The Impact of Management Practices on Student and School Performance in Ghana

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Abstract

The importance of management practices for productivity has been shown in private firms by some research but there is little evidence for the public sector. In this paper, we seek to ascertain whether management practices matters for student and school performance in Ghana. This study uses data from a survey that collected data from senior high schools across Ghana. We apply factor analysis to identify different dimension of management practices and relate this with variation in test scores. While our measures of management quality may be endogenous, we find that management practices, such as monitoring, Human Resource Management (HRM), external inspections and internal strategies are correlated with student achievement. Students from better managed schools perform more successfully in the test and are more likely to pass the test. However, no firm conclusion can be drawn on the school level performance. The result also shows that headteacher characteristics, school qualities, teacher qualities and student characteristics can affect student test scores to some extent.

1 Introduction

Over the centuries, economists have been trying to uncover the mystery of the differences in the productivity between firms within countries and between countries. Despite the well-established determinants such as human and physical capital, infrastructure, financial development, and technology (see for example, Tybout 2000, Isaksson and Ng 2006, Islam 2008), there is a new consensus on the management practices in explaining the variations in productivity.

Bloom and Van Reenen (2007) conduct data analysis from manufacturing firms in four developed countries: United States, France, Germany, and the United Kingdom, and reveal a strong correlation between management practices and firm-level productivities across countries and within countries. They use survey instruments and interviews to score these practices based on four dimensions: operations, monitoring, targets and incentives. Also, they try to explain why these differences in management practices exist. Bloom, Mahajan, McKenzie and Roberts (2010) also examine the management practices in developing countries, where the productivity gap is huge. They attribute management practices as one of the reasons why firms in developing countries have low productivity. Evidence is taken from a randomized field experiment they run in India (Bloom, Eifert, Mahajan, McKenzie, and Roberts 2011). Working with a consulting company who provided training on management practices, they compare the productivity and profitability of treatment plants and control plants of large Indian textile firms and find significant improvement within the treatment group that received the best industry management practices.

A related strand in the literature is the impact of Human Resource Management (HRM) on productivity. HRM includes incentives, work organization and matching. A large number of studies show positive effect upon productivity of incentive pay (both individual and group) and new HRM practices (Bloom and Van Reenen 2010). Ichniowski, Shaw and Prennushi (1997) present a similar analysis in the steel production lines in the United States to find the effects of HRM practices upon productivity by comparing different HRM systems that have different strategies upon incentive pay, recruiting and selection, teamwork, etc. Another study shows a positive relationship between HRM and productivity by focusing upon performance pay in another American industry (Lazear 2000). Evidence can also be found in other countries including developing countries in Asia and Africa (see Bae and Lawler 2000, King-Kauanui, Ngoc and Ashley-Cotleur 2006, Ghebregiorgis and Karsten 2007).

Within the literature on management practices, the impacts of leadership on corporate performance cannot be ignored. As the leaders of firms, CEOs play an important role in the management of the firms. Bertrand and Schoar (2003) indicate that the heterogeneity across managers can explain some of the variations in corporate practices. By comparing 800 of the largest American firms, they show that some of the managerial characteristics are associated with corporate performance. The firms with more empowered CEOs display higher variations in firm performances implying that CEOs do make a difference (Adams, Almeida and Ferreira 2005).

These researchers focus upon the impacts of management practices in private sector firms. What about the influences in public sector?

To answer this question, we first should acknowledge the differences in management

activities between private and public sectors such as the decision-making processes, human resource management, and performance measurements. But whether these differences mean that management practices cannot take a role to improve the outcomes is not certain. For example, studies have shown that management matters in hospitals' productivity and quality across both cross-countries and within-countries (Bloom, Homkes, Sadun, Van Reenen, Dorgan, and Layton 2010). They score management practices for hospitals in seven developed countries and analyze the results by improving one-point score in management practices. Also, they test whether the factors which drive better management for firms still work in hospitals.

This paper focuses on the education sector since education shapes a country's future and school performances relate to a country's economic growth. Hanushek and Kimko (2000) use the test scores collected in the international mathematics and science examinations as indicators of human capital and subsequently analyze their impacts upon economic growth rates. Their within-US immigrants' analysis provides the fact that schooling quality matters in earnings.

The second question is whether management practices make a difference in schools. Besley, Hussain and Machin (2006) conduct an open questionnaire in British schools, scoring management practices based on target setting, monitoring and evaluation. And they conclude that the scores are associated with inspection grades.

A lot of studies focus on one aspect of management practices such as incentives, monitoring or leadership. Cross-country micro data has shown that institutional variations in incentive structure strongly matter in student performance (Ludger 2003). Within the different

dimensions of management practices, teacher incentive pay is a debated topic since the link to student achievement is unclear and as is the problem of controlling variables. A positive relationship between teacher's pay and student achievement is revealed in Indian private schools' data obtained by applying an achievement production function (Kingdon and Teal 2007, 2010). In their 2010 paper, they also examine the correlation between teacher unionization and student performance. Muralidharan and Sundararama (2011) run a 2-year teacher performance pay program in Indian government-run rural primary schools. The program shows significant improvement in students test scores. Monitoring brings the same result from an incentive program conducted also in India (Duflo, Hanna and Ryan 2012). In addition, leadership is worth studying. Besley and Machin (2008) answer the question "Are public sector CEOs different" and point out headteachers perform a leadership function analogous to the CEO in a private corporation. They conclude head teachers' pay is sensitive to school performance which is a major concern for the impact of CEOs on firm performance. The role of headteachers has been studied in other countries as well, for example, Kenya (Lydiah and Nasongo 2009). These studies show a similar impact on school achievement.

Even though an increasing amount of research on management practices takes place cross countries, most of them are in western developed countries or Asia developing countries. There is very limited literature studying the African countries practices, especially Ghana. Fening, Pesakovic and Amaria (2008) study the impact of management practices upon Small and Medium size Enterprises (SMEs) performance in Ghana and find a positive correlation between seven quality practices on firm performance. Financial sectors are investigated by Hansen-Thompson (2007) using two leading Ghanaian banks data. The case

study supports the general view of the link between HRM and corporate success. Even less attention is paid on public sector. There is only one report to assess HRM in Ghana health service (Quality Health Partners, Ministry of Health and Ghana Health Service, 2005).

The education sector of Ghana can play an important role in its growth and development. Focusing upon education quality, Yaw et al (2005) review the literature on Ghana and other African countries and show that the quality of education in Ghana is low by assessing several indicators (not including management practices). They also mention some previous studies sponsored by organizations and research centers between 1987-2005 which point to the ineffective leadership and inefficient management as a barrier to deliver quality education. Then they summarize this into the challenging situations faced by the Ghanaian education sector. In addition, Agyeman, Baku and Gbadamosi (2000) conduct a literature review on 34 studies on Ghana which use a variety of approaches. Their meta-analysis indicates that the inefficiency of the education sector management is an important reason for the low quality of education, and they recommend renewing the organizational structure. However, the impact of leadership is not covered in this review and the time frame needs to be updated. The predominant methodologies used by the selected studies are sample survey and analytical documentary approaches. In terms of leadership, Oduro and Macbeath (2003) explain what prevents headteachers of urban and rural schools in Ghana from fully filling their roles by interviewing 20 primary school headteachers. Some of the challenges of leadership include: the rural-urban issue, competences for school leaders, and administrative burden. It arrives at the same concern of the low education quality in school performance and the demand for improvement. Though management practices have been mentioned in previous studies, a

deeper, quantitative analysis of the impact of management practices on student/school performance needs to be conducted. This paper will fill this gap by using the data on management practices of headteachers in Ghanaian schools to test the prediction that management practices matter in student and school performances.

This paper is structured as follows: Section 2 provides a brief description of the Ghanaian education system, and also introduces the data on management quality in schools. Section 3 develops the two level models, describes the data set and controls for variables, including the methodology we use for measuring management practices. Section 4 presents results from running the models and discusses possible explanations to the questions raised by the results. Section 5 summarizes and offers conclusions.

2 The Context and School Survey Instrument

2.1 The context: Ghanaian education system and challenges

As one of the fastest growing economies in sub-Saharan Africa (Government of Ghana, 2014), Ghana has maintained its growth rate from: improved oil and gas production, increased private-sector investment, improved public infrastructure development and sustained political stability. The Ghanaian education system implemented Ghana's most recent reform in 2007 and made several achievements. According to the Ministry of Education of Ghana (2014), universal Basic Education shall now be 11 years, made up of: 2 years of Kindergarten, 6 years of Primary School and 3 years of Junior High School (JHS). At the end of JHS, students take the Basic Education Certificate Examination (BECE). After JHS,

students may choose to go into different streams at Senior High School (SHS), comprising General Education and Technical, Vocational and Agricultural and Training (TVET) or enter into an apprenticeship scheme with some support from the Government. SHS offer core subjects: English, Mathematics, Integrated Science, Social Studies and ICT (Information and Communications Technology); and one of the following course programmes: Agriculture, Business, Technical, Vocational, (Home Economics or Visual Arts), or General (Arts or Science) (Ghana High Commission Nigeria, 2014). If students choose to enter senior high schools for a three-year course, at the end of the three year senior secondary course, students will be required to write the West African Senior Secondary Certificate Examinations (WASSCE). The results of WASSCE determine whether students can enter university (NUFFIC, 2013).

Several programs were carried out and have achieved some improvements. One of them aimed to decrease the untrained teachers is called the National In-Service Training (INSET), which enhances skills of teachers in various specialties. However, these programs focus more on basic level education. The performance of Senior High Schools needs to be paid more attention to since they are the entrance to higher education. Besides, Ghanaian education system is still faced with many challenges which are considered to be the barriers for economic development. Yaw et al (2005) summarize major challenges such as unwillingness to incorporate research initiatives, financial constraints, uneven resource distribution, ineffective leadership, etc. Except for these ongoing issues, new topics have emerged in recent years: inequality in gender, low quality of learning achievements, inadequate of qualified teachers (Aheto-Tsegah, 2011). Also, headteachers are surrounded

with obstacles from social issues to internal responsibilities (Oduro and Macbeath, 2003). The barriers lead to even more inefficiencies in management. Since raising the quality of teaching and learning for effective outcomes is one of the goals of Ministry of Education, the approach of improving management practices would be a strategy.

2.2 The Survey Instrument

The data used in this paper is collected from a survey which was conducted in 135 out of approximately 600 senior high schools from across Ghana (Ksoll and Lehrer, 2012). The sample is randomly selected to be representative of all senior high schools in both urban and rural areas. As a cost-effective research tool to collect data, questionnaires are designed for headteachers of the selected senior high schools. Data from the headteacher questionnaires was collected in 2011, 2012 and 2013 in a sequence.

Some of the questions are taken from Besley, Hussain and Machin (2006)'s survey conducted in UK schools which provide high quality and reliable information for their study. In terms of methods, Bloom and Van Reenen (2007) mention that measuring management practices is a hard task and this is why they take the open-ended approach. However even their approach is not without critiques (i.e. is that measure really exogenous or not). So, most of the questions in the questionnaire are closed questions, with the focus on headteacher characteristics, management practices, and school facilities information. The remainder provides general school information, teacher status and student enrollment.

Part I asks basic school information, such as school name, location, type, and who the respondent is. Part II is about the headmaster or headmistress, including their characteristics,

their actions regarding management practices and teacher status. The last three parts ask about information of school facilities, school fees and management, and student enrollment. We will regroup the questions in the following sections. There are very limited open questions where they only need to answer the time, numbers, course, etc. All questions are very straightforward to avoid missing values or extreme values.

The analysis of this paper is based on the 2011 survey result. The questionnaires were carried out from May to July of 2011 (mainly in June) across all regions in Ghana by 6 interviewers. The detailed school information will be described in the following section.

3 Empirical Strategy

3.1 The model

To examine the impact of management practice on performance, there are two levels we can exploit: student-level and school-level. As a result of data collection, we have variations in headteacher characteristics, school quality, teacher status, and management practices. We also have WASSCE results for individual students in 2011. The ordinary least-squares (OLS) is our initial method of analysis. First, it is the student performance equation to be estimated:

$$AS_{ij} = \beta_0 + \beta_1 H_j + \beta_2 Q^S{}_j + \beta_3 Q^T{}_j + \beta_4 S_{ij} + \beta_5 M_j + u_{ij} \qquad (1)$$

Where AS_{ij} is the achievement score of the *i*th student in *j*th school measured by the result of WASSCE. The achievement is determined by headteacher characteristicsH_j; school and teacher qualities, $Q^S{}_j$ and $Q^T{}_j$; S_{ij} is the student characteristics captured by the WASSCE test information; and finally the management practices M_j. u_{ij} is the error term of

any unobserved characteristics affecting student achievement. The coefficient on M_j (β_5) is our variable of interest, since it tests the significance of management practices on student performance.

Besides student performance, a school-level analysis is developed:

$$A_j = \alpha_0 + \alpha_1 H_j + \alpha_2 {Q^S}_j + \alpha_3 {Q^T}_j + \alpha_4 M_j + v_j \qquad (2)$$

Where A_j is the achievement score of the *j*th school measured by the result of WASSCE, for example the average test score or the proportion of students passing the test; v_j is the error term of other impacts on school performance not captured by this model; other independent variables are the same as above but no student-level variables. Teacher variables are included because from the questionnaire, all teacher qualities are in school-level. We will describe the variables and measurements for each variable below.

3.2 Data

The data set consists of 135 Senior High Schools across all 10 regions in Ghana. Most of the respondents are headteachers (72%), and the rest are assistant headteachers (administration) (16%) and assistant headmasters (academic) (11%). In terms of dependent variables, WASSCE is a standardized test in West Africa. Then the test scores of it are comparable between sample schools in Ghana. We have individual WASSCE scores in 2011 and we picked the results only for the selected schools. Because there is no test information for three of those schools, the three schools are dropped from the dataset. Table 1 shows the descriptive statistics of the individual test scores. According to WASSCE grading system, the final grades are A1, B2, B3, C4, C5, C6, D7, E8, F9. For the school performance, we cluster

individual scores into school-level and have average scores for each school. The pass dummy variable is constructed if students pass in both Math and English, pass in either Social Studies or Integrated Science, as well as pass in three elective subjects. A pass grade is all grades except F9 (Ksoll and Lehrer 2012).

Table 1

Descriptive statistics of test scores for all schools and sample schools

	ALL Schools		SAMPLE schools	
	Mean	Std. Dev.	Mean	Std. Dev.
English Language	5.433	1.654	5.374	1.509
Mathematics	6.453	2.285	6.473	2.118
Social Studies	4.121	2.194	3.981	2.093
Integrated Science	6.500	2.133	6.403	1.979
Total	28.989	10.684	28.347	9.595
Pass	0.710	0.454	0.760	0.427

Note: The total is the sum of 6 subjects that are relevant for applying to university. It is math, English either integrated science or social science and the three best elective subjects from Agriculture, Business, Technical, Vocational, (Home Economics or Visual Arts), or General (Arts or Science).

From the descriptive statistics, our sample is representative of all senior high schools in Ghana. Though the pass rate is higher (76%) than all schools result (70%), we focus more on the total scores as they determine the entrance to university and the sample is a representative. The minimum total score is 6 and the maximum is 54. This high standard deviation draws our attention to derive the factors that lead to such differences.

From the questionnaire, we define different control variables to measure the independent variables introduced in equation (1) and (2). Table 2 describes variables we use to model the determinants of performance except for management practices, which will be explained

further in the next section.

Table 2

Variable definition

headteacher characteristics	
SEX	Gender of the headteacher: Male=1; Female=0
EXP	Experience in teaching profession in years
YEARS	Be a headmaster/headmistress in years
EDU	Headteacher's highest education level: Master's and PHD=1; Others=0
school quality	
TYPE	Type of the school:
BOY	1=boys only school; 0=others
GIRL	1=girls only school; 0=others
LOCAL	Locality of the school: rural=1, urban=0
ACCOM	Shortage of accommodation of on/off school permises Y=1; N=0
CLASS	Number of classrooms
BOOK	Total number of student textbooks in English and Math
FACILITY	Index of school facility. The index was constructed by giving a value of 1 for each of the following eight categories and adding up: sports field, toilets, canteen/dining hall, science lab, overhead projector, blackboards, functioning fans, functioning library.
LAB	School has a computer lab Y=1; N=0
teacher quality	
NUMBER	Total number of permanent teachers in 2010-2011
NASE	Number of teachers doing their national service
LEFT	Number of permanent teachers left last year
APP	Number of permanent teachers appointed this year
ABSENT	Number of teachers absent in a week
student characteristics	
FEM	Sex of the student Female=1; Male=0
AGE	Age of the student

Note: MSLC=Middle School Leaving Certificate, BECE = Basic Education Certificate Examination, GCE O'level= General Certificate of Education Ordinary Level, SSCE= Senior Secondary Certificate of Education, GCE A'level = General Certificate of Education Advanced Level.

To make it clear, we measure headteacher characteristics (H) by four variables:

$$\mathrm{H} = \{SEX, EXP, YEARS, EDU\} \quad (3)$$

Which include the gender of the headteachers (SEX), how many years' experience in teaching profession (EXP), how many years being a headmaster/headmistress (YEARS), and whether the headteacher's education level is masters or above (EDU). The variables used to measure school qualities include: the school type – two dummy variables: one for boys only schools and one for girls only schools; the locality of the school – rural or urban; whether there is a shortage of accommodation of on/off school premises; the number of classrooms the school has; total number of student textbooks that the school owns in English and Math (SH1-SH3, SH4 does not include because of missing values); facility index show whether the school has sports field, toilets, canteen/dining hall, science lab, overhead projector, blackboards, functioning fans, functioning library; and whether the school has a computer lab. So:

$$Q^S = \{TYPE, LOCAL, ACCOM, CLASS, BOOK, FACILITY, LAB\} \quad (4)$$

We measure teacher qualities by five variables: total number of permanent teachers in 2010-2011; the number of current teachers who are doing their national services; approximate number of permanent teachers who left the school last year; approximate number of permanent teachers appointed to the school this year; and the number of teachers who will be absent during a normal week.

$$Q^T = \{NUMBER, NASE, LEFT, APP, ABSENT\} \quad (5)$$

The student characteristics (S) are captured in the test information, which include the gender and the age of the students.

$$S = \{FEM, AGE\} \quad (6)$$

Table 3 presents the descriptive statistics for all the variables in the student achievement equation (1) except for management practices. Because of the different dimensions of management practices and a series of management related questions, we will apply another methodology to develop this key variable.

Table 3

Descriptive statistics of student achievement equation

Variable	Obs	Mean	Std. Dev.	Min	Max
headteacher characteristics					
SEX	31953	0.744	0.437	0	1
EXP	38932	30.471	5.654	9	41
YEARS	36370	6.077	6.649	0	41
EDU	39806	0.441	0.496	0	1
school quality					
TYPE					
BOY	39806	0.064	0.246	0	1
GIRL	39806	0.056	0.230	0	1
LOCAL	38793	0.256	0.436	0	1
ACCOM	39557	0.973	0.163	0	1
CLASS	39389	29.692	10.121	7	52
BOOK	33493	2285.594	1080.278	12	4590
FACILITY	39806	7.049	1.135	3	8
LAB	39806	0.916	0.278	0	1
teacher quality					
NUMBER	39806	64.388	21.705	11	113
NASE	39028	4.689	3.613	0	15
LEFT	39484	2.603	2.079	0	8
APP	39057	7.098	6.449	0	40
ABSENT	39400	2.849	3.773	0	35
student characteristics					
FEM	39806	0.430	0.495	0	1
AGE	39799	20.222	1.569	14.248	35.149

From the descriptive statistics, we can see large differences between schools in the number of classrooms, the number of student textbooks, and the number of permanent teachers. Also, it shows that on average, headteachers are experienced in teaching profession and do not hold a Master's Degree or above in education. The studied schools are well-equipped in facilities, textbooks and computer labs. Those are the improvements from the reform and government projects mentioned in Section 2. It should be noted that the average age of the students taking the test is 20 years old.

3.3 Methodology to measure management quality

Factor analysis is a data reduction tool commonly used in psychometrics, marketing, physical science, and to a smaller extent in economics. It is a statistical method used to analyze large numbers of correlated variables and to represent these correlated variables with a smaller set of unobserved variables called factors. The factors are formed that are relatively independent of one another. Factor analysis can investigate whether a number of variables of interest (observed variables) Y_1, Y_2, …, Y_i, are linearly related to a smaller number of unobservable factors F_1, F_2, …, F_k ($k<i$). Loadings are what weight the different variables have in the construction of the factor. The higher the load is, the more relevant in defining the factor's dimensionality. However, the factor loadings are not unique. To determine a first set of loadings, the most widely used method is the Principal Component Method. This method seeks values of the loadings that bring the estimate of the total communality as close as possible to the total of the observed variances (Tryfos, 1997). After having the first set of loadings, it is recommended to rotate the factor loadings to get a clearer pattern. The most

widely used rotation is the Varimax Criterion.

Factor analysis is also used in economics since it is a useful tool to remove redundancy or duplication from a large set of correlated variables and derive few estimated factors which contain more important information. Ross, Glewwe and Wydick (2013) use it to derive three orthogonal factors related to children's psychological well-being, and they define the factors: happiness, self-efficacy, and hopelessness. This methodology supports their study very well and obtains reasonable research results[1]. Wydick Glewwe and Rutledge (2013) apply this method again in a recent research paper. Economists use this approach in different fields and expand this methodology to adapt further research (see for example, Caudill, Zanella and Mixon, 2000; Zhao, Zhang and Wang 2006; Ludvigson and Ng, 2007; Bai and Ng 2008). In our case, we have quite number of questions that relates to management practices, and some of them are logically correlated with the others. Factor analysis will help to avoid the problem and find unobserved factors which can be our measurements for management practices (M) in our equations.

The variables we want to derive from are shown in the table below (Table 4). The descriptive statistics is shown in Table 5. To find the first factor solutions, we use the most widely used method – Principal Component Factoring –to determine the first set of loadings (Table 6). We follow Kaiser Criterion which suggests to retain those factors with eigenvalues equal or higher than 1. Four factors are retained and followed by an analysis using varimax rotation method.

[1] They analyze the impacts on adult life outcomes from international sponsorship organizations. A third follow-up study uses factor analysis to create measures of hopefulness and self-esteem. They find large and statistically significant impacts from child sponsorship on several of these measures.

Table 4

Management Variables

Pass	Headteacher pass by classrooms Y=1; N=2
Time	Time spent in a day passing by classrooms to check teaching in minutes
Obtime	Times observed any of the individual classes to evaluate teaching in the past month
Influapp	Influence of headteacher on the initial appointment of teachers: 1=no influence; 2=little influence; 3=moderate influence; 4=significant influence; 5=decisive influence
Influreplace	Influence of headteacher on the replacement of non-performing teachers: 1=no influence; 2=little influence; 3=moderate influence; 4=significant influence; 5=decisive influence
Meet	Times of the school organized formal parent-teacher meetings in the last academic year
Board	School has a board of governors Y=1; N=2
Training	How often the teachers receive in-service training in the past year: 1=not at all; 2=once during the past year; 3=once each term; 4=twice a term or more
Inspector	How often the school visited by a GES inspector in the last year: 1=not at all; 2=once during the past year; 3=once each term; 4=twice a term or more

Note: there is one more variable called *boardmeet* which measures how often the board of governors meet, which should be included. However, because *board* is the pre-question to *boardmeet*, including both will cause zero variation problems. So we drop *boardmeet* from our list. For simplification purposes the ordinal variables are treated as cardinal. GES = Ghana Education Service.

Table 5

Descriptive statistics of management variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Pass	132	1.576	0.496	1	2
Times	129	74.527	59.978	0	300
Obtime	129	3.760	10.028	0	100
Influapp	135	2.941	1.125	1	5

Influreplace	135	3.170	1.137	1	5
Meet	134	2.433	1.072	0	6
Board	135	1.067	0.250	1	2
Training	135	2.526	1.021	1	4
Inspector	133	2.158	1.218	1	4

We can see from the above table that the time spent in a day passing by classrooms and times observed any of the individual classes to evaluate teaching vary so much across schools. On average, all schools have applied management practices to some extent, but have no board of governors.

Table 6

First set of loadings

Factor analysis/correlation				Number of obs = 119
Method: principal-component factors				Retained factors = 4
Rotation: (unrotated)				Number of params = 30
Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	1.762	0.162	0.196	0.196
Factor 2	1.600	0.347	0.178	0.374
Factor 3	1.253	0.159	0.139	0.513
Factor 4	1.094	0.157	0.122	0.634
Factor 5	0.937	0.175	0.104	0.738
Factor 6	0.762	0.057	0.085	0.823
Factor 7	0.705	0.204	0.078	0.902
Factor 8	0.501	0.116	0.056	0.957
Factor 9	0.386		0.043	1.000

LR test: independent vs. saturated: chi2 (36) = 112.61 Prob>chi2 = 0.0000

Table 7 shows the rotated factor loadings from the analysis presented in Table 6. Uniqueness is the variance that is 'unique' to the variable and not shared with other variables.

Table 7

Rotated factor loadings

Variable	Monitoring	Power	Auxiliary	Internal Strategy	Uniqueness
Pass	0.076	-0.224	-0.592	0.045	0.591
Time	0.811*	0.067	0.096	-0.107	0.317
Obtime	0.778*	-0.195	-0.075	0.049	0.349
Influapp	-0.087	0.845*	-0.090	-0.115	0.257
Influreplace	0.018	0.847*	0.026	0.222	0.233
Meet	0.157	0.146	0.245	0.746*	0.338
Board	0.503*	0.056	-0.514	0.210	0.436
Training	0.102	-0.245	0.689*	0.073	0.450
Inspector	0.213	0.024	0.319*	-0.729*	0.321

We name the four factors based on the correlations between the latent factor and nine survey variables. According to the commonly measurements for management practices applied by other researchers (see, for example, Bloom and Van Reenen 2007; Besley, Hussain and Machin 2006; Bloom, et al 2011), HRM studies and CEO studies such as Adams, Almeida and Ferreira (2005), the controls are named following these research. Factor 1 is positively correlated with the time that headteacher pass by classrooms to check teacher's attendance and teaching, the time of observing individual classes to see how the teachers are teaching and to evaluate teacher performance, and whether the school has a board governors, so we name it "Monitoring". We label factor 2 "Power" because it is strongly correlated with the influence of headteachers on appointment of new teachers and

replacement of non-performing teachers. Here, the power represents specifically the headteachers' power on management which should be differentiated from their characteristics in variable H. Factor 3 is labeled as "Auxiliary" because it is positively correlated with teachers' in-service training and GES inspector visits. As mentioned above, in-service training is a government project for untrained teachers, so for school, this is a part of Human Resource Management. These two provide supplementary or additional help and support on the school management from the HRM and external sources. The last factor is positively correlated with the times of formal parent-teacher meetings, and negatively correlated with the inspector. We name it "Internal Strategy" because it is only the internal teaching strategies of the school which can be a part of inspecting since more meetings associated with less visits by GES inspectors. There are other two important aspects – target setting and incentives – which are not included in this paper because of the lack of data. But these four factors are interesting measurements we want to study on in order to examine the impact of management practices on performance. And they are tested before as good explanations to the variations in achievements.

So now we predict these four factors as the measurements of management practices:

$$\mathrm{M} = \{MONITORING, POWER, AUXILIARY, INTERNAL\ STRATEGY\} \quad (6)$$

4 Results

4.1 Student level

Table 8 shows the empirical result of equation (1). The first column presents the result from the OLS regression on total WASSCE scores that the students received in 2011, where standard errors are clustered at school level. Note for Column 1 that higher scores indicate worse outcomes, as on the WASSCE a score of 1 is the highest and a score of 9 is the lowest grade. The robust clustered standard error controls for minor concerns about failure to meet assumptions, such as iid (independently and identically distributed) standard errors and heteroscedasticity. We cluster into schools to indicate that the observations may be correlated within schools, but would be independent between schools. In the regression we control for all the variable vectors described above: headteacher characteristics (H), school quality and teacher quality (Q^S and Q^T respectively), student characteristics (S), and management practices (M).

We investigate whether factors that affect student achievements and whether better management practices are associated with better performance (i.e., lower scores and more likely to pass the test). Given the sample of around 20,000 students, management practices are highly significant in the determination of student achievements except for power. Auxiliary support for management is significantly correlated with scores negatively, which means HRM and inspections from Ghana Education Service positively impact student achievements. However, monitoring and teaching strategies positively correlate with individual test scores, which have negative effects on whether they pass the exam. We will explain some of the possible reasons below.

Before getting into that, there are other interesting findings showed in this analysis. Female headteachers and headteachers with more experience (captured through years of

being a headteacher) have negative effect on scores (i.e., better performance). Only some school qualities have impacts: school type, whether a school has accommodation shortage and the number of classrooms significantly correlate with scores. The students from the schools which are boys/girls only (not coeducational), and where there is no shortage in accommodation, and that have more classrooms perform better in the test. The number of permanent teachers left last year alone has an impact on the scores. Having fewer teachers left has a positive effect on student achievement. Student characteristics matter in a way that female students and older students perform worse in the test (3.08 and 1.44 standard deviations higher in scores, respectively).

Column (2) shows the logistic regression estimates of passing the test. In most cases, the coefficients have the opposite sign as in Column (1) because of WASSCE grading system and the way the variable “Pass” is constructed. A higher percentage in pass means the students are more likely to pass the test. The differences in observations come from the way of treating missing variables.

Table 8

Student achievement – OLS

	(1) Total	(2) Pass
headteacher characteristics		
SEX	3.362*	-0.448
	(1.924)	(0.461)
EXP	-0.093	0.031
	(0.116)	(0.027)
YEARS	-0.162*	0.009
	(0.094)	(0.030)
EDU	0.041	0.234
	(1.009)	(0.257)
school quality		

TYPE		
BOY	-6.557***	0.737*
	(1.269)	(0.420)
GIRL	-5.998**	1.451*
	(2.762)	(0.846)
LOCAL	1.448	-0.193
	(1.154)	(0.307)
ACCOM	7.401***	-1.673**
	(2.037)	(0.675)
CLASS	-0.208**	0.039
	(0.082)	(0.025)
BOOK	0.001	0.000
	(0.001)	(0.000)
FACILITY	0.099	-0.060
	(0.622)	(0.138)
LAB	1.782	-0.220
	(1.758)	(0.315)
teacher quality		
NUMBER	-0.021	-0.011
	(0.042)	(0.015)
NASE	0.076	0.009
	(0.182)	(0.044)
LEFT	1.142***	-0.152*
	(0.293)	(0.081)
APP	0.100	0.024
	(0.120)	(0.034)
ABSENT	-0.129	0.021
	(0.261)	(0.061)
student characteristics		
FEM	3.075***	-0.741***
	(0.355)	(0.085)
AGE	1.440***	-0.186***
	(0.130)	(0.027)
Management practices		
MONITORING	1.320***	-0.231**
	(0.437)	(0.102)
POWER	-0.228	0.002
	(0.569)	(0.147)
AUXILIARY	-1.351***	0.122
	(0.504)	(0.177)
INTERNAL STRATEGY	0.953**	-0.255**

	(0.384)	(0.122)
CONSTANT	-8.700	6.117***
	(6.381)	(1.741)
Observations	19,773	20,041
R-squared	0.264	

Notes: Column (1) is the OLS regression of individual total scores; Column (2) shows the logistic regression estimates of passing the test; Std. Error adjusted for 70 clusters at the school level; Robust standard errors in parentheses;* represents significance at the 10% level, ** at the 5% level, and *** at the 1% level.

By checking the Variance Inflation Factor (VIF), there is no severe multicollinearity problem in the data (no VIF>6). Then the endogeneity will be another concern and some variables may suffer from it. First, in the student-level equation (1), most of unobserved variables in the error term will be student characteristics, parental attributes and teacher characteristics (see examples in Kingdon and Teal 2007, 2010), as well as other management practices variables such as target setting and incentives introduced above. Some variables associated with teacher such as teacher's pay, hours of working may be associated with the error term but we do not have information on them. Also, the age and gender of students are not assumed to be correlated with the error term. Second, management practices may suffer from endogeneity because some management practices take place based on teachers' or students' performances. For example, monitoring and parent-teacher meetings are likely to be correlated with unobserved variables such as teachers' efforts, teachers' lack of skills, students' absence, etc. We will discuss this endogeneity problem in more detail below.

4.2 School level

The OLS result for the school-level is presented in Table 9. We use average total score (Column 1) and the proportion of students passing the test (Column 2) of each sample school as our dependent variables for school performance. In equation (2) described above which is at the school level, we control for headteacher characteristics (H), school quality, teacher quality (Q^S and Q^Trespectively), management practices (M) but no student characteristics (S). It is seen that from the relatively small sample for schools, our controls cannot explain the variations in test scores between schools. Management practices measured in our analysis do not have significant impact on school performance. Only the school type and number of teacher left are significantly correlated with school average scores and percentage of passing. They show the same sign as in the student level result. Even though other variables don't show significance, no firm conclusions can be drawn because of the modest sample size (N=111). We will use the student result as our preferred specification.

Table 9

School performance – OLS

	(1) Average Grade	(2) Average Pass
headteacher characteristics		
SEX	1.621	-0.032
	(1.529)	(0.064)
EXP	0.013	0.000
	(0.104)	(0.005)
YEARS	-0.079	0.003
	(0.102)	(0.005)
EDU	-0.739	0.035
	(1.305)	(0.060)
school quality		
TYPE:		
BOY	-5.454***	0.148**

	(1.550)	(0.067)
GIRL	-4.981**	0.134*
	(2.123)	(0.079)
LOCAL	0.902	-0.024
	(1.423)	(0.062)
ACCOM	1.633	-0.023
	(5.024)	(0.180)
CLASS	-0.121	0.005
	(0.101)	(0.005)
BOOK	0.001	-8.87e-06
	(0.001)	(2.98e-05)
FACILITY	-0.538	0.011
	(0.636)	(0.029)
LAB	-1.668	0.044
	(2.173)	(0.094)
teacher quality		
NUMBER	-0.077	0.001
	(0.047)	(0.002)
NASE	0.143	0.003
	(0.184)	(0.008)
LEFT	0.936***	-0.029**
	(0.265)	(0.012)
APP	-0.020	0.005
	(0.092)	(0.004)
ABSENT	0.072	-0.006
	(0.103)	(0.006)
Management practices		
MONITORING	-0.253	0.022
	(0.692)	(0.030)
POWER	-0.398	0.007
	(0.630)	(0.029)
AUXILIARY	-0.333	-0.009
	(0.659)	(0.030)
INTERNAL STRATEGY	0.459	-0.009
	(0.517)	(0.026)
CONSTANT	35.87***	0.454
	(7.048)	(0.300)
Observations	111	111
R-squared	0.478	0.290

Notes: Column (1) and (2) show the OLS regressions of average scores and average pass percentage

clustered by schools; Robust standard errors in parentheses; * represents significance at the 10% level, ** at the 5% level, and *** at the 1% level.

Now we know management practices significantly impact student achievements. Monitoring, auxiliary management as well as teaching strategies have significant effect on individual test scores. To check the coding and get a hint of the direction of influence of management practices on performance, we include original variables introduced in Table 4 in the student and school performance model. Table 10 presents the result of student and school level regressions, including all management variables instead of our measurements from factor analysis.

Table 10

Compare management practices and original management variables

	Student-level		School-level	
	(1)	(2)	(3)	(4)
	Total	Pass	Average Total	Average Pass
headteacher characteristics				
SEX	2.810	-0.325	1.509	-0.043
	(2.294)	(0.535)	(1.499)	(0.065)
EXP	-0.103	0.037	-0.013	0.002
	(0.120)	(0.030)	(0.107)	(0.005)
YEARS	-0.142	-0.001	-0.081	0.002
	(0.101)	(0.031)	(0.103)	(0.005)
EDU	-0.007	0.192	-0.908	0.040
	(1.030)	(0.265)	(1.376)	(0.063)
school quality				
TYPE				
BOY	-5.298**	0.343	-4.956***	0.158*
	(2.073)	(0.533)	(1.778)	(0.086)
GIRL	-6.523**	1.633*	-4.993**	0.139*
	(3.017)	(0.845)	(2.096)	(0.072)
LOCAL	1.626	-0.385	1.088	-0.038
	(1.140)	(0.317)	(1.442)	(0.061)
ACCOM	8.217***	-2.188**	5.139*	-0.138

	(2.143)	(0.941)	(2.917)	(0.102)
CLASS	-0.233***	0.048**	-0.124	0.006
	(0.079)	(0.023)	(0.103)	(0.005)
BOOK	0.001	0.000	0.001	-7.08e-06
	(0.001)	(0.000)	(0.001)	(3.17e-05)
FACILITY	0.146	-0.128	-0.444	0.004
	(0.742)	(0.168)	(0.664)	(0.029)
LAB	1.837	-0.095	-2.107	0.071
	(1.822)	(0.346)	(2.320)	(0.095)
teacher quality				
NUMBER	-0.005	-0.018	-0.078	0.001
	(0.044)	(0.013)	(0.047)	(0.002)
NASE	0.072	-0.002	0.122	0.002
	(0.185)	(0.045)	(0.185)	(0.008)
LEFT	1.148***	-0.141*	0.974***	-0.030**
	(0.310)	(0.079)	(0.279)	(0.013)
APP	0.113	0.022	-0.032	0.006
	(0.122)	(0.034)	(0.091)	(0.004)
ABSENT	-0.190	0.035	0.116	-0.009
	(0.273)	(0.059)	(0.109)	(0.006)
student characteristics				
FEM	3.060***	-0.744***		
	(0.363)	(0.083)		
AGE	1.413***	-0.172***		
	(0.134)	(0.027)		
Pass	1.619	-0.468	-0.482	0.009
	(1.060)	(0.311)	(1.250)	(0.056)
Time	-0.001	0.004	-0.010	0.001
	(0.011)	(0.003)	(0.009)	(0.001)
Obtimes	0.088*	-0.034**	0.105*	-0.005**
	(0.051)	(0.014)	(0.053)	(0.002)
Influapp	-0.560	0.074	-0.191	-0.029
	(0.702)	(0.187)	(0.541)	(0.029)
Influreplace	0.416	-0.225	-0.067	0.015
	(0.546)	(0.170)	(0.604)	(0.031)
Meet	0.113	-0.035	-0.046	0.002
	(0.348)	(0.097)	(0.508)	(0.024)
Board	5.249*	-0.728	-1.675	0.184
	(2.725)	(0.726)	(2.687)	(0.137)
Training	-0.133	-0.233	-0.499	-0.001

	(0.540)	(0.169)	(0.658)	(0.030)
Inspector	-0.503	0.086	-0.568	0.022
	(0.374)	(0.130)	(0.413)	(0.020)
CONSTANT	-15.37*	8.870***	39.34***	0.314
	(7.789)	(2.178)	(7.064)	(0.327)
Observations	19,773	20,041	111	111
R-squared	0.266		0.506	0.338

Notes: Column (1) is the OLS regression of total scores; Column (2) presents logistic regression of whether a student passed the test; Column (3) and (4) show the regression estimates of average score and average pass percentage for school level; All standard error clustered at the school level; Robust standard errors in parentheses; * represents significance at the 10% level, ** at the 5% level, and *** at the 1% level.

We can see both positive and negative impacts of management variables on scores but they are not all significant. Training and inspector are negatively correlated with scores, which is consistent with our findings of auxiliary management. The same for monitoring variables, all have positive effect. It is worth mentioning that the times observing any of the individual classes and whether the school has a board of governors matter in individual test scores.

The above findings raise two questions related to management practices: why the power of school headteachers is not significant in determining student and school performance? One possible reason could be the unlinked similarity of headteachers and CEOs of firms in African countries. Though Besley and Machin (2008) proved analogous function of headteachers to CEOs in England, there is no evidence of the same pay sensitivity of headteachers' pay to school performance in Ghana. So the power of headteachers would not impact achievements since the findings from studies of CEOs power on firm productivities do not apply to public service leaders of the country studied. Another explanation relates to the

insufficient control variables for power. In the headteacher questionnaire, we only have two questions related to the power of headteacher. Mentioned in Adams, Almeida and Ferreira (2005), there are four sources of power to measure CEO power: structural power, ownership power, expert power, and prestige power. They focus on structural power by measuring status as a founder, status as the sole insider on the board, and formal position/titles of the CEO. However, in this paper, the power measures only the influence of headteachers on teacher hiring and replacement process. So it lacks the data on any of the main measurements of power discussed in those studies of CEOs. Then the result does not show significance. The last reason could come from the variation in headteachers characteristics. We have shown above that headteacher characteristics are highly significant in test scores. The deeper influence on decisions from a less-experienced headteacher may not be a good thing. So the impact of power on achievements becomes uncertain.

The second question is why monitoring matters but has a negative impact? One potential interpretation is that headteachers need to monitor more when the teachers are not as reliable or when the classes have bad performance. The same for the teaching strategy, schools would organize more formal parent-teacher meetings for those classes with worse performance in tests. Then they suffer from endogeneity. Furthermore, according to Besley, Hussain and Machin (2006), Bloom and Van Reenen (2007), the measurements for monitoring include school level and teacher level, tracking performance, reviewing performance and consequence management and in a more continuously and systematic way. The headteacher questionnaire did not include additional questions to better capture monitoring. Then the time passing by classrooms and time observing a classroom to evaluate

teacher performance in the past month may not give us the real impact of monitoring on achievement. Further studies need to be conducted to gather more detailed data on monitoring.

5 Conclusion

In this paper, the data used is from a survey that collected variables from 135 schools chosen out of approximately 600 senior high schools from across Ghana to study whether management practices matter in student and school performance. The methodology used is factor analysis which is a good tool to derive important measurement for management practices since it removes redundancies from a large set of correlated management variables. There are different dimensions of management practices: monitoring, target setting, and incentives. We only focus on monitoring, HRM, and other strategies such as organizing parent-teacher meetings, and external inspections. In the study, we also add the power of the headteacher on the decision making process as one of management practices variables.

From the data of approximately 20,000 students, we find that management practices matter in student achievements. Except for the power of the headteacher, factors such as monitoring, HRM, external inspections and internal strategies can significantly explain some of the variations between students among schools in WASSCE test scores in 2011. Students from better managed schools perform more successfully in the test and are more likely to pass the test. However, monitoring and internal teaching strategies might be endogenous

because it is likely that they are correlated with teacher quality or student quality. For example, the headteacher would check and evaluate more when teachers are shirking from their duties. Other dimensions are less likely to have the problem since schools do not control the external inspections. However, the school level result does not show significant effects and due to the modest sample size, we cannot draw firm conclusion from the school level analysis.

Another observation from this survey study is that headteacher characteristics, school qualities, teacher qualities and student characteristics can affect student test scores to some extent. If the school has a female and more-experienced headteacher, is not coeducational, with no shortage in accommodation for on/ off school premises, has more classrooms, and has fewer permanent teachers left, students on average will perform better. It is shown in this paper that male and younger students have a higher percentage of passing the test. Senior high schools are important in the Ghanaian education system. So, for these schools, the choice of headteachers, and efforts put in school qualities are worth taking into serious consideration.

While some of these variables that measure management practices potentially suffer from endogeneity, they are consistent with the view that the importance of management practices in schools of Ghana indicates valuable economic approaches to improve student performance, especially for those schools that are supported by government and have a limited budget for improving other resources. Headteachers seem to play important roles in school achievement and management, and more successful Human Resource Management may improve students' achievement. It makes sense for students and parents to evaluate school management when comparing schools along with other criteria.

Our study has limitations so potential extensions to this work need to be pursued. First, not all dimensions of management practices are controlled. Only partial monitoring, HRM, and power are included in our models. A complete measurement and data for monitoring, target setting, incentives as well as HRM need to be considered. Second, teacher, student, and parent variables are not included. Restricted by the data, a large amount of teacher qualities, student characteristics, and parental attributes are in our error term. A further study that includes all of them can also eliminate the problem of endogeneity. It will draw an integral picture of the impact of management practices on achievements. Third, the study analyzes a single year data and a small number of schools. Management practices may change for schools across years, as well as the student scores. Can management practices explain multi-year variations in performance with and without school fixed effects? Can management practices impact school-level scores? The answer will present more implications about impact of management practices on student and school performance in Ghana.

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