All (Mean)	0.63	0.67	0.82	0.85	0.86	0.75

* Tuition fees plus fees for extra classes, uniforms, lunch, & 'other'

4. Management Quality and Educational Outcomes

a. Empirical Approach

We estimate here a student learning production function, following (Todd and Wolpin, 2003), in which student achievement T is conceived of as a function of their ability A , and all present and past family inputs F , and school inputs S .

$$T = f(A + F + S) \quad (1)$$

The role of management as one of the school “inputs” is conceived of in terms of “management as a technology” (Bloom et al., 2015b) in which management enters the production function as intangible capital, which can be invested in and can depreciate.

In our context,

$$dT/dS = f(\alpha, L, K, M) \quad (2)$$

where α is an efficiency term, L is non-management labour, K is capital, and M is management capital.

In practice, estimation of (1) is impeded by the lack of measures of student ability and the full history of family and school inputs. A common solution is the estimation of a lagged dependent variable, dynamic OLS ‘value-added’ specification, in which a student’s prior test score serves as a composite proxy variable for both their unobserved ability and all observed and unobserved prior home and school inputs, which allows for the estimation of the marginal effects of contemporaneous inputs.

Here then test score T of student i at school s at time t is related to their own lagged performance, student characteristics X_i , school characteristics S_s , and school management quality M_s . Some of these school characteristics (specifically average socioeconomic status of students and school fees) proxy both for family inputs and school inputs. We assume that management quality is persistent and unchanging across the three years for which we have test score data.

$$T_{ist} = \alpha + \beta^1 T_{ist-1} + \beta^2 M_s + \beta^3 X_i + \beta^4 S_s + u_{ist} \quad (3)$$

Value-added models have been shown in various contexts through comparison with experimental estimates and through simulations to produce unbiased estimates of individual teacher quality (Kane and Staiger, 2008) (Kane et al., 2013) (Chetty et al., 2014) and of private school effects (Andrabi et al., 2011) (Singh, 2015) (Muralidharan and Sundararaman, 2013).

An important concern here is regarding drop-outs, and whether these are differential between better and worse managed schools. It may be that better managed schools are better primarily at encouraging under-performing students to leave. This concern is assuaged partially by the fact that much of the focus of schools on student selection is likely to be on entrance, and we are controlling for prior ability, so different ability cohorts is not the problem. Schools do not have strong incentives to encourage any differential drop-out, as they often funding either directly per student in the form of fees or indirectly through government subsidy. Schools are

judged by the media and parents primarily on the absolute number of top grades (Division 1) achieved, and so are not penalized if they have a high number of low scoring candidates. We have some data on dropouts over the last year of school – the number of students per school that were enrolled in S3 but did not enter the final UCE exam the following year. This however does not allow us to control for any dropouts that may occur during S1 or S2. The rate of dropout between S3 and S4 at the school level has no correlation with school performance on the UCE exam.

b. Results

There is a clear positive correlation between school management and student performance, at both the school average level and individual student level. On average, a school with a 1 standard deviation higher management score is associated with between .1 and .24 standard deviation higher average UCE test score, depending on whether controls are included for other factors including prior test scores, sex, socioeconomic status, location, school size, and school fees).

Table 6: Management and School Performance

	UCE Score	UCE Score	VA	VA
Management (Z-Score)	0.238*** (0.062)	0.104** (0.051)	0.314*** (0.105)	0.204** (0.093)
School Controls	No	Yes	No	Yes
N	199	199	199	199
r2	0.088	0.504	0.046	0.357

Std. Err. adjusted for 199 school clusters. School controls include number of students, fee rates, ownership, student socioeconomic status, location, and 'noise controls' or survey enumerator * p<0.1, ** p<0.05, *** p<0.01

These results are broadly in line with comparable estimates from Brazil, Canada, India Sweden, US, and UK.

Table 7: Management and School Performance Internationally

	All (excl Uganda)	Brazil	Canada	India	Sweden	US	UK	Uganda	Uganda
	Cross- country pooled	Average maths	Fraser rating	Average maths	9th grade GPA	HSEE maths pass	Context- ual value added	UCE Score	Value added
Management (z-score)	0.232*** (0.044)	0.104** (0.050)	0.609 (0.368)	0.499** (0.243)	0.242 (0.206)	0.170** (0.080)	0.881** (0.369)	0.104** (0.055)	0.204** (0.090)
General controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pupil controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1002	472	77	152	82	133	78	476	476

Source: Uganda School Management Survey & Bloom et al (2015)

The availability of individual student level performance data in our sample allows for a student-level analysis providing greater statistical power than just looking at school-average level performance. Tables 10 and 11 show that the coefficient on management is more

precise and smaller (0.05 standard deviations) when looking at individual pupil level data. This relationship is robust to aggregating the individual question areas of management by simple averaging or by principal components analysis.

Table 8: Management and Student Performance

	UCE	UCE	VA	VA
Management (Z-Score)	0.294*** (0.089)	0.081* (0.046)	0.097** (0.040)	0.055** (0.026)
School Controls	No	Yes	No	Yes
N	15,775	15,775	15,775	15,775
r2	0.039	0.306	0.521	0.578

Std. Err. adjusted for 199 school clusters. School controls include number of students, fee rates, ownership, student socioeconomic status, location, and 'noise controls' or survey enumerator

* p<0.1, ** p<0.05, *** p<0.01

Breaking down the management index by the four main components (Table 11) suggests that only target-setting and people management are statistically significantly correlated with student performance. These results are similar to those in the international study, where people management has the largest relationship with performance followed by target-setting, monitoring, and operations, though there is no a priori reason why the sub-components of management should have equal weight in systems with different binding constraints to improved performance.

Table 9: Disaggregating Management Components and Student VA Performance

	(1)	(2)	(3)	(4)	(5)
Management (Z-Score)	0.055** (0.026)				
Operations (Z-Score)		0.011 (0.025)			
Targets (Z-Score)			0.069*** (0.021)		
Monitoring (Z-Score)				0.012 (0.020)	
People (Z-Score)					0.059*** (0.021)
School Controls	Yes	Yes	Yes	Yes	Yes
N	15,775	15,775	15,775	15,775	15,775
r2	0.578	0.577	0.579	0.577	0.578

Std. Err. adjusted for 199 school clusters. School controls include number of students, fee rates, ownership, student socioeconomic status, location, and 'noise controls' or enumerator * p<0.1, ** p<0.05, *** p<0.01

In Table 13 we test for heterogeneous effects of management by different kinds of students – interacting school management score with gender and prior test score (columns 1-3). Neither interaction terms are statistically significant, whether prior test score is specified linearly or as a binary variable for scoring the top ‘Division 1’ grade. We had expected to find a positive interaction between management and prior test score, as anecdotally the focus of media

reporting and hence bottom-up accountability on secondary schools is around the number of top grades achieved by a school, rather than average progress by all students. We therefore also consider whether there is an interaction solely between the target-setting component of management and prior test score. As part of our management survey pre-testing we found that of the schools that do have any kind of target-setting for teachers, these are typically around the number of top grade “Division 1” scores obtained. Looking only at the effect of target-setting on performance, here we do find a positive and significant interaction with prior test score (columns 4-5).

Table 10: Heterogeneous effects of management on Student VA by Student Characteristics

	(1)	(2)	(3)	(4)	(5)
Management (Z-Score)	0.041 (0.030)	0.151* (0.081)	0.048* (0.025)		
Female x Mgmt	0.026 (0.026)				
PLE x Mgmt		-0.004 (0.003)			
Division 1 x Mgmt			0.055 (0.058)		
PLE x Targets				0.009** (0.004)	
Division 1 x targets					0.127** (0.061)
School Controls	Yes	Yes	Yes	Yes	Yes
N	15,775	15,775	15,775	15,775	15,775
r2	0.578	0.578	0.578	0.579	0.579

Std. Err. adjusted for 199 school clusters. School controls include number of students, fee rates, ownership, student socioeconomic status, location, and 'noise controls' or enumerator * p<0.1, ** p<0.05, *** p<0.01

In Table 14, we test for heterogeneous effects of management by different kinds of school - by school location, by size, by average student socioeconomic status, by dropout rate, and by level of tuition fees. Interaction terms are positive for socioeconomic status and the school drop-out rate, negative for tuition fees, and insignificant for school location and size. First, this implies that students do substantially better in schools that are both better managed and have higher SES students. Second, students do better in schools where dropout between S3 and the final S4 exam is higher, implicitly a selection effect rather than a treatment effect, and that this is greater in better managed schools. One explanation could be that better managed schools might encourage students not to take the final exam if they are not expected to do well.

Table 11: Heterogeneous effects of management on Student VA by School Characteristics

	(1)	(2)	(3)	(4)	(5)
Management (Z-Score)	0.060 (0.037)	0.056** (0.026)	0.053** (0.023)	0.060** (0.026)	0.044* (0.025)
Urban x Mgmt	-0.005 (0.090)				
Peri-urban x Mgmt	-0.013 (0.066)				
Num. students x Mgmt		-0.005 (0.028)			
SES x Mgmt			0.131*** (0.038)		
Drop-out rate x Mgmt				0.043* (0.026)	
Tuition fees x Mgmt					0.109*** (0.038)
School Controls	Yes	Yes	Yes	Yes	Yes
N	15,775	15,775	15,775	15,775	15,775
r2	0.578	0.578	0.580	0.579	0.579

Std. Err. adjusted for 199 school clusters. School controls include number of students, fee rates, ownership, student socioeconomic status, location, and 'noise controls' or survey enumerator

* p<0.1, ** p<0.05, *** p<0.01

Robustness

An obvious concern is that better managed schools may be higher performing for other reasons not related to management. Here we control for student socioeconomic status and school fees, which reduces but does not eliminate the effect of management.

The stronger correlation with raw test scores than value-added suggests that there may also be some selection bias in the effects of management on test scores before controlling for student intake.

The remaining (positive) effect of private schools on performance is unexplained, given that the effect of private schools on improved performance is sometimes attributed to improved management.

Finally, the model being estimated is the value-added specification, in which prior test scores account for past inputs and unobserved student ability. These prior test scores are measured four years before the later test score, implying that separate measures are needed for all school and family inputs between the two points in time. We have some variables, such as average student socioeconomic status, which may serve as a proxy variable for current and past family inputs, and various school characteristics (including fees) which proxy for some extent for school inputs. We don't have any measurements at the classroom or teacher-level, though the hypothesized effect of management on performance should work through improved teaching at the classroom level through better support and accountability for classroom teachers.

Dropouts between the start of secondary and the final examination are an important concern. The value-added specification will produce consistent estimates only if dropouts are caused only by time-invariant student characteristics. A common approach to dealing with bias caused by attrition is inverse probability weighting of observations, which can produce unbiased estimates of attrition is caused by observable individual characteristics. As our student-level sample only includes those who have taken the UCE exam, we do not have any data on the characteristics of the students that did drop out, so we can't estimate the probability of attrition within our sample. As an approximation however, we can look at the national distribution of primary school leaving exam (PLE) scores by gender, and estimate the probability of individual dropout based on the relative proportions of each score by sex for the pre-secondary entry PLE results and the PLE results of those taking the secondary certificate in our sample. Making this adjustment increases slightly the coefficient on management.

A second check is looking at the correlation between the reported number of dropouts between S3 and the final S4 exam at the school-level, for which we do have data, and the school management score. There is no systematic relationship between this school-level measure of dropouts and school management. In our sample, this rate of dropout between students in S3 and those taking the UCE exam at the end of S4 is 21%, above the overall national rate of reported dropout from students enrolled in S1 in 2011 to those enrolled in S4 in 2014 was 16%, down from a higher dropout rate in previous years.

Table 12: Secondary School Enrolment

Year	S1	S2	S3	S4	S1 to S4 Dropout Rate	S3 to S4 Dropout Rate
2008	291,797					
2009	296,400	280,026				
2010	324,487	277,345	256,385			
2011	320,273	279,267	230,989	222,226	24%	13%
2012		296,297	259,003	216,754	27%	6%
2013			284,919	250,274	23%	3%
2014				268,253	16%	6%

Source: Uganda Bureau of Statistics 2015 Statistical Abstract

Another concern here is our measurement of the dependent variable (UCE test scores), and whether any flaws in official test results as proxies for student learning is correlated with any of our independent variables. If a better managed school was only better at preparing students for exams without them actually learning any more, results for the effect of management on performance would be biased upwards. One check available for this is a question asked of Head Teachers about the amount of exam preparation carried out in schools. Controlling for exam preparation makes no difference to the coefficient of management on performance. Any 'classical' measurement error in prior test scores will lead just to an attenuation of the effect of these prior test scores on secondary scores.

5. Explaining variation in School Management

Although there is substantial variation in the quality of school management in Uganda, there are few differences on average between major types of schools. Unlike in the international data in which autonomous government schools score best on management, there is little difference in management score between most public, private, or public-private partnership schools. There are two exceptions; a small number of elite government schools that are on average 0.4 points better managed than other government schools, and a chain of internationally managed PPP schools, which score 1.1 points better than average. There is no difference between mainstream government schools and private schools, whether they are for profit or not for profit, and there is no difference in management quality between schools by religious orientation. There is little difference between schools that have selective admissions and those that do not, or between schools with different fee levels.

Readily observable Head Teacher characteristics also appear to have very little to do with school management. There is no relationship between Head Teacher qualifications, experience, or having a second job, with school management.

As well as predicting a positive effect of management on performance, the Bloom et al (2015) model of management as a technology also predicts factors that are associated with better management. These include a (i) a positive effect of competition on management, (ii) a positive effect of firm age on management, and (iii) that management is increasing in the local supply of skills (reducing the cost of hiring good teachers).

This is specified as below that management M is estimated as a function of school characteristics S , headteacher characteristics HT , and community characteristics C (including number of nearby schools and distance to a National Teacher Training College).

$$M_s = \alpha + \beta^1 S_s + \beta^2 HT_h + \beta^3 C_c + u_{ist} \quad (4)$$

We measure competition as the total number of schools (taken from the 2013 EMIS) per capita (from the 2014 census) within a sub-county. There are 2,792 secondary schools nationally and 1,382 sub-counties, giving an average of 2 schools per subcounty. In our sample the median school is in a subcounty that has 3 schools in total.

School age is the length of time in years since the school opened (captured in our survey). The supply of skills is measured by calculating the distance from each school to the closest of 7 National Teacher Training Colleges (NTCs), and by looking at local child literacy rates from the 2002 census. All government junior secondary school teachers must have at least a qualification from one of these colleges or a university.

Table 13: Management score by School Characteristics

	Schools	Management (Mean)	Management (SD)
<i>School type</i>			
Government (USE)	82	2.0	0.32
Elite Government (Not USE)	7	2.4	0.24
PPP (Private USE)	62	2.0	0.34
Private (Not USE)	48	1.9	0.32
PEAS (USE)	19	3.1	0.59
<i>Religious</i>			
Not religious	95	2.2	0.62
Anglican-Protestant	61	1.9	0.32
Catholic	47	2.0	0.35
Other	11	1.9	0.34
<i>Selective Entrance</i>			
No Selection	11	2.0	0.66
Academic Selection	204	2.1	0.48
<i>For Profit</i>			
Not for Profit	163	2.1	0.52
Profit	50	2.0	0.35
<i>Headteacher qualifications</i>			
Postgraduate	56	2.0	0.37
Graduate/ Bachelor's degree	142	2.0	0.32
<i>Headteacher's employment</i>			
No other job	187	2.1	0.51
HT has 2nd job	28	1.8	0.22

Of these variables, only school age is robustly correlated with management (after controlling for other school characteristics).

Table 14: Correlates of management performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Schools per capita (Z-Score)	0.029 (0.024)	0.026 (0.024)						
School age (Z-Score)			0.092*** (0.026)	0.065* (0.035)				
NTC (Z-Score)					0.047 (0.033)	0.042 (0.028)		
2002 Literacy Rate (Z-Score)							0.051** (0.024)	0.046 (0.033)
SES (Z-Score)		0.084** (0.034)		0.072** (0.036)		0.087** (0.034)		0.064* (0.037)
School Controls	No	Yes	No	Yes	No	Yes	No	Yes
N	199	199	199	199	218	199	199	199
r ²	0.008	0.125	0.061	0.142	0.009	0.130	0.023	0.129

School controls include number of pupils, socioeconomic status, region, urban location, and survey enumerator. * p<0.1, ** p<0.05, *** p<0.01

Looking at the different aspects of school autonomy, there is no relationship between autonomy over financial and personnel decisions (budget, salaries, and hiring) and overall management quality. For academic matters, only course choice is statistically significant, and none of admissions, course content, or textbook choice are (Table 16).

Focusing specifically on the people management component of the management score, schools with autonomy over hiring and salaries do score around 0.4 points higher on this component, though the combined R-squared of hiring and salary autonomy as factors explaining management score is below 0.1, indicating that our people management score captures substantially greater variation than a simple binary indicator of autonomy (Table 16). None of the autonomy measures are statistically significantly correlated with student performance.

Table 15: Management and School Autonomy

	(1)	(2)	(3)	(4)
budget	0.155 (0.133)	0.013 (0.133)		
salaries	-0.009 (0.108)	0.004 (0.111)		
hiring	0.009 (0.103)	0.142 (0.106)		
admissions			0.042 (0.073)	0.074 (0.083)
courses			0.103* (0.062)	0.128** (0.064)
content			0.041 (0.077)	-0.059 (0.087)
textbooks			-0.066 (0.066)	-0.077 (0.067)
School Controls	No	Yes	No	Yes
N	199	199	128	128
r2	0.009	0.170	0.032	0.258

Note: School controls include number of pupils, socioeconomic status, region, urban location, and survey enumerator. * p<0.1, ** p<0.05, *** p<0.01

Table 16: People Management and Autonomy

	(1)	(2)	(3)	(4)
hiring	0.330*** (0.084)		0.092 (0.131)	0.096 (0.127)
salaries		0.380*** (0.083)	0.309** (0.131)	0.250* (0.127)
School Controls	No	No	No	Yes
N	199	199	199	199
r2	0.072	0.095	0.098	0.276

Note: School controls include number of pupils, socioeconomic status, region, urban location, and survey enumerator. * p<0.1, ** p<0.05, *** p<0.01

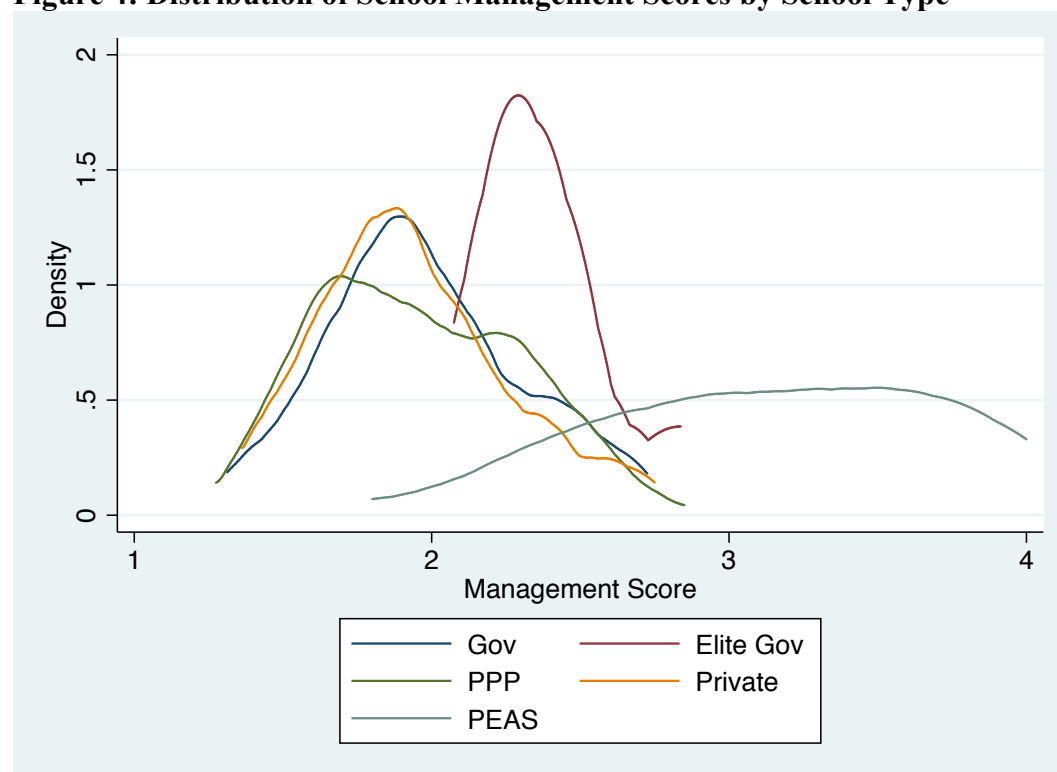
Why don't all schools adopt better management practices?

We are left with something of a puzzle, when we find that better management practices improve school performance, that these better management practices do not require extra financing or inputs, and yet schools do not adopt them. A simple explanation is an informational constraint – school leaders do not know what good management practice is. One piece of evidence for this hypothesis is the low correlation (0.145) between head teachers' self-assessment of school management with our measure.

Another is the example of the internationally-owned chain of non-profit PPP schools “PEAS”, which demonstrate what is possible with the same budget as other locally owned PPP schools. PEAS schools score a full 1 point (over 2 standard deviations) better than the average school in Uganda. Student exam performance reflects this improved management performance. Some key features of the PEAS model include;

- *More and better targets* - Whereas most schools in Uganda have targets limited to overall school enrolment and the number of school leaving exam top grades (which covers only 8% of pupils), PEAS schools have detailed school improvement plans with targets for a range of key performance indicators (enrollment, attendance, and attainment in terms of progress and absolute examination grades).
- *Stronger accountability for Head Teachers* - PEAS have acted to remove clearly under-performing head teachers from their posts, and have promoted successful head teachers into regional management roles. By contrast, 25% of head teachers locally owned schools reported feeling no personal responsibility at all for their school's performance.
- *Ongoing support and challenge* - School leaders receive regular training throughout the year and have repeated visits from PEAS' education team, who provide support and challenge to help them improve.
- *Specialisation and division of labour* - PEAS employ a school director alongside a head teacher to manage each school. Consequently, the head teacher is free to focus on the quality of teaching, and the experience of students in the school, rather than spending too much time on administrative tasks.

Figure 4: Distribution of School Management Scores by School Type



Conclusion

This paper adds to a growing literature on the importance of management for school performance. We collect the first comparable schools management data from sub-Saharan Africa, placing the management of Ugandan schools in international context. We find that management matters for school performance, measured by growth in individual student test scores (or “value-added”). Further, though there is some level of higher spending which can lead to better management (as demonstrated by the better performance of elite government schools), amongst non-elite schools there is little correlation between school fees or other school resources and management performance, showing that in principle better management can be a low-cost strategy for improving learning outcomes.

A priority for future research is understanding better the conditions in which school management matters most for student outcomes, and the extent to which this depends upon the effectiveness of accountability systems. It would also be helpful to test our finding that target-setting matters more than other aspects of management, and evaluate the cost effectiveness of different strategies designed to improve school leadership and management.

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