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THE PRIVATE SCHOOL EFFECT ON STUDENT ACHIEVEMENT IN MATHEMATICS: A LONGITUDINAL STUDY IN PRIMARY SCHOOLS IN GHANA

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ABSTRACT: *As the preference for private school education becomes more widespread in Ghana, the debate on the relative merits of public and private education has gained increasing relevance and importance. To assess the differences in the educational outcomes of students, it is necessary to isolate the pure effect of school choice (private versus public). As part of a longitudinal study on teaching effectiveness in Ghana, this paper examines the effect of school type on child academic performance in mathematics. A representative sample of 73 primary schools in Ghana was selected and written tests in mathematics were administered to all grade 6 students of the school sample both at the beginning and end of the school year 2013–2014. Data on student background factors were also collected. Our analytical techniques (i.e., multilevel modelling) take into account the hierarchical structure of schools (i.e., students nested within classes, and within schools. Students in private schools appear to do better than their peers in public schools in both our correlation and multilevel analysis. The factors that stood out more clearly as important for achievement were student prior knowledge in mathematics, and school composition of students. Implications of findings are drawn.*

KEYWORDS: Learning Outcome Differentials, Private vs. Public Schooling

INTRODUCTION

The debate on public versus private education has gained increasing importance in recent years throughout the world (i.e., Day Ashley et al., 2014; Hanushek et al., 2003; Lauglo, 2010; Lubienski & Lubienski, 2006; Ntim, 2014; Nyarko et al., 2014). As the preference for private school education becomes more widespread in Ghana, the debate on the relative merits of public and private education has gained increasing relevance and importance (Akaguri, 2013). Like other countries, the perception in Ghana is that private schools offer a better education, an environment more conducive to learning, additional resources, and better policies and management practices. As a result parental choice implies that the more advantaged parents tend to send their children to privately managed schools.

However, a key question remains regarding the quality of education in private versus public schools. Multiple factors at the level of students (e.g., prior achievement), schools (e.g., quality teaching, school composition of students) and the community level (e.g., school location) interconnect to determine student learning outcomes (Hiebert & Grouws, 2007). The key point here is to disentangle the 'private school effect' from other factors that may be influencing learning outcomes (e.g., Lubienski & Lubienski, 2006). Thus, educational effectiveness researchers have taken advantage of new methodological developments (e.g., multi-level modeling, Value Added Models (VAM) in modeling school effects more efficiently (e.g., Creemers & Kyriakides, 2010; Rowan, Correnti & Miller, 2002).

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Prior studies in Ghana on this subject (e.g., Abudu & Fuseini, 2013; MOE, 2014; Nyarko et al., 2014; Ntim, 2014) were based on cross sectional data. Moreover, these studies did not address the hierarchical nature of schools in their analysis. Cross-sectional studies are subject to many methodological limitations including sampling bias and confounding effects (Goldstein, 1997; Lee & Bowen, 2006). Particularly, failure to recognize the hierarchical nature of data in educational settings, or any setting for that matter, results in unreliable estimation of the effectiveness of schools, which could lead to misinformed educational policies (Goldstein, 1997). As part of a longitudinal study on teaching effectiveness in Ghana, this paper uses multilevel modeling techniques to examine the effects of schools (private, public) on child academic performance. It was envisaged that the findings might generate data from which effective policies and interventions can be crafted for improving the learning of all children.

Background

The Government of Ghana has since independence in 1957 made a number of reforms to the educational system with the aim to achieve efficiency, accessibility and equity in service delivery (MOE 2013). For example, the Free Compulsory Basic Education (FCUBE) reform initiative introduced in 1992 has achieved a number of gains: the gender gap in primary school enrolment has been virtually eliminated. Gender ratio is now almost 1:1. Also, 89% of children in the 6-11 age brackets now attend school (MOE 2014). Also, the Government sees the growth of the private sector as key to increasing access to education. The Government has deliberately favored the development of private education by making non-salary inputs into private education institutions to encourage investment: About 29% of all primary schools are private and the number continues to grow rapidly. The number of private primary schools increased by 13.9% between 2008/2009 and 2012/2013, whereas the number of public primary schools increased by only 6% (same period) (MoE, 2013).

However, the major challenge that remains is the stark inequalities in student performance in the educational system. Over the years, results from both the National Education Assessment (NEA) and the Basic Education Certificate Examination (BECE) have consistently indicated that children attending public schools, of low socio economic background or those from rural areas lag behind their peers from the relatively well endowed families. For example, in the NEA 2013, grade six students attending private schools achieved three times more than their rural counterparts in math proficiency (i.e., 21% versus 6%). Also, the percentage-point gap between girls and boys who reached the minimum competency in math and English language was 5.3 and 2.9 respectively (MOE**,** 2014).

In the current age of accountability, educational policy requires evidence that student subgroups demonstrate levels of performance at par with one another (Dickinson & Adelson, 2014; Duncan, Magnuson & Votruba-Drzal, 2014). As indicated above, prior studies in Ghana on this subject (e.g., Abudu & Fuseini, 2013; MOE 2014; Nyarko et al., 2014; Ntim, 2014) were based on cross sectional data. Moreover, these studies did not address the hierarchical nature of schools in their analysis. Cross-sectional studies are subject to many methodological limitations including sampling bias and confounding effects (Goldstein, 1997; Lee & Bowen, 2006).

The current study uses a longitudinal design by collecting data on student achievement in mathematics both at the beginning and end of a school year. Data on background factors, and school context factors were also collected. Our analytical techniques take into account the hierarchical structure of schools (i.e., students nested within classes, and within schools).

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Multilevel modeling techniques is used in analyzing the joint effects of multiple factors at the level of the students, schools and the community level that interconnect to impact on student achievement. This comprehensive approach makes the study a unique one in Ghana. Specifically, after controlling for student background factors we model out the private/public school effect on student achievement.

LITERATURE REVIEW

Although schools are expected through quality teaching to reduce if not eliminate any gabs in student learning outcomes, there is a general agreement among educational researchers and scholars that factors both outside and inside schools interact to create achievement gaps among student groups (e.g., Creemers & Kyriakides, 2008; Desforges & Abouchaar, 2003). The genetic characteristics of the child i.e. sex, age, and aptitude have differential effects on achievement (Creemers & Kyriakides, 2008). Also, parental characteristics (e.g., genetic endowment, education, occupation, and income), believes and behaviors has an influence on child skill development, motivation and achievement (Eccles & Davis-Kean, 2005). Similarly, the school and its neighborhood conditions, the value for education by citizens and the resources available at the community level for learning also plays a part (i.e., Carlson, & Cowen, 2015). The focus of this review is on school characteristics.

School context

School context factors such as school location and type, school neighborhood conditions, and as well the composition of students in a school has an impact on child learning (Carlson & Cowen, 2015; Fischer, 2013; Parcel & Dufur, 2001). School neighborhoods differ in terms of the resources available for learning e.g., libraries, children's services, and well-educated and successful adult role models for children (Carlson & Cowen, 2015; Katz, 2014; Sastry & Pebley, 2010). As a result, children in schools have different skill levels, attitudes and behavior, in part because they are exposed to different home environments and neighborhood conditions (Downey, von Hippel, & Broh, 2004). A school composition can therefore be a source of motivation, aspiration and direct interactions in learning (Hanushek, Kain, Markman, & Rivkin, 2003; Burke, & Sass, 2011). According to Hanushek et al. (2003) peer group interaction is simultaneous nature, whereby a student both affects his or her peers, and is also affected by those peers (i.e., whiles a single slow learner or disruptive student may hold back an entire class, a small group of high achievers might inspire others to aim high in learning).

School neighborhoods effects on child learning outcomes have been studied by various researchers (e.g. Carlson & Cowen, 2015; Sastry & Pebley, 2010; Sirin, 2005). Sirin's (2005) meta-analysis recorded effect sizes of 0.28, 0.17 and 0.23 for suburban, rural and urban schools respectively. Also, in a study on family and school neighborhood sources of socioeconomic inequality in child reading and mathematics achievement (Sastry & Pebley, 2010), it was found that children in the higher socioeconomic bracket scored better primarily because their mothers had better reading skills and more schooling, and also because they lived in more affluent neighborhoods. Similarly, Carlson and Cowen (2015) investigated the relative importance of school neighborhoods in shaping student achievement in reading and math in 160 public schools spanning the period between 2007 and 2011 in the USA. It was that a student residing in a neighborhood in the 95th percentile of income distribution would on average, exhibit one-

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year test score gains of about 0.05 standard deviations greater than a student residing in the median neighborhood in both learning outcomes.

Other researchers (e.g., Braun, Jenkins & Grigg, 2006; Lubienski & Lubienski 2006) have also examined the effects of school type (public verses private) on learning achievement and concluded that private schools may not be as effective in delivering learning outcomes as commonly assumed. For example, Lubienski and Lubienski (2006) employed hierarchical linear models in examining public versus private performance in reading and mathematics for grades 4 and 8 student. Their data set was from the US National Assessment of Educational Progress (NAEP) assessments for 2003. After controlling for student and school-level variables (i.e., socioeconomic status, race/ethnicity, gender, disability, limited English proficiency, and school location), they came to the conclusion that the demographic differences between students in public and private schools accounted for the relatively high raw scores of private schools. Indeed, after controlling for those differences, the private school effect disappeared, and even reversed in most cases (Lubienski & Lubienski 2006, p: 3). Also, in analyzing PASEC data for Togo, Fehrler, Michaelowa and Wechtler (2009) found that students in private schools show higher overall performance, but this performance advantage vanishes when socio-economic background and initial knowledge as measured in the pre-test scores is adequately controlled for.

The number of students in a classroom can affect how much is learned in a number of different ways (Ehrenberg, Brewer, Gamoran, & Willms, 2001). According to the authors, the number of students in a classroom can affect how much is learned in a number of different ways. The interactions and social engagement of students in a classroom can result in for example, more or less noise and disruptive behavior, which in turn can affect the kinds of activities the teacher is able to promote. It can also affect how much time the teacher is able to use in focusing on individual students and their specific needs rather than on the group as a whole. Also, the composition of students in a classroom can be a source of motivation, aspiration and direct interactions and learning for all students (Hanushek et al., 2003). Peer groups can positively affect the learning process within a classroom through questions and answers, and contribution to the pace of instruction; but can also hinder learning through disruptive behavior.

A number of studies have also examined the effects of peers on achievement. In a meta-analysis of peer effects from 30 studies, Ewijk and Sleegers (2010) obtained an average weighted effect size of 0.32 for peer effects. Also, using both linear and non linear-in-mean models, Burke and Sass (2011) analyzed the impact of classroom peer ability on achievement. Their data was based on a longitudinal study covering all Florida public school students in grades 3–10 over a five-year period (1999–2005). They found small but statistically significant effects for peer effects in their linear-in-means models. In their nonlinear models, they found peer effects to be larger, and both statistically and economically significant. Similarly, Ferrer et al. (2004) analyzed PASEC data (2001/02) for Togo fifth and second grade. Students in private schools show higher overall performance, but this performance advantage vanishes when socio-economic background and prior knowledge is adequately controlled for.

In summary, the characteristics of the child (i.e., age, gender, prior knowledge) has an influence on his/her learning achievement (Davis-Kean 2005; Creemers & Kyriakides, 2008; OECD, 2013). Particularly, prior knowledge has a huge predictive power for learning achievement (Hattie, 2012; Slavin, 2014; Walberg, 2003). Similarly, school context factors (e.g., school location, public/private) can have an effect on learning outcomes depending on the model used (Carlson & Cowen, 2015) However, in order to avoid the limitations of sampling bias and

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confounding effects, it is important to use more advanced methodological techniques such as longitudinal and multilevel modeling techniques in educational effectiveness studies (Goldstein, 1998; Lee & Bowen, 2006).

METHODS

Participants

The primary school population in Ghana is (N=19,854) made of public schools (N=14,112) and private schools (N=5,742). Gender parity ratio is almost 1:1, whiles teacher/pupil ratio is 1: 45 (MOE, 2012). The study was conducted in the Upper East Region, one of the ten regions of Ghana, which has a total school population of (N=701). Using the stage sampling procedure, three out of the ten districts of the region were randomly selected. Thereafter, schools (N=73) representing 10% of the school population in the region were randomly selected. Then, all grade six classes/teachers (N=99) and their students (N=4386) served as participants. Out of this sample, 55 schools were public whereas 18 were private. The chi-square test did not reveal any statistically significant difference between the research sample and the population in terms of school type (X^2=1.03, d.f.=1, p=0.09). In regard to the student sample, 49% were male and 51% female and the chi-square test did not reveal any statistically significant difference between the research sample and the population in terms of pupils' sex (X^2=0.95, d.f.=1, p=0.43). The sample is representative of primary schools in Ghana in terms of the background characteristics for which statistical data of this region are available.

Dependent Variable: Student achievement in mathematics

Ghana operates a centralized system with standard mathematics text books for use in all primary schools (MOE, 2007). The assessment of learning is however the responsibility of schools and their teachers. For this reason, tests based on the prescribed curriculum were developed. To gain an accurate insight on the teaching and learning activities used in grade six in Ghana, specification tables were first developed for both the pre- and post-test measures capturing the salient themes in the curriculum and math text books. The test items covered tasks on basic operations, numbers and numerals, measurement of shape and space, collecting and handling data, and problem solving. The construction of the tests was subject to controls for reliability and validity (see Azigwe, 2015).

The pre-test measure was administered at the beginning of the school year in September 2013, whereas the post-test was administered at the end of the school year in July 2014. In both measures, the Extended Logistic Model of Rasch (Andrich, 1988) was used to analyze the emerging data to determine their reliability and validity. The analysis revealed that the scales in both measures had relatively satisfactory psychometric properties. Specifically, the indices of cases (i.e., students) and item separation were higher than 0.80. Moreover, the infit mean squares and the outfit mean squares were near one and the values of the infit t-scores and the outfit t-scores were approximately zero. Furthermore, each analysis revealed that all items had item infit with the range of 0.99 to 1.01. Rasch person scores for each student for each of the two measures were then generated for further analysis.

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Explanatory variables: Student and school background factors

A student questionnaire was designed for collecting data on background characteristics. The grade six students completed the questionnaires during the school year in 2013. The response rate was recorded at 89%. The questionnaires elicited each student's demographic profile and school context factors.

Basic student background variables: The following were coded as dichotomous variables: student sex (0=boys, 1=girls); educational level of fathers and mothers (no education = 0; middle school = 1; secondary school=2; college/university or above=3) and occupational status of fathers and mothers (not employed, peasant farmer, laborer=0, commercial farmer, small scale business owner, public servant=1).

School context: The following variables were taken into account: school type (public =1, private = 2); school location (urban= 1; rural= 2). The following continues variables were also taken into account: *Class size*, mean 43 (SD =15); Class composition of students. The classroom compositional variable was created based on an average of the educational level of mothers.

RESULTS

The following steps are used in presenting the results. Descriptive statistics of the data is first presented to inform the reader on the general patterns of the student characteristics. This is followed by correlation analysis of student math achievement with background characteristics. Then in the next step, we present multilevel analysis of the effects on student achievement by background factors.

Descriptive Statistics

The analysis is based on students who have scores in both the pre-test and post-test measures (N=3,585). Table 1 below presents descriptive statistics of student achievement by school type, school location, student sex and age. As can be observed in the table, out of the total number of students, 49% are boys, while 51% are girls. The mean achievement in the post-test was -0.97 (SD=1.07), minimum -4.39, maximum 2.72. The larger the standard deviation implies that achievement among the students was heterogeneous. Also, based on the mean cores, it appears students in private schools did better than their peers in public schools. Whereas students in private schools had a mean score of -.23, students in public schools had a mean score of -1.23. As expected, it appears students in urban schools did better than their rural counterparts. Whereas students in urban schools had a mean score of -0.68, students in rural schools had a mean score -1.28.

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Table 1: Student achievement by school type, location and gender

Variables		Frequency	%	Post-test score Mean	Std. Deviation
Sex	Boys	1749	49	-.95	1.05
	Girls	1837	51	-1.00	1.09
Age	11 years or below	475	14	-.68	1.16
	12 years	777	24	-.84	1.10
	Above 12 years	2053	62	-1.03	1.08
School type	Public	2679	75	-1.23	.96
	Private	907	25	-.23	1.03
School location	Urban	1824	51	-.68	1.04
	Rural	1762	49	-1.28	1.01

Correlation Analysis

The IBM SPSS Statistics software was used to run bivariate correlation analysis between the variables and students' achievement at the alpha level of 0.01. Figure 1 presents a correlation matrix of student achievement in mathematics (post-test measure) and background characteristics. As can be observed in the figure, the correlation between achievement and the pre-test measure (prior knowledge) is statistically significant at the level of 0.01. The variables school type and school location are also significant in favor of private schools, and schools located in urban areas respectively.

Post-test					
Pre-test	.544**				
Gender	-.026	-.026			
Age	-.125**	-.030	.068**		
Schooltype	-.404**	-.392**	.005	.121**	
SchLoc	-.280**	-.211**	.009	.182**	.442**

Figure 1. **Correlation matrix of student math achievement and background characteristics**

** . Correlation is significant at the 0.01 level (2-tailed).
* . Correlation is significant at the 0.05 level (2-tailed)

Multilevel analysis on the effects of student and school background factors on achievement

The data is hierarchically structured (i.e., students nested in classrooms, classrooms in schools, and schools in turn nested in districts). The score gains of the students are linked to their schools (N=73), and school location (rural, urban). The hierarchical structure of the data makes multilevel modeling the appropriate technique for analyzing the data (Goldstein, 2003). The MLwiN software (Goldstein et al., 1998) was used in conducting multilevel analysis on the effects on student achievement in mathematics by their background factors. A two level structure (i.e., students in level 1, schools in level 2) was used for the analysis.

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The random intercept model was used in conducting two-level models where the intercepts represent random differences between groups (Goldstein, 2003). In a two-level model, the residuals in achievement are split into two components, corresponding to the two levels of the data structure (Leckie & Charlton, 2012). The first model is an unconditional or null model with no predictor variables. The model is referred to as a variance components model, as it decomposes the variation in the dependent variable into separate level-specific variance components (Leckie & Charlton, 2012) (see equation 0 below). In the second step, student background factors were added to the null model to determine their impact (equation 1). Then in the third step school context factors were added (model 2). The models can be represented in following equations:

$$\text{Posttestscore}_{ij}=\beta_0 + u_j + e_{ij} \qquad (0)$$

$$u_j \sim N(0, \sigma_u^2)$$

$$e_{ij} \sim N(0, \sigma_e^2)$$

$$\text{Posttestscore}_{ij}= \beta_0+ \beta_1\text{Pretestscore}_{ij}+ \beta_2\text{StudAge}_{1j} +,\ldots, u_j + e_{ij} \qquad (1)$$

$$\text{Posttestscore}_{ij}= \beta_0+ \beta_1\text{Pretestscore}_{ij}+ \beta_2\text{StudAge}_{1j} \ldots+ \text{school type..}, u_j + e_{ij} \qquad (2)$$

Table 2 below presents the results. As can be observed in the first column of the table (model 0), 55% of the variance in student achievement is at the level of the school, and 45% at the level students. This is an indication that an extremely high proportion of the variance in achievement lies at the school level. This finding seems to reveal that schools matter more in Ghana. Also, having established a significant variation in student achievement between the schools justifies the need for a further examination of the factors accounting for this variation (Raudenbush & Bryk, 2002).

In this respect, in model 1, student background variables were added to the empty model. As can be observed in the (model 1), the pretest measure (a proxy for prior learning), and student sex (in favor of male students) had statistically significant effects on students' achievement in mathematics ($p< .05$). On the other hand, student age is not statistically significant. Also, as can be observed at the bottom end of the table for model 1, 29% of the variance in student achievement was explained by the student background factors, whiles 32% and 39% of the variance remained unexplained at the school and student levels respectively. The likelihood statistic (X^2) shows a significant change between the empty model and model 1 ($p<.001$) which justifies the selection of model 1.

In the next step in model 2, school context variables were added to model 1. As can be observed in the table, the column under model 2, school type (in favor of private schools), and classroom composition (i.e., aggregate of mothers' educational level) had a statistically significant effect on student achievement ($p<.05$). On the other hand, school location is not significant. Also, with the addition of school context variables to model 2, 36 % of the variance in achievement was explained whiles 25% and 39% of variance remained unexplained at the school and the student levels respectively. The likelihood statistic (X^2) also shows a significant change between mode 2 and model 3 ($p<.001$) which justifies the selection of model 3.

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Table 2. Parameter estimates (and standard errors) for the analysis of student achievement in mathematics (students within classes).

	Model 0	Model 1	Model 2
Fixed Part (Intercept)	-0.994 (0.080)	-0.893 (0.079)	-0.893 (0.079)
Students' context			
Pretest measure		0.370* (0.015)	0.368* (0.015)
Gender (female 1, male 0)		-0.049* (0.023)	-0.050* (0.023)
Age of students		-0.025 (0.020)	-0.015 (0.020)
School type			-0.407* (0.150)
School location			0.181 (0.118)
School composition			0.366* (0.113)
Random Part			
school level	55%	32%	25%
Students	45%	39%	39%
Explained		29%	36%
Significance test			
X2	8131	6843	6816
Reduction		1288	27
Degrees of freedom		2	4
p value		.001	.001

*=statistically significant at the 0.05 level

Discussions

This study examined the effects of student SES and school characteristics on student achievement in mathematics. Our analysis utilizes more appropriate and sophisticated methods than the in previous studies in Ghana. Like other studies examining learning achievement in developing countries (e.g., Cho, Schermanm & Gaigher, 2014; van der Berg, 2008; Zhao, Valcke, Desoete & Verhaeghe, 2012), we found 55% and 45% of the variance in student achievement at the school and student levels respectively. For example, Cho et al. (2014) used multilevel modeling techniques in analyzing TIMSS 2003 data for science achievement of South African students and found 41% of the total variance in achievement to lie at the student level, whiles 59% was at the school/classroom level.

This finding further advances the critical role of school for mathematics learning (i.e. Nye, Turner, & Schwartz, 2006; Willms, 2003). According to Willms (2003), school is generally more important for the learning of science and mathematics since parents may lack the required knowledge to support child learning of those subjects at home. We argue that school may even be more important for mathematics learning in developing countries considering the relatively low levels of education in such countries. For example, in this study, majority of mother parents (50%), and father parents (42%) do not have any educational qualification.

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There is broad agreement that good schools are those that have simultaneously high average achievement and an equitable distribution of achievement among students of different socio economic background (OECD, 2013). Similar to prior studies in Ghana (e.g., Buabeng et al., 2014; Chowa et al., 2013; MOE, 2014; Ntim, 2014), student sex appeared important for mathematics achievement in both our initial corelation analysis, and as well the multilevel analysis. The variable that mattered most at the students' level was prior knowledge in mathematics, which had a huge predictive effect on achievement (i.e., Hattie, 2009; Walberg, 2003). At the school level, what appeared important was the average SES (mothers' education). This suggests that students attending advantaged schools tend to score much higher than students attending disadvantaged schools. (i.e., Ewijk & Sleegers, 2010).

Other cross sectional studies in Ghana such as the biannual National Educational Assessment (NEA) has consistently found private schools to perform significantly better than public schools (see MOE, 2014). After controlling for student and school factors in our study, the school effect remained significant in favor private and public schools in performance. This finding appears not to be consistent with other studies. Fehrler et al. (2009) analyzes of PASEC data (2001/02) for Togo fifth and second grade found that students in private schools show higher overall performance, but this performance advantage vanishes when socio-economic background and initial knowledge as measured in the pre-test scores is adequately controlled for (see also Lubienski & Lubienski, 2006).

CONCLUSION

The study explored the joint effects of students and school context variables on student mathematics achievement from the perspective of Ghana. We advance prior research on SES in Ghana by drawing on a longitudinal design and applying regression techniques suited for school data. It was envisaged that the study might contribute to effective policies and interventions for improving the learning of all children, and particularly the disadvantaged children. At the student level, the factors that stood out more clearly as important for learning were prior mathematics. Also, the private school and school composition of students were also significant. This highlights the existence of a private school premium, perhaps caused by better management and supervision of in these schools than in public schools.

Our study is however our study is not without limitations. Although our study explored the effects of several factors at the level of students, other equally important variables such as students' beliefs, attitudes or motivation for learning are mediators of academic performance (i.e., Eccles & Davis-Kean, 2005). The study does not control for endogeneity completely so it is unclear whether the differential in performance is entirely due to better quality of education provided in private schools or some unobservables such as innate abilities of children, difference in motivation and performance of teachers etc. Furthermore, school level factors like quality of teachers or school facilities have not been controlled for so the differences in outcomes are not explained fully. Future research on how such variables in addition combine to exert their influence on learning achievement is needed. Particularly, there is the need to examine the quality of teaching in both private and public schools to determine any differential effects.

The limitations notwithstanding, we are able to make recommendations that can improve child learning in Ghana and countries of similar characteristics like that of Ghana. The foregoing has

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highlighted those areas that are significant determinants of student performance and thus which areas should receive policy priority. The larger values of the intraclass correlation coefficient found here suggest that policy interventions are required earlier rather than later in the education process, as this high level of between school inequality arose before secondary school level. Also, as established in the study, the school is especially very important for the learning of mathematics. Therefore, educational authorities, schools and teachers can take concrete actions to increase and improve the quantity and quality of time children spend in mathematics and science courses since parents may not have the capacity to help in these courses at home. For example, extra afterschool learning programs targeted at students of low SES families can be a useful option. Also, children in schools have different skill levels, and motivation, in part because they are exposed to different home environments and neighborhood conditions (Downey et al., 2004; Hanushek et al., 2003). Therefore, classroom teachers can maximizes the potential benefits of peer group interactions and learning, whiles working as much as possible to reduce if not eliminate any negatives that may also stem from differences in children.

REFERENCES

Abudu, A. M. & Fuseini, M.N. (2013). Influence of single parenting on pupils' academic performance in basic schools in the Wa municipality. *International Journal of Education Learning and Development, 1*(2),*85-94.*

Academy of Education (IAE) Belgium and the International Bureau of Education, Switzerland achievement. *Psychological Science in the Public Interest, 2*(1), 1-30.

Akaguri, L. (2013). Fee-free public or low-fee private basic education in rural Ghana: how *American Sociological Association, doi: 10.1111/cico.12005*

Andrich, D. (1988). A general form of Rasch's extended logistic model for partial credit scoring. *Applied Measurement in Education, 1*(4), *363-378.*

Azigwe, J.B. (2015). *Searching for teaching factors that explain variation in student learning outcomes: a longitudinal study in primary schools of Ghana*. Published Phd Thesis, University of Cyprus, Cyprus.

Bradley, R.H., & Corwyn, R.F. (2002). Socioeconomic status and child development. *Annual Review Psychology 53*, 371–99.

Braun, H., Jenkins, F., and Grigg, W. (2006). *Comparing private schools and public schools using hierarchical linear Modeling (NCES 2006-461).* Washington, DC: Department of Education, National Center for Education Statistics, Institute of Education Sciences Government Printing Office

Burke, M.A. & Sass, T.R. (2011). *Classroom peer effects and student achievement*. Public Policy, Federal Reserve Bank of Boston, Discussion paper , No. 11-5 http://www.bostonfed.org/economic/ppdp/index.htm.

Carlson, D. & Cowen, J.M. (2015). Student neighborhoods, schools, and test score growth: Evidence from Milwaukee, Wisconsin. *Sociology of Education ASA, 88*(1), *38-55.*

Cho, M-O., Scherman, V., & Gaiger, E. (2014). Exploring differential science performance in Korea and South Africa: a multilevel analysis. *Perspectives in Education, 32*(4), 21-39.

Chowa, G.,Masa, R., & Tucker, J. (2013). The effects of parental involvement on academic performance of Ghanaian youth: Testing measurement and relationship using structural equation modeling. *Children and Youth Services Review, 35*(12), 2020-2030. doi:10.1016/j.childyouth.2013.09.009

ISSN 2055-0219(Print), ISSN 2055-0227(online

Creemers, B. P. M., & Kyriakides, L. (2008). *The dynamics of educational effectiveness research*. A contribution to policy, practice and theory. London and New York: Routledge.

Dahl, G.B. & Lochner, L. (2012). The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit, *American Economic Review , 102(5): 1927–1956* *http://dx.doi.org/10.1257/aer.102.5.1927 1927*

Day Ashley, L., Mcloughlin, C., Aslam, M., Engel, J., Wales, J., Rawal, S., Batley, R., Kingdon, G., Nicolai, S., & Rose, P. (2014). The role and impact of private schools in developing countries: a rigorous review of the evidence. Final report. Education Rigorous Literature Review. Department for International Development.

Desforges, C. & Abouchaar, A. (2003). *The impact of parental involvement, parental support and family education on pupil achievement and adjustment: A literature review*. London: Department for Education and Skills

Dickinson, E.R. & Adelson, J.L. (2014). Exploring the Limitations of Measures of Students' Socioeconomic Status (SES), *Practical Assessment, Research & Evaluation* Volume 19, Number 1, May, 1531-7714

Downey, D.B. von Hippel, P.T. & Broh, B.(2004). Are Schools the Great Equalizer? School and Non-School Sources of Inequality in Cognitive Skills (Running Head: Are Schools the Great Equalizer?) *American Sociological Review*, 69(5), 613-635

Duncan, G. J. Magnuson,K. & Votruba-Drzal, E. (2014). Boosting Family Income to Promote Child Development VOL. 24 / NO. 1 / SPRING, 99, www.futureofchildren.org

Duncan, G.J. & Magnuson, K. A. (2005). Can Family Socioeconomic Resources Account for Racial and Ethnic Test Score Gaps? VOL. 15 / NO. 1 / SPRING, www.future of children.org

Eccles, J.S. & Davis-Kean, P.E. (2005). Influences of parents' education on their children's educational attainment: the role of parent and child perceptions. *London Review of Education, 3*(3), *191-204.*

Ehrenberg, R. G., Brewer,D. J., Gamoran, A., & Willms, J. D. (2001). Class size and student achievement. *Psychological Science in the Public Interest, 2*(1), 1-30.

Ewijk, R. V. & Sleegers, P. (2010). The effect of peer socioeconomic status on student achievement: A meta-analysis. *Educational Research Review, 5, 134–150.*

Ferrer, E. Salthouse, T.A. Stewart, W.F. & Schwartz, B.S. (2004). Modeling age and retest processes in longitudinal studies of cognitive abilities. *American Psychological Association, 19*(2), *243–259* .

Fischer, C.S.(2013). Showing that neighborhoods matter: City and community. *American Sociological Association, 12*(1), *7–12.*

Goldstein, H. (1979). The design and analysis of longitudinal studies: Their role in the measurement of change. New York: Academic Press

Goldstein, H. (1997). Methods in school effectiveness research. *School effectiveness and school improvement, 8*(4), 369-395.

Goldstein, H. (2003). *Multilevel statistical models* (3rd ed.). London: Edward Arnold.

Hanushek, E. A. Kain, J.F. Markman, J.M. & Rivkin, S.G. (2003). Does peer ability affect student achievement? Journal of Applied Econometrics, 18: 527–544

Hattie, J. A. C. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. London: Routledge.

Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In Lester, F.K. (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 371-404). Charlotte, N.C.: Information Age Publishers.

ISSN 2055-0219(Print), ISSN 2055-0227(online

International Education DOI: 10.1080/03057925.2013.796816

Katz, L.F. (2014). Reducing inequality: Neighborhood and school interventions. *Focus, 31(2), Fall/Winter*

Kaufman, S.B., Reynolds, M.R. Liu, X. Kaufman, A.S. & McGrew, K.S. (2012) . Are cognitive g and academic achievement g one and the same g? An exploration on the Woodcock–Johnson and Kaufman tests, Intelligence, doi:10.1016/j.intell.2012.01.00

Lauglo, J. (2010). *Do Private Schools Increase Social Class Segregation in Basic Education Schools in Norway?* published by the Centre for Learning and Life Chances in Knowledge Economies and Societies at: http://www.llakes.org.uk.

Leckie, G. & Charlton, C. (2013). runmlwin - A program to run the MLwiN multilevel modelling software from within Stata. *Journal of Statistical Software, 52 (11), 1-40***.**

Lee, J.S. & Bowen, N.K. (2006). Parent Involvement, Cultural Capital, and the Achievement Gap Among Elementary School Children, *American Educational Research Journal, Summer , Vol. 43, No. 2, pp. 193–21*

Lubienski, C., & Lubienski, S.T. (2006). *Charter, Private, Public Schools and Academic Achievement: New Evidence From NAEP Mathematics Data*. New York, NY: Columbia University

MOE, (2012). Ghana National Education Assessment, Findings Report, Ghana Education Service Assessment Services Unit**,** January 24

MOE. (2007). Teaching syllabus for mathematics (primary school 1 - 6). Accra: Ministry of Education, Curriculum, Research and Development Division (CRDD), Ghana.

MOE. (2013). Education sector performance report. Accra: Ministry of Education**,** Ghana.

MOE. (2014). National Education Assessment Technical Report (Final Version). Ghana Education Service: National Education Assessment Unit.

Ntim, S. (2014). The Gap in Reading and Mathematics Achievement between Basic Public Schools and Private Schools in Two Administrative Regions of Ghana: Where to Look for the Causes *American International Journal of Contemporary Research Vol. 4, No. 7*

Nyarko, K. Adentwi, K.I.Asumeng1,M. &Ahulu,L.D. (2014). Parental attitude towards sex education at the lower primary in Ghana. *International Journal of Elementary Education*

Nye, C. Turner, H. Schwartz, J. (2006). Approaches to Parent Involvement for Improving the Academic Performance of Elementary School Age Children, Campbell Systematic Reviews: 4 DOI: 10.4073/csr.4

OECD (2012). *Public and private schools: How management and funding relate to their socio-economic profile*, OECD Publishing. *http://dx.doi.org/10.1787/9789264175006*

Parcel,T.L. & Dufur, M.J.(2001). Capital at home and at school: Effects on student achievement. *Oxford University Press*, *79*(3), *881-911*.

Raudenbush, S., & Bryk, A. (2002). *Hierarchical linear models: Applicant and analysis methods*. Second edition, Sage: Thousand Oaks.

Sastry, N. & Pebley, A.N. (2010). Family and neighborhood sources of socioeconomic inequality in children's achievement**.** Population Association of America 777-800

Sirin, S. R. (2005). Socioeconomic status and academic Aachievement: A meta-analytic review of research. *Review of Educational Research, 75*(3), *417–453.*

Slavin, R.E. (2014). *Educational psychology, theory and practice* (10th ed.). Prentice Hall: Pearson Education Limited.

van der Berg, S. (2008). How effective are poor schools? Poverty and educational outcomes in South Africa. *Studies in Educational Evaluation, 34*(3), 145-154.

Walberg, H. J. & Paik, S.J. (2000). *Effective educational practice*. Switzerland: PCL, Lausanne, International Academy of Education, International Bureau of Education.

ISSN 2055-0219(Print), ISSN 2055-0227(online

Zhao, N., Valcke, M., Desoete, A., & Verhaeghe, J.P. (2012). The quadratic relationship between socioeconomic status and learning performance in China by multilevel analysis: Implications for policies to foster education equity. *International Journal of Educational Development 32*(3), 412–422.

ISSN 2055-0219(Print), ISSN 2055-0227(online