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A Research Programme Consortium on
Implementing Education Quality in Low Income Countries

SOCIAL AND ECONOMIC EFFECTS ON PRIMARY PUPILS' READING ACHIEVEMENT: FINDINGS FROM SOUTHERN AND EAST AFRICA

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ABSTRACT

This study goes beyond the well-established link between pupils' socio-economic status (SES) and their achievement in school through investigating what material resources in the home and social influences give primary school students an advantage in learning to read. This is done through investigating the pupil characteristics that correlate with reading achievement in the second wave of data collected by the Southern and East African Consortium for Monitoring Education Quality (SACMEQ) in 2000-2. The study focuses on six low income countries (Kenya, Malawi, Mozambique, Tanzania, Uganda and Zambia) and four small middle income Southern African states (Botswana, Lesotho, Namibia and Swaziland). The variables investigated are divided into four themes: pupil individual background (e.g. gender, school location, frequency of use of language of instruction outside of school); living conditions (e.g. access to water and electricity, number of meals eaten in a day); educational resources and support for learning in the home (e.g. access to books and interest of adults in education); and social influences (e.g. parental education, peer influence).

Some well-known associations between pupil background factors are confirmed, such as the advantage of speaking the language of instruction outside of school, progressing through primary school without repeating a year, being well-nourished and having parents with post-basic levels of education. With respect to these variables, the study offers a nuanced understanding of these dependencies and some of their interactions within the East and Southern African region. Interactions between gender and location revealed complex patterns of dependency. Individual repetition and the peer effect of having large numbers of repeaters in a school has a greater impact in the small Southern African states than the larger low income countries. Children who ate less than two meals a day were very strongly disadvantaged. Resources available to learners in the home that support reading and writing, such as books, artificial lighting and, in some countries, a table, were associated with higher achievement. However, other indicators of SES that are not useful in reading and writing, such as quality of building materials used in the home and access to water or electricity, were either insignificant or had only a very small effect in a limited number of countries.

The findings point to some clear implications for policy and research. Policies to improve girls' or boys' learning need to be informed by research and consultation at the national and sub-national levels. Efforts to ensure that children enter primary school at the correct age and then progress without repetition continue to be needed. Training teachers and designing curricula towards minimizing the use of repetition as a remedial strategy is particularly important in the Southern African small states. Targeted school meal programmes are likely to have a significant impact in tackling disadvantage, particularly in Botswana and Namibia. These, however, should not be implemented as a blanket policy at the national level, but rather targeted at schools where a substantial proportion of children eat less than two meals a day. Findings on resources in the home suggest that the cultural or social capital of the home is just as important as economic wealth in determining pupil performance, and that local awareness-raising campaigns and complementary education programmes targeted at communities where educational aspirations tend to be low is a way forward to be explored.

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ABBREVIATIONS

DFID	Department for International Development
EFA	Education for All
FPE	Free Primary Education
GDP	Gross Domestic Product
HDI	Human Development Index
HL	Heyneman-Loxley
IEA	International Association for the Evaluation of Educational Achievement
IIEP	Institute for Educational Planning
IRL	International Study of Reading Literacy
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
SACMEQ	Southern and East African Consortium for Monitoring Education Quality
SES	Socio-economic status
TIMSS	Trends in Mathematics and Science Study
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

1. INTRODUCTION

Between 2000 and 2002, the Southern and East African Consortium for Monitoring Education Quality (SACMEQ), a consortium made up of 14 ministries of education, administered standardised reading and mathematics tests to around 46,000 grade six learners across the 14 SACMEQ countries. At the same time, information was collected from pupils on their individual background, from teachers on their background, practices and professional attitudes, and from headteachers on both contextual and whole school organisational information. This paper presents the findings of secondary analysis of data from ten of the countries in the SACMEQ II survey using multi-level modelling to investigate key social and economic factors that best explain the variation seen in pupil attainment in the reading test. The countries we investigate are Botswana, Lesotho, Kenya, Malawi, Mozambique, Namibia, Swaziland, Tanzania, Uganda and Zambia.

International survey research suggests that a substantial proportion of learners in low and middle income countries are not achieving desirable levels of literacy even when they are enrolled in school. For example, in the 2006 Progress in International Reading Literacy Study (PIRLS) survey less than 22% of grade four students in South Africa and 26% in Morocco achieved the 'lowest international benchmark', compared to more than 95% in North American and Western countries (for more detail see Mullis *et al.*, 2007, p.69). A first glance at the SACMEQ II test results reinforces this picture. More than 40% of pupils tested in Malawi, Mozambique, Uganda, Zambia, Zanzibar, Lesotho and South Africa were assessed as unable to 'read for meaning'¹. Even when the limitations of international standardised tests for comparing across countries implementing different curricula in different languages are taken into account (Beaton *et al.*, 1999; Goldstein, 2004), these findings indicate a denial of children's right to education of an acceptable quality on a grand scale (Tomaševski, 2001).

Previous studies which have conducted secondary analysis of the whole SACMEQ II dataset have identified socio-economic status (SES) as a strong predictor of pupil attainment, although the strength of the dependence varies considerably from country to country (Lee *et al.*, 2005; Zhang, 2006; Atherton, 2009; Hungi & Thuku, 2010b). The research presented here sets out to identify specific resources in the home and social influences outside of school that appear to influence the reading ability of primary school pupils with higher or lower SES. So rather than using a composite SES, we explore individually the indicators that typically are constituents of such a variable, such as the material from which a pupil's house is made, possessions in the home, and parental education (Dolata, 2005).

Another difference to the previous studies lies in our modelling approach. Previous studies have either covered all 14 countries, focused on a small number - usually three to five (for example, Spreen & Fanscali, 2005; Zuze, 2008), or just one country, sometimes exploring only a narrow selection of variables that are relevant to a targeted question (for example, Paviot *et al.*, 2008; Hungi & Thuku, 2010a). In this study we investigate ten out of the 14 countries by constructing a separate model for two country groupings that are relatively homogeneous. The first grouping consists of six low income countries (Kenya, Malawi, Mozambique, Tanzania, Uganda and Zambia) with a population between 10 and 40 million. The second grouping consists of four small states that are classified as lower middle income (Botswana, Lesotho, Namibia and Swaziland). Constructing two separate models for the grouping of low income countries and the grouping of small lower middle income countries is expected to enhance the sensitivity to differences in SES effects between countries that differ markedly in respect to national economic prosperity and demography by allowing for different variables to be retained as significant within each model.

The next section describes the SACMEQ II dataset and the analytical approach taken in the research reported here, whereby separate models were constructed for a group of low income countries and a group of small lower middle income states. In the third section, findings from the statistical analysis are detailed with some commentary under the four themes of pupil background, pupil living conditions, educational resources in the home, and social influences on learning. The fourth and fifth sections respectively set out policy implications and implications for further research that flow from these findings. The paper concludes by reflecting on how the analytical approach has generated new insights and a nuanced understanding of how SES influences achievement in reading in the ten countries investigated.

2. ANALYTICAL APPROACH

2.1 Background to SACMEQ II

SACMEQ is a consortium of ministries of education supported technically by the United Nations Educational, Scientific and Cultural Organization's (UNESCO) International Institute for Educational Planning (IIEP). Its primary function has been to train ministry personnel in aspects of the design and administration of data collection instruments and in data analysis, in order to enhance the monitoring of education quality in their respective countries (see Murimba, 2005). Its second major function has been to provide support and information for participating countries to inform their own policymaking. Cross-national comparison of the quality of education was only intended as an incidental outcome of

¹ For a definition of the SACMEQ 'reading for meaning' skill level see table 1 below.

SACMEQ's surveys. Inevitably, a number of researchers across the globe, including ourselves and SACMEQ's own researchers (for example, Lee *et al.*, 2005; Atherton, 2009; Hungi & Thuku, 2010b), have performed statistical analyses on the SACMEQ II dataset to compare the influence of pupil and school factors across the countries.

The first wave of data collection (SACMEQ I) in 1995 concentrated on grade six reading achievement and involved seven countries in sub-Saharan Africa. For the second wave, collected mainly in 2000 (with the exception of Mauritius and Malawi, where the survey was conducted in 2001 and 2002 respectively), the study expanded to incorporate surveying conditions of schooling and education quality in 14 countries in South and East Africa (Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania Mainland, Tanzania Zanzibar, Uganda and Zambia) and encompassed sampling more than 46,000 pupils in the eighth month of grade six in more than 2000 schools. Alongside the collection of detailed pupil and teacher background characteristics, school resourcing information, teacher attitudes to teaching and learning, and headteacher reflections on school management, organisation and whole school issues, all grade six pupils sampled were tested in both reading and mathematics. The methodology used for test construction, questionnaire construction, sampling and scaling have been described as basically the same as that used in PIRLS, the Trends in Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) (Hungu & Thuku, 2010b).

2.2 Test Construction

Ross et al. (2005) inform us that the SACMEQ II reading test included test items selected from preceding studies, including the Zimbabwe indicators of the Quality of Education Study, the SACMEQ I project and the International Association for the Evaluation of Educational Achievement's (IEA) International Study of Reading Literacy (IRL). The SACMEQ II project adopted the definition of reading literacy established by the 35-country IRL study, within which reading literacy is defined as "the ability to understand and use those written language forms required by society and/or valued by the individual". Curriculum analysis was conducted across all the SACMEQ II countries in order to define the reading skills considered by all countries to be the most important. This resulted in the identification of three domains for reading literacy (see box 1) and five skill levels. The final test consisted of 83 multiple test questions. Following Rasch analysis and a skills audit of these, eight skill levels were identified for reading, which are outlined in table 1. Table 1 also indicates the range of scores pegged against each competence level to assist interpretation of findings presented in section three. The scores were normalised so that the mean across the whole SACMEQ II dataset was set at 500 with a standard deviation of 100.

Table 1: Reading competency levels

Level	Score range	Example text items
1: Pre-reading Matches words and pictures involving concrete concepts and everyday objects. Follows short simple written instructions.	<373	<ul style="list-style-type: none"> locate familiar words in a short (one line) text match words to pictures follow short and familiar instructions
2: Emergent reading Matches words and pictures involving prepositions and abstract concepts; uses cuing systems (by sounding out, using simple sentence structure, and familiar words) to interpret phrases by reading on.	374 - 414	<ul style="list-style-type: none"> read familiar words and identify some new words use simple and familiar prepositions and verbs to interpret new words match words and very simple phrases
3: Basic Reading Interprets meaning (by matching words and phrases, completing a sentence, or matching adjacent words) in a short and simple text by reading on or reading back.	415 - 457	<ul style="list-style-type: none"> use context and simple sentence structure to match words and short phrases use phrases within sentences as units of meaning locate adjacent words and information in a sentence
4: Reading for meaning Reads on or reads back in order to link and interpret information located in various parts of the text.	458-509	<ul style="list-style-type: none"> interpret sentence and paragraph level texts match phrases across sentences read forwards and backwards in order to locate information in longer texts
5: Interpretive reading Reads on and reads back in order to combine and interpret information from various parts of the text in association with external information (based on recalled factual knowledge) that "completes" and contextualizes meaning.	510-563	<ul style="list-style-type: none"> locate, interpret, and read forward to join two pieces of adjacent information use multiple pieces of information to interpret general purpose of a document paraphrase and interpret a single non-adjacent piece of information
6: Inferential meaning Reads on and reads back through longer texts (narrative, document or expository) in order to combine information from various parts of the text so as to infer the writer's purpose.	564-618	<ul style="list-style-type: none"> interpret, and make inferences from, different types of texts by reading backwards and forwards to confirm links between widely separated information pieces extract information from a non-traditional (left to right) document make judgments about an author's intentions or purpose beyond the text content
7: Analytical reading Locates information in longer texts (narrative, document or expository) by reading on and reading back in order to combine information from various parts of the text so as to infer the writer's personal beliefs (value systems, prejudices, and/or biases).	619-703	<ul style="list-style-type: none"> combine several pieces of information from a range of locations in complex and lexically dense text or documents analyse detailed text or extended documents for an underlying message identify meaning from different styles of writing
8: Critical reading Locates information in longer texts (narrative, document or expository) by reading on and reading back in order to combine information from various parts of the text so as to infer and evaluate what the writer has assumed about both the topic and the characteristics of the reader – such as age, knowledge, and personal beliefs (value systems, prejudices, and/or biases).	> 703	<ul style="list-style-type: none"> use text structure and organisation to identify an author's assumptions and purposes identify an author's motives, biases, beliefs in order to understand the main theme link text to establish multiple meanings including analogy and allegory

Source: Ross et al. (2005, p.89-90, 95)

Box 1: Three reading domains

Narrative prose: Continuous texts in which the writer aims to tell a story – whether this be fact or fiction.

Expository prose: Continuous text in which the writer aims to describe, explain, or otherwise convey factual information or opinion to the reader.

Documents: Structured information organized by the writer in a manner that requires the reader to search, locate, and process selected facts, rather than to read every word of a continuous text.

Source: Ross et al. (2005, p.74)

2.3 Country grouping and country background

Since the early 1980s, a series of international studies on pupil achievement have suggested that pupil factors and school factors could influence the attainment of a pupil. There is still discussion on the relative importance of school level and pupil level factors on pupil achievement. In particular, an international comparison of pupil attainment in 29 high and low income countries by Heyneman and Loxley (1983) contested previous studies which had concluded that school factors (such as teacher quality and school resources) had less impact on a pupil's attainment compared to the pupil's socio-economic and background characteristics. Their analyses found that for pupils in low income countries, social background did not explain variation in attainment to such an extent as it did in high income countries, and that pupil variation in achievement was best explained by factors relating to school and teacher quality (such as the physical facilities present in the school, textbook availability, academic qualification of teachers and aspects of teacher training). They concluded that the relative influence of pupil and school related factors on pupil attainment were linked to the economic wealth of a country (Heyneman & Loxley, 1983; Baker, *et al.*, 2002). In addition, a substantial literature (for example, Baldacchino & Bray 2001; Crossley *et al.*, 2009) on small states demonstrates their distinction from larger countries, particularly in terms of education governance.

The 14 SACMEQ II countries range in economic wealth from low to upper middle income and include six small states and one micro-state. This means that a single model for all 14 countries may mask factors that are important in low or middle income countries, large or small states. By taking into account the income level of a country ('upper middle', 'lower middle' or 'low' income, based on the World Bank rankings), the population size of a country (large or small - see below) and the Human Development Index (HDI) ranking, two distinct country groupings, hereon named *Group A* and *Group B*, have been identified within the SACMEQ consortium. To ensure the groupings are reasonably homogeneous, the research presented here involves the study of 10 of the 14 countries. In so doing, a more context-sensitive modelling approach has been adopted. Separate multi-level models are constructed for each group type. Four countries are not included in the multi-level analysis. South Africa and Zanzibar are omitted from the analyses presented in this paper, on the basis that their economic wealth and population size characteristics do not match the low income/large population or lower middle income/small population groupings. The two island states of Mauritius and Seychelles are omitted on the grounds that they are considerably wealthier than the other small states, falling into the upper middle income bracket¹.

¹ Initially Mauritius and Seychelles were included in the analysis but later removed in order to enhance homogeneity of Group B. However, this did not produce anything more than minor differences to the results. Findings for this grouping can be found in Smith & Barrett (2009).

Table 2: Human development, equity and wealth indicators and population size of the SACMEQ consortium.

	Population in 2000* (millions)	GDP per capita (PPP US\$) in 2000*	% population on under \$1 and \$2 per day† <\$1 <\$2	Richest 20% to poorest 20% ratio of income 1996-2004†	Gini index 1996-2004†	Human development index (HDI) 2000‡
Seychelles	0.1	12 508	-	-	-	-
Mauritius	1.2	10 017	-	-	-	0.78
South Africa	43.3	9 401	4 62	18	58	0.71
Botswana	1.5	7 184	24 50	32	63	0.63
Namibia	1.8	6 431	35 56	56	74	0.66
Swaziland	0.9	4 492		24	61	0.59
Lesotho	2.0	2 031	36 56	44	63	0.58
Uganda	23.3	1 208		8	43	0.48
Kenya	30.7	1 022	23 58	8	43	0.53
Mozambique	18.3	854	38 78	7	40	0.38
Zambia	10.4	780	76 94	8	42	0.42
Malawi	11.3	615	42 76	12	50	0.43
Tanzania (Mainland & Zanzibar)	35.1	523	58 90	6	35	0.43

Source: * UNDP (2002); † UNESCO (2007); ‡ UNDP (2007).

Group A consists of six low income large population countries, namely Uganda, Kenya, Mainland Tanzania, Malawi, Mozambique and Zambia. These all had populations between 12 million (Malawi) and 34 million (Mainland Tanzania) and, with per capita Gross Domestic Products (GDPs) between 600 US dollars (Malawi) and 1,200 US dollars (Uganda), were classified as 'low income' by the World Bank at the time the data was collected. Group B consists of the lower middle income small population states of Botswana, Namibia, Lesotho and Swaziland. These are small states with populations of around one to two million and at the time the survey took place were all classified as 'lower middle income'. Lesotho's per capita GDP being just over 2,000 US dollars placed it close to the borderline with low income countries and was considerably lower than that of the other three, which ranged from 4,500 US dollars (Swaziland) up to 7,200 US dollars (Botswana) (figures from United Nations Development Programme (UNDP), 2002; figures for Malawi from UNDP, 2004). As with most middle income countries, there is a high degree of inequality in the distribution of wealth within Group B countries. In 2000, a greater proportion of the population in Lesotho and Namibia lived on less than one dollar a day than did in Kenya, but then a greater proportion of people in Kenya lived below two dollars per day than did in Lesotho or Namibia. Gini indices for the countries reflect the degree of inequality of the distribution of wealth within a country. Indices for the period 1996-2004 were calculated to be below 50 for all Group A countries and above 60 for all Group B countries, lending support to the groupings.

The HDI is a measure of the combined effect of participation rates in education (across the primary, secondary and tertiary sectors), literacy rates and life expectancy at birth, in addition to the GDP per capita in a country. In 2000, Kenya was assessed as a middle development country with an HDI of 0.53. Uganda was near the top of the low development countries at 0.48. Tanzania, Zambia and Malawi clustered around 0.43 and Mozambique had a somewhat lower index of 0.38. The Group B countries were clustered around 0.6 (UNDP, 2007 p.234-7). Towards the end of the 1990s, the HIV/AIDS pandemic had the greatest impact in Southern Africa and hence the HDI for Group B countries tends to be depressed by low life expectancies. Overall, the HDI rankings of the countries are consistent with the groupings based on population size/income assessments of the ten countries we study hereon and provide further support to the homogeneity of the two groupings.

Clearly there are many other similarities between these countries, as geographic proximity and shared land borders also breeds cultural and social interchange. There are also distinct geographic and cultural differences and this can make definition and interpretation of some SACMEQ variables problematic. For example, the school location variable with its categories of 'city', 'small town' and 'rural/isolated' is discussed below. Politically, Swaziland stands out as the only country that does not have some form of multi-party politics, being ruled by a monarchy.

SACMEQ II data can only give an indication of the relative advantage and disadvantage of learners who have been retained in the primary education system up to grade six. At the time data was collected, Group A had net enrolment rates at the primary level ranging from 47% for United Republic of Tanzania (combined figure for Mainland Tanzania and Zanzibar) up to 66% for Zambia, and survival rates to grade five in 1999 ranged from 43% for Mozambique up to 81% for United Republic of Tanzania. In Group B, the net enrolment rates ranged from around 78% for Lesotho up to 93% for Swaziland, and the survival rates to grade five in 1999 ranged from 69% for Botswana up to 92% for Namibia (all figures from UNESCO, 2003). This means grade six learners in Group A already represent a relatively academically successful minority of school-aged children, more than 50% of their peers having not enrolled or having been lost to the system before reaching grade six. Although the majority of children do make it to grade six in the Group B countries, a substantial proportion do not.

Two of the countries in Group A introduced free primary education (FPE) during or shortly before the period when the SACMEQ II cohort was enrolled in primary school. Uganda introduced FPE in 1997, when those pupils who participated in SACMEQ II and had not repeated a grade in their schooling would have been in grade two. Therefore, the Ugandan cohort would not have experienced the enormous class sizes that immediately resulted, but would have been undergoing their education during a time when the system was under extreme stress and as policies and systems were being hastily introduced to address the impact FPE had on quality (Ward *et al.*, 2006). Malawi introduced FPE in 1994-5. As data collection in Malawi took place in 2002, the majority of the Malawian grade six group surveyed would have experienced a rapidly expanded system throughout their primary school career.

2.4 Multi-level modelling approach

Pupils attending the same school are, as a collective, likely to share certain similarities as a grouping of individual pupils, due to the community from which they are drawn and the school processes to which they are exposed. However, ordinary regression theory is based on the fundamental assumption that individual pupils are independent of each other. A multi-level modelling approach recognises inter-dependency by allowing for the clustering of pupils within a school. In so doing, separate estimates of the variability in individual performance due to the school attended are obtained in addition to estimates of the variability in performance between pupils regardless of where they attend school.

A two-level model was constructed using MLwiN software in which pupils were modelled at level one and the school attended by the pupil at level two. A model accounting for the nesting of schools within a country, which in practice means adding a third level to the analysis, is not possible, as the sample size of 14 countries is too small to provide reliable estimation of coefficients in the modelling process. Of key interest here is whether any differences in the *mean* country level score for identifiable socio-economic groups within a country in grade six reading exist after adjusting for socio-economic differences between pupils. This is achieved by introducing country dummies and country interactions with pupil level factors in the fixed effects part of the statistical model. An assessment of the impact of various socioeconomic factors on the variation in pupil achievement due to the school attended is carried out on the collective of countries in each of groups A and B. By looking at the interaction of the factor with each country term, a more refined model of the key social and economic elements affecting pupil reading score in each country is realised. In many cases, the importance of the factor is not necessarily equal for each country, and indeed may not even be a significant factor for pupils in one or more of the countries considered. This helps to establish both a more contextualised model for each country, as well as identifying the universal core factors affecting pupil achievement across the country groupings when pupil characteristics and peer social group effects on learning are considered.

At the current time, there is a paucity of longitudinal education data for the sub-Saharan African region. It is recognised that, due to the cross-sectional nature of the SACMEQ dataset, findings can only provide a snapshot of socio-economic disadvantage of grade six learners in the period 2000 to 2002 in the ten countries analysed. Further, the true gravity of social disadvantage is not captured by SACMEQ II, as the most disadvantaged learners are likely to have dropped out of school before reaching grade six and thus will not have participated in the survey.

2.5 Identifying variables for investigation

This sub-section outlines the thematic approach used to identify which of the 1,235 variables collected by the second wave of SACMEQ best captured pupil background and social influences on achievement. Socio-economic status (SES) impacts on pupils' achievement across high, middle and low income countries and there is considerable variation between countries in the strength of the dependence (Willms, 2006). Dolata (2005) constructed a composite SES variable for the SACMEQ II dataset based on wealth indicators such as household possessions and livestock, combined parental education level and amenities available in the home. Analysis by SACMEQ researchers (SACMEQ, 2009; also presented in UNESCO 2006, p.51; see also Atherton, 2009) has shown that the relationship between

literacy and mathematics scores and this socio-economic status composite was strongest in countries excluded from this analysis, namely South Africa and Mauritius. Of countries included in this analysis, Kenya, Tanzania and Namibia had the strongest association between mathematics score and the SACMEQ SES composite. In Malawi, Mozambique, Lesotho and Swaziland, although the effect of SES was statistically significant, it was relatively small. The use of a composite SES variable is not employed in the analysis here, on the grounds that it might mask the relative influence of factors in different contexts and that the strength of the association was weaker for reading score than for mathematics (although still a large effect, see Hungi & Thuku, 2010b). Recognising that factors such as parental education, material possessions, access to particular amenities and the quality of the home environment may well change according to country of residence and relative wealth of the country in competing ways is paramount to understanding differences in achievement.

A thematic approach, informed by engagement with literature, has been taken in selecting variables for exploration in the statistical models. The themes are:

- The pupil's individual background context. The pupil factors considered are rurality/urbanicity, nationality, exposure to the language of instruction outside school, residence during term time, gender and age;
- The basic living conditions in which the pupil lives which promote a stable home environment supporting the basic housing and nutritional needs of a child so that they are able to participate and engage in their education. The factors identified in this group are the number of meals eaten in a day, housing quality, and access to amenities such as electricity, water and lighting in the home;
- The educational resources and home support available to a pupil outside of school. The factors investigated are the number of books in the home, the presence of a table in the home, and adult involvement in school work outside of school;
- The attitudes to learning and education to which a pupil is exposed by way of their key social influences in the home environment and amongst their peers at school. Factors included here are: mother's education and father's education, as indicators of social influence in the home; the proportion of repeaters in the school year group and male to female ratio in year group, as indicators of peer group influences; and individual repetition and individual absenteeism and the reasons given for absence, as indicators of individual influences on educational aspiration.

3. FINDINGS

This section presents and comments on the statistical findings using the thematic framework above. Results for Group A are presented in a table in Appendix 1 and for Group B in a table in Appendix 2. All reported variables are significant at the 5% level ($p \leq 0.05$).

3.1 Pupil Individual Background

Previous school effectiveness studies have found that the most important pupil background characteristics which can be attributed to explaining differences in attainment for primary school learners in formal education are nationality, gender, and whether they live in an urban or rural environment (e.g. Cueto *et al.*, 2005). Other studies of SACMEQ II data have also identified gender and exposure to language of instruction outside school (Yu & Thomas, 2008; Atherton, 2009; Hungi & Thuku, 2010b).

3.1.1 Gender and Location

In the SACMEQ II dataset, information on school location was provided by headteachers. Measures of rurality or urbanicity had to be applicable to a range of diverse countries, including small states and island states. For example, the population of a city in some of the larger countries, such as South Africa or Kenya, is greater than the entire population of a small state such as Lesotho. Thus, isolated, rural, small town and large city schools were defined according to distance from amenities such as a main road, hospital and bookshop. A simple comparison of raw reading scores would indicate that pupils in city schools performed better than pupils in small town schools, who in turn performed better than pupils in rural or isolated schools in all countries. However, when other factors are held constant, the pattern of dependency changes in some countries. In Uganda, Kenya and Zambia, location was not found to be statistically significant. In Malawi, rural schools outperformed town and city schools. In Mozambique, rural and small town schools outperformed city schools. In Tanzania, Lesotho and Swaziland, pupils in small town schools achieved the highest. Hence, in some countries, city environments appear to present greater barriers. In five countries (Malawi, Mozambique, Uganda, Kenya and Zambia) remoteness *per se* does not appear to produce disadvantage for those learners who survive to grade six, but rather children living in more rural areas are more likely

to be affected by other factors in the model associated with disadvantage. However, it should be noted that survival rates to grade six are generally much higher in urban settings¹.

Consideration of interactions between factors often reveals the sharpest disparities in learning outcomes (Colclough *et al.*, 2000) and this is especially true of the interaction between gender and rurality (Cueto *et al.*, 2005). In this study also, differences between dependency on pupil background factors for groups A and B are primarily seen in the areas of pupil gender and its interaction with school location. In Group A, rural girls and boys attending school in Malawi, Kenya and Uganda can expect to achieve the same reading scores. However, Tanzanian, Zambian and Mozambiquan rural girls scored on average 21, 14 and 15 points lower than their male counterparts respectively. Girls in large cities were the highest scoring in Group A, scoring on average 34 points more than girls attending school in other locations and outperforming boys attending school in any location type. In Group B, for the three countries of Lesotho, Swaziland and Namibia little difference in boys' and girls' score and where they attended school was found, except that girls tended to do better than boys in large cities. Botswanan girls in rural schools did better than boys by about 8 reading points.

3.1.2 Age

The effect of a pupil being over-age compared to the SACMEQ mean age of 13 years and 10 months was found to have an incremental effect of 4 points and 3 points per year for group A and B respectively. Countries in Group A tended to have an older cohort of pupils, on average, and therefore it is not surprising that the over-age effect per year over age is slightly higher here.

3.1.3 Language

Exposure to the language of instruction outside of school was important in both models, with the effect being slightly larger in Group A. In both groups, the enhancement was greater for pupils exposed to the language of instruction outside school 'sometimes' compared to 'rarely' than it was for those reporting 'often' being exposed to the language of instruction (22 points compared to 16 for Group A and 15 compared to 5 in Group B). This finding could in part be due to pupils' interpretation of the options given in the survey ('sometimes' or 'often' exposed to language of instruction outside school) and a tendency to underestimate the frequency with which they practice the language of instruction.

3.1.4 Residence in Term Time

In both groups, pupils who live away from home tend to perform less well than those who live at home during their schooling. Pupils living with relatives, in a hostel, or by themselves attained between 6 to 16 points lower literacy scores than those residing in the parental home. Pupils living by themselves so that they may attend school are, on average, most vulnerable to a lowering of reading score.

3.2 Living Conditions

Two aspects of learners' living conditions explained differences in reading achievement across both country groupings. These were the type of lighting in the home and number of meals eaten in a day. Otherwise, the impact of pupil's access to amenities was mixed and varied between countries.

3.2.1 Access to Water and Electricity

Access to water in the home did not explain differences in the reading scores of pupils in Group A. In Group B, pupils without access to water at home on average attained 6 points lower than those with water. Electricity had a small but significant positive effect in Tanzania, Mozambique and all Group B countries and an equally small but negative effect in Zambia and Malawi. Kenya was the only country in which electricity had a large impact, raising the score by 18 points over that of a pupil living without electricity.

3.2.2 Lighting in the Home

The type of lighting source that had the greatest impact on raising achievement varied from country to country, suggesting that different forms of lighting are more likely to be made accessible or are preferred for study in different contexts. In Kenya, a pupil with a candle/paraffin/oil lighting source for study was likely to score 24 points higher than a Kenyan with no artificial lighting source. In Botswana, pupils using candle/oil/paraffin and electric lighting on average scored 15 and 37 points higher respectively than those without artificial lighting. A Zambian with electric lighting on average scored 38 points more than a Zambian without any lighting in the home. Namibian pupils with electric lighting (40% of all Namibian pupils surveyed) fared some 10 points better than pupils with either another source of lighting or no lighting for study. In Lesotho, where the main source of lighting is candle/oil/paraffin, pupils with gas lighting scored 20 points more than pupils without lighting or other lighting source access in the home.

¹ Zhang (2006), who included only three indicators of pupil background in his model (gender, composite SES variable and age) found that disparity between rural and urban students diminished when these pupil background factors were controlled for and only remained significant in two countries (Zambia and Tanzania) when school context and resources were controlled for.

3.2.3 Housing Quality

With the exception of Tanzania and Zambia, the quality of building materials used in pupils' homes did not explain the variation in attained reading score for pupils in Group A countries and accounted for some of the variation in pupil scores in Group B countries, though the effect was small. In Tanzania, the total score could be enhanced by up to 21 points and in Zambia by up to 18 points for those with the highest quality of housing.

3.2.4 Number of Meals Eaten

Ability to concentrate and physical wellbeing facilitate the learning potential of an individual pupil. Previous studies have linked pupil performance to health and nutrition (Abidoye, 2000; Glewwe, 2005). The SACMEQ II dataset did not collect information on the general health of the individual but did ask about the number of meals eaten by the pupil in a week. This study used a derived variable of meals per day as an indicator of nutrition. In Group A, pupils receiving fewer than two meals per day were likely to attain a literacy score 14 points lower than a pupil in receipt of two to three meals per day. Of the four Group B countries, Botswanan pupils were most likely to receive fewer than three meals per day, some 46% of all pupils, and nearly 20% of pupils receive fewer than two meals per day. Those receiving fewer than two meals per day, on average, attained scores 36 points lower than those on three meals per day, and those on two to three meals 7 points lower than those on three meals. Namibian pupils receiving fewer than two meals per day attained 13 points lower in reading score (17% of all Namibian pupils surveyed) compared to a Namibian pupil receiving three meals per day.

3.3 Educational Resources and Support at Home to Facilitate Learning

Resources available to support study in the home explained differences in reading scores across both country groupings, although which resources were most important varied according to country grouping. Home interest was only important in one Group A country and had a very small negative effect in Group B countries.

3.3.1 Access to Books and a Table

Prior school effectiveness research has highlighted the importance of homework. A school effectiveness model developed by Yu & Thomas (2008), based on analysis of SACMEQ II, found that the setting and marking of homework in schools significantly improved performance. Therefore, it would be expected that having resources in the home that support study, such as light in the evening, a table at which to write, and support from adults in the home, would enhance pupils' performance. The findings of Sukon & Jawahir (2005), who conducted secondary analysis of the Education for All 2000 Assessment Survey data from Mauritius, are fairly typical in this respect. For the 1800 grade four pupils surveyed, they found that pupils who reported having more educational resources at home, such as a computer, books from a library and magazines or newspapers, had higher mathematical achievement. Our analysis of SACMEQ II yielded a similar finding, although the resources which were found to explain differences in pupil reading score varied between the countries. In Group A, possession of one to ten books or between 11 to 50 books in the home enhanced a pupil's score by roughly 4 points in each case compared to a pupil with no home access to books. By contrast, in Group B, a pupil with access to one to ten books, 11 to 50 or over 50 books in the home attained, on average, 4, 9 and 14 points more in reading than a pupil without books to hand in the home environment. Whilst no further enhancement was attributable to over 50 books in Group A, in Group B it added an increment of a further 5 points. In Group A, access to a table only made a sizable difference in Kenya, Uganda and Tanzania, where it was associated with a 9 point increase in reading attainment. In Group B, a pupil with table access in the home in Namibia and Botswana could be expected to enhance reading score by 6 points.

3.3.2 Home Interest in Education

As well as physical resources, adults in the home can also provide emotional support for study by showing an interest in schoolwork. Hence, parents' attitudes have been related to performance (Davison, 1993; Woldehanna *et al.*, 2005). SACMEQ has derived a composite home interest variable based on pupil responses to the regularity with which someone outside school (i) asked questions about school work, (ii) checked homework was completed, (iii) helped with homework, (iv) requested work related to school to be done and (v) looked over the work completed at school. Of countries in Group A, these practices only explained differences in reading attainment for Tanzanian pupils. Here, home support contributes to a 4 point enhancement in score for every unit increase in home interest shown. For those Tanzanian pupils whose parents/guardians/relatives are actively supporting the pupil at home in all measured practices most of the time, this can contribute up to 45 additional points to their score. Across Group B countries, greater parental interest in and support of their child's education had a small inhibiting effect. For every 1 point increase in home support for school work, a pupil on average attained 1 point less on the reading test compared to a pupil whose parents/guardians/relatives provided no support. These findings are not inconsistent with studies in high income countries. Okagaki & French (2000) found that different types of parent involvement in homework have different relationships to achievement and that the type of parent involvement varies across ethnic groups. In their review, Patall *et al.* (2008) related effectiveness of parental involvement to the age of learners, with negative effects occurring for older learners.

3.4 Social Influences on Attitudes to Learning

3.4.1 Parental Education

Paternal and maternal degree of education (or predominantly one of the two) has a large bearing on creating a positive home learning environment, and hence parents' education has been found to influence performance (Galeb *et al.*, 2005; Smits & Hoşgör, 2006). Studies in Africa have attributed different degrees of importance to mother's and father's education. Glick & Sahn (2000) found that in Guinea mother's education had a greater influence only on girls' education, whilst Tansel (1997) claimed father's education to be more influential for both boys and girls in Côte d'Ivoire and Ghana. Consequently, father's and mother's level of education have been accounted for separately in the model. In general, parents' education had a strong association with reading score, although the effect depended on location. Father's education was more important than mother's in Group A countries, especially in rural areas. Mother's education had the greater effect in Group B countries. This is similar to Atherton's (2009) finding, based on multi-level analysis of the SACMEQ II scores for mathematics, that father's education was more important for countries with a lower national GDP than Swaziland (i.e. all Group B countries and Lesotho) whilst mother's education was more important in Swaziland and those with a higher GDP than Swaziland (of which only Namibia and Botswana are included in this analysis).

Figure 1: Differential effects of mother's education and rurality on reading score of pupil

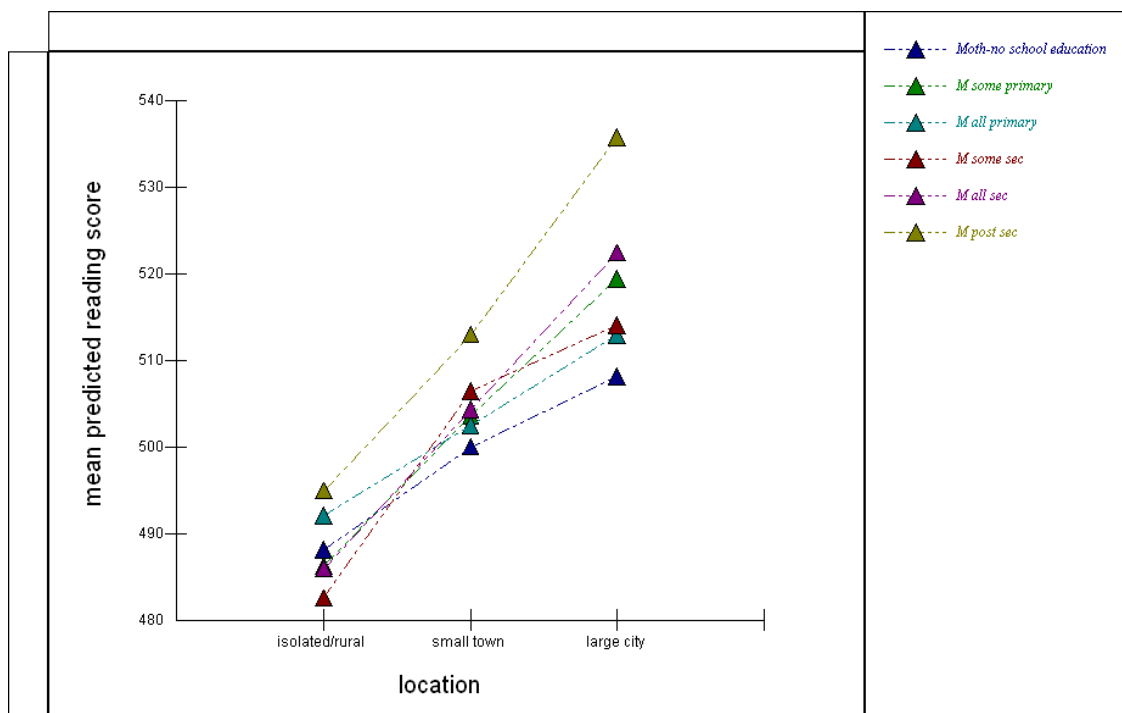
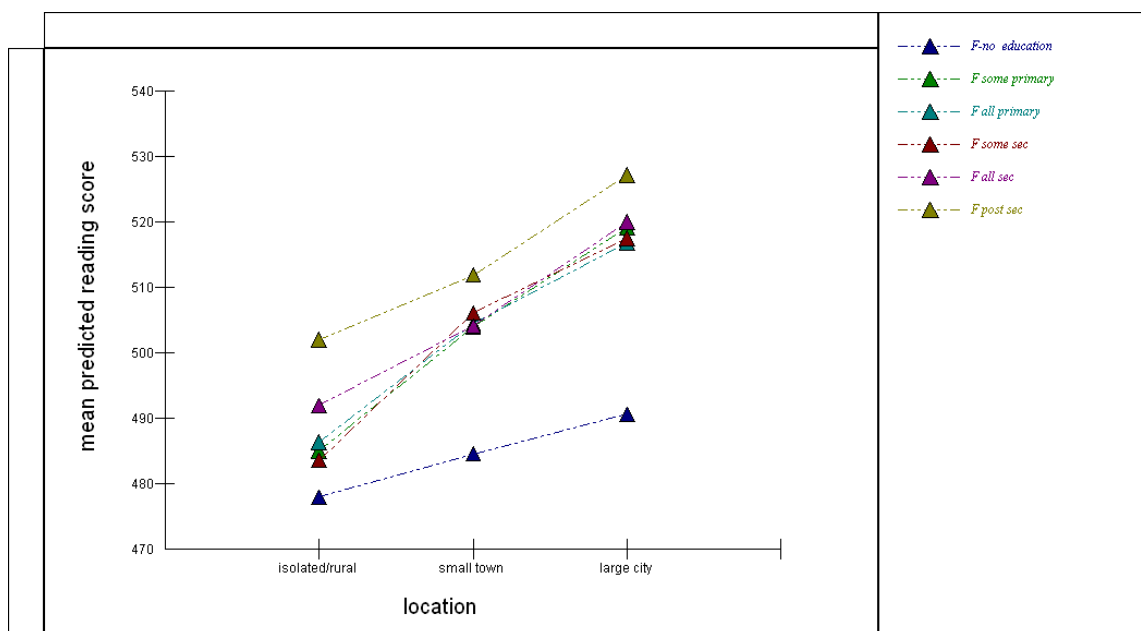


Figure 2: Differential effects of father's education and rurality on reading score of pupil



In Group A, rural dwellers' father's level of education was the key positive influential factor, with scores enhanced by between 7 and 24 points for a father having received at least some primary education compared to a father with no formal education, whilst their mother's education level had no effect on score attained (see figures 1 and 2). For pupils attending school in a small town, a father having some primary education led to a 26 point score increase compared to children whose father had no formal education, and mother's education had a positive effect, by 13 points, only if they had some secondary education. Pupils in large cities whose father had some primary education attained 48 points higher than rural pupils whose fathers had no formal education. For a pupil attending a city school, mother's education level accounted for variations in pupil achievement, so that pupils whose mother had some lower primary education performed 31 points higher than pupils whose mother had no formal education. Having a mother who had completed all secondary or post-secondary education could raise the reading score by 34 and 47 points respectively compared to a pupil whose mother had little formal education.

In Group B countries, a pupil whose father had received some primary education generally attained 6 points more than a pupil whose father had no formal experience of education. A pupil whose father had studied to post-secondary level could expect a 10-point enhancement, on average. Both these findings were irrespective of whether the pupil attended a rural, town or city-based school. A more complex picture emerged for dependency on mother's

education. Overall, the higher the level of education of the mother and the more urban the environment, the greater the reading score enhancement. A pupil attending school in a town setting whose mother had some post-secondary education attained 13 points higher on average than a pupil in a town school whose mother was not educated to this level. A pupil attending a city school whose mother had post-primary education had an additional enhancement of between 15 to 25 points in reading, over and above the fact that they attended school in a city (which had a 65-point enhancement by itself).

3.4.2 Proportion of Grade Six Pupils in School Who Have Repeated At Least Once and Gender Ratio

In addition, the impact of the social composition of a grade six pupil's peer group could inhibit or enhance the learning experience and the attitude to learning of the individual. In high income countries, quantitative studies have reached conflicting conclusions on the strength of peer group effects (for a discussion of this see Thrupp, Lauder & Robinson, 2002). In the research reported here, the evaluation of peer group influences was limited to the investigation of the impact of (a) the proportion in the school year group who had repeated a grade at least once in their schooling, and (b) the ratio of males to females in the school year group. Only the former was found to have a significant impact and then only in Group B countries was its effect large. In Lesotho, Namibia and Swaziland, where between 50% and 60% of all grade six pupils reported having repeated, many learners could be at risk of achieving up to 20 points lower due to this effect. In Botswana, where around one third of pupils reported having repeated, the impact could also be sizeable.

3.4.3 Individual Pupil Repetition Vulnerability and Impact of Absences

Grade repetition is often associated with lower attainment in the long term, negative effects on self-esteem and peer relationships and negative attitudes to school (Brophy, 2006). The individual's vulnerability to grade repetition, as indicated by number of grades repeated, was investigated. A pupil from a Group A country who had repeated once, twice or three or more times in their school career was likely to score, on average, 15 to 18 points lower in their reading test than a pupil who had never repeated. The impact on a pupil's reading score was greater for a pupil attending school in one of the Group B countries. Here, a pupil who had repeated a grade one or more times was likely to attain lower scores, on average of between 23 and 29 points, compared to a pupil who had never repeated. Thus, for repeating pupils, repeating a grade more than once had only slightly more associated disadvantage in terms of lowering attainment compared to a pupil who has repeated on only one occasion.

Absenteeism is well known to be strongly associated with lower achievement. Pupils were asked to explain absence in terms of the options 'illness', 'adverse weather conditions', the 'need to work', 'family reasons', 'unpaid fees' or 'other reasons'. The effect of absences was larger in Group A countries and also only depended on the reason given for absence in Group A. The reasons that had the greatest negative impact were 'need to work', 'adverse weather conditions' and 'unpaid fees'. With respect to the 'adverse weather conditions', it is worth noting that for most of the Group A countries the month preceding data collection did not fall in a normal wet season; in the year 2000 La Niña resulted in both drought and floods in different parts of East and Southern Africa. In Group B, a pupil could expect to attain only one point lower for each day of absence in the previous month.

4. SOME POLICY IMPLICATIONS

4.1 Gender Awareness in Rural and Urban Environments

Patterns of dependency on location and gender are complex and vary from country to country, suggesting that policy-making to tackle disadvantage associated with these factors needs to be informed by a more detailed mapping of disadvantage than SACMEQ II provides.

In Malawi, Mozambique, Uganda, Kenya and Zambia, the lower raw scores of pupils living in remote areas was explained by other factors in the model. In Tanzania, Lesotho and Swaziland, there was evidence of underachievement amongst rural and city-dwellers relative to those living in small towns, suggesting that in these countries educational disadvantage follows the familiar pattern of being concentrated in some remote areas and high population density areas in cities (as reported in UNESCO, 2007). Rural girls are significantly disadvantaged in Tanzania, Mozambique and Zambia, suggesting that further research into the social factors contributing to gender inequality in these countries and policy actions to enhance their performance are needed. In Botswana, it is rural boys who are disadvantaged in reading.

Policy implication 1

Policy needs to promote gender-awareness and provide an enabling framework for local education authorities, schools and local community leaders to recognise and respond to the specific forms of gender inequality within their localities and other context-specific factors that inhibit participation in learning.

4.2 Primary Schools are for Children

Pupils who are over the average age for their year group and pupils who are living independently of their families, most especially those who are living on their own, scored less well. 'Need for work' was one of the three reasons for absenteeism that had the strongest (negative) correlation with score. Putting these together, a pattern emerges whereby learners who are older or more self-reliant, whether economically or emotionally, were less likely to perform well. This is not surprising given that primary schools are generally intended to serve children of an age where they are expected to still be dependent on parents or guardians. However, the fact that older teenagers or children who are economically active or living on their own perform less well on the SACMEQ II reading test adds to existing evidence for ensuring children enrol in grade one at the correct age and that repetition is then kept to a minimum. It also suggests that, where large numbers of children of necessity have to be economically active before primary school leaving age, more flexible schooling, complementary or alternative education programmes might better meet their needs.

The finding that a history of repetition is associated with lower achievement supports established wisdom and replicates a finding made by others analysing the SACMEQ II dataset (Lee *et al.*, 2005). However, we have added nuance to this by identifying a clear trend with respect to the two country groupings. The impact of repetition was much stronger in the small Southern African middle income countries. Further, we only found a peer effect with respect to the proportion of repeaters in the grade six year group of a school for Group B countries. Hence, it appears that repetition is contributing to underachievement in Lesotho, Namibia, Swaziland and, to a lesser extent, Botswana, possibly through eroding educational aspirations across grade cohorts. The implication is that it is important to train teachers for mixed-ability groups. In those countries, such as Tanzania and Kenya, that have introduced FPE since 2000, and hence have a more diverse population enrolled in schools, this may also be more urgent now than when the SACMEQ II data was collected (Croft, 2006).

Policy implication 2

Policies to ensure that pupils enrol at the correct entry age in schools near to where they live and to minimize repetition are still essential in East and Southern Africa. These may include establishing schools or offering alternative, more flexible basic education programmes close to where families live. Minimizing repetition should be a priority in all countries but is particularly important in Lesotho, Namibia, Swaziland and Botswana.

4.3 School Meals

In Uganda, Kenya, Tanzania, Malawi, Mozambique and Zambia, it is possible to identify a group of pupils who regularly eat less than two meals a day and this appears to lower their attainment substantially. Around a fifth of pupils surveyed in Botswana and Namibia ate less than two meals a day and here too the negative impact on score was large.

Policy implication 3

School meals programmes targeted at primary schools where a large number of children (20% or more) eat less than two meals a day in low income countries and less than three meals a day in middle income countries are likely to improve attainment

4.4 Supporting Learning in the Home

It is not surprising that parents' education appears strongly correlated to educational achievement. Parents' social influence may be presumed to act through the aspirations they instil in their children but not the active interest pupils perceive them to show in their school work. With the exception of Tanzania, support for learning in the home in the form of adult interest in school or homework was either not significant or had a small negative effect. A more effective strategy for improving achievement appeared to be ensuring children had access to materials for reading or studying at home. Learners' access to books, artificial lighting and, in some countries, a table to write at, had strong positive impact on score. By contrast, resources in the home that might be taken as indicators of SES but could not be used directly for reading or studying were not significant or were associated with only a very small effect in one country. This suggests that one way to tackle intergenerational transfer of educational poverty might be to encourage parents to make available to children the resources needed for reading. Where poverty is so deep that households cannot afford lighting or books, schools may have to do more to support private reading and study, for example by lending reading books.

Policy implication 4

Awareness-raising programmes to communicate to parents how they can promote their child's learning through providing space, time and materials for reading and writing in the home may have a positive effect on learning. In communities where a large proportion of households cannot provide these, the possible role for complementary education programmes should be explored.

4.5 Social Influences on Learning

Taken together, the strong negative influence of parental education as a disadvantage, particularly for pupils whose father had no or only partial primary education, of repeating a grade or frequent absenteeism suggests that social influences on aspiration and opportunity to achieve for children enrolled in school is significant. In Botswana, Lesotho, Namibia and Swaziland, peer effects associated with high proportions of the grade group within a school repeating could also have a large negative impact on attainment. This suggests that outreach programmes aimed at breaking the cycle of underachievement in education by raising the aspirations of children and of parents for their children may raise attainment. Complementary education programmes may also be effective in this regard.

Policy implication 5

Policy needs to recognise that social as well as economic aspects of pupils' home backgrounds (and often these come together) can constrain pupils' aspirations and effective opportunities for learning.

5. IMPLICATIONS FOR FURTHER RESEARCH

The findings reported in this paper suggest the following implications for future research:

1. National policy-making needs to be informed by qualitative research that gives detailed information on how gendered norms influence girls' and boys' participation in school within specific rural and urban environments. Further research on gender is particularly important in Tanzania, Mozambique, Zambia, Botswana and Namibia, where the problem is most acute. Also, qualitative research exploring imaginative ways of delivering school meals will identify the support needed to enable teachers and local community members to start and manage such programmes.
2. Whilst the association between age and achievement in primary education is well known, there is still scope for more in-depth studies looking at the influence of age of enrolment and repetition. Ikeda (2005) has performed detailed analysis of grade repetition in the SACMEQ II dataset, including looking at the profile of repeaters, the prevalence across schools with low or high mean achievement, and the correlation with test scores. She advises that "a better understanding of the practice of grade repetition ... requires further data collection, systematic research and analysis" (Ikeda, 2005, p.16).
3. School meals programmes are likely to be effective in raising attainment in areas where large numbers of pupils are undernourished. Such programmes can be expensive and it is therefore important that they are targeted at those children who need them most. Survey research to identify in which areas the problem is most acute is needed to inform investment in schools meals programmes, particularly in Uganda, Kenya, Tanzania, Malawi, Mozambique and Zambia. This may involve nurturing local initiatives, suggesting the importance of qualitative research exploring imaginative ways of running school meals programmes in areas where hunger appears to be most pervasive.
4. The SACMEQ tests are designed so as to allow valid comparisons between pupils surveyed in the successive SACMEQ projects and IEA's international reading and literacy studies. SACMEQ III data is expected to be released towards the end of 2010. Comparisons of findings from analysis of SACMEQ II and III for countries such as Malawi and Uganda, which introduced FPE in the mid-1990s, and Kenya and Tanzania, which introduced it in the opening years of the 21st century, are likely to add insights on the impact of different strategies for universalising primary education on learning achievement.
5. Social influences appear to have large effects on learning. Future research should explore how social influences in the home, amongst the peer group and local society curtail educational aspirations and effective learning opportunities.
6. Learners enrolled in primary school who are overage, living on their own, or economically active appear to be a disadvantaged group in Southern and East Africa. Despite the introduction of FPE lowering enrolment ages in many countries, poverty, together with the HIV/AIDS pandemic, is likely to mean that there will continue to

be many such learners enrolled in primary schools in the region for the foreseeable future. Research should explore how schools or alternative education programmes could best meet their needs.

6. CONCLUSION

Secondary analysis of the SACMEQ II dataset conducted in the past has demonstrated a strong dependence of attainment on SES, although the strength of this dependence varies considerably from country to country. In this analysis we have sought to probe what personal factors, material possessions and social influences are related to reading score by rejecting the use of a composite indicator of SES and instead looking at a carefully selected group of variables. The findings both confirm some long-established relationships, such as the negative effect of learning in a language that there is no opportunity to practice outside of school, and reveal some new patterns. An example of the latter is the importance found of allowing children access to space and resources for reading or studying within the home.

As there is an ongoing debate on the relative importance of pupil and school factors in predicting achievement in developing countries, we sought to build into our analytical approach the possibility that the social and economic factors that influence attainment in schools may be very different in countries with different incomes and population sizes. We did this by creating separate models for two groups of SACMEQ countries, a group of low income countries with populations between 10 and 40 million (Group A) and a group of lower middle income countries with population sizes between one and two million (Group B). However, a country variable was maintained in the model so that differences between countries within a grouping would be evident. Although there were many similarities between the two models, some clear differences did emerge, most dramatically with respect to social influences on attainment. Whereas father's education was more strongly related to reading attainment in Group A countries, in Group B countries mother's education had a greater effect. Peer group influences with respect to proportion of the year group who had repeated could have a potentially large effect in most Group B countries but was not significant for Group A countries. Hence, our findings have confirmed the methodological importance of not assuming homogeneity across countries with very different economic and demographic characteristics, even when they are geographic neighbours.

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APPENDIX 1: LOW INCOME-LARGE POPULATION COUNTRY GROUPING MODEL RESULTS

Countries: Malawi, Mozambique, Tanzania (Mainland), Uganda, Zambia, Kenya (reference)

	Model				
	Cons (SE*)	country	SE*	final	SE*
Fixed Part					
Cons	495.86 (2.66)	544.11	4.985	487.050	13.668
Malawi (ref: Kenya)		-115.28	5.632	-42.294	15.364
Mozambique		-27.60	5.868	25.878	15.737
Tanzania		2.51	7.249	-23.712	16.397
Uganda		-61.99	8.334	-30.625	17.503
Zambia		-107.41	6.802	-96.656	16.382
Girl (ref: boy)				-3.464	3.129
age in months				-0.320	0.031
Lives with relatives (ref: at home)				-7.187	1.897
Lives in a hostel				-8.773	3.632
Live by myself				-12.660	4.245
small town (ref: rural school)				7.230	13.841
large city				19.516	15.134
girl x small town				2.606	3.053
girl x large city				11.434	3.567
small town x Malawi				-26.258	13.136
large city x Malawi				-47.480	13.923
small town x Mozambique				-19.608	13.902
large city x Mozambique				-30.892	14.009
small town x Tanzania				30.066	14.530
large city x Tanzania				-3.965	18.058
small town x Uganda				-7.127	21.314
large city x Uganda				-29.249	28.121
small town x Zambia				-12.599	13.081
large city x Zambia				-22.382	14.300
Malawi x girl				-5.208	3.668
Mozambique x girl				-11.646	3.916
Tanzania x girl				-17.493	4.715
Uganda x girl				-5.183	4.082
Zambia x girl				-10.227	4.483
Sometimes speaks LOI				21.719	1.738
Often speaks LOI (ref: never speaks)				15.861	2.095
under two meals per day				-14.466	2.046
2-3 meals per day(ref: 3 meals)				-2.151	1.487
no water (ref: has water)				-2.613	1.592
Electricity (ref:no electricity)				18.469	6.275
Electricity x Malawi				-23.024	8.143
Electricity x Mozambique				-14.040	7.294
Electricity x Tanzania				-22.246	9.447
Electricity x Uganda				-11.842	8.613
Electricity x Zambia				-21.044	10.336
home quality				0.446	0.868
home quality x Malawi				-0.322	0.991
home quality x Mozambique				1.051	1.044
home quality x Tanzania				3.543	1.271
home quality x Uganda				1.597	1.460
home quality x Zambia				2.894	1.557
candle/paraffin/oil (ref:no light)				24.124	6.668
Gas lamp				7.515	8.786
Electric lighting				12.063	7.523
candle/paraffin/oil x Malawi				-28.241	8.326
Gas lamp x Malawi				-11.757	11.636
Electric lighting x Malawi				-4.343	10.919
candle/paraffin/oil x Mozambique				-12.928	8.167
Gas lamp x Mozambique				-8.837	11.299
Electric lighting xMozambique				0.634	9.399
candle/paraffin/oil x Tanzania				-2.295	9.598
Gas lamp x Tanzania				-21.447	15.692
Electric lighting x Tanzania				4.743	13.829
candle/paraffin/oil x Uganda				-8.552	7.994
Gas lamp x Uganda				-10.341	11.909
Electric lighting x Uganda				8.802	13.067
candle/paraffin/oil x Zambia				-13.744	9.053
Gas lamp x Zambia				-11.321	15.752
Electric lighting x Zambia				25.709	12.558
Repeated grade once (ref:never repeated grade)				-15.267	1.489
Repeated grade twice				-16.314	1.902
Repeated three plus times				-17.817	2.866
Father some primary education (ref: no education)				6.960	2.743
Father all primary education				8.342	2.537
Father some sec education				5.647	3.097

	Model				
	Cons (SE*)	country	SE*	final	SE*
Father all sec education				13.966	3.205
Father post sec education				23.579	3.583
Mother some primary education (ref: no education)				-1.536	2.356
Mother all primary education				4.173	2.478
Mother some sec education				-5.305	3.245
Mother all sec education				-2.005	3.310
Mother post sec education				6.890	4.101
Mother some primary education x small town				4.891	4.940
Mother all primary education x small town				-1.688	5.390
Mother some secondary education x small town				11.727	6.538
Mother all secondary education x small town				5.817	6.495
Mother post sec x small town				5.878	7.306
Mother some primary x large city				12.497	6.772
Mother all primary x large city				0.474	7.157
Mother some sec x large city				10.490	7.624
Mother all sec x large city				15.935	8.398
Mother post sec x large city				20.209	8.043
Father some primary x small town				11.815	5.808
Father all primary x small town				11.287	6.224
Father some sec x small town				15.702	6.386
Father all sec x small town				5.102	6.788
Father post sec x small town				3.066	7.541
Father some primary x large city				22.086	9.352
Father all primary x large city				17.719	11.013
Father some sec x large city				21.631	9.446
Father all sec x large city				15.732	9.614
Father post sec x large city				13.223	10.515
absent days				-1.220	0.272
Absent:work				-10.258	2.421
Absent:weather				-11.091	3.188
Absent:fees				-5.425	2.562
Absent:ill				-0.120	1.368
Absent:family				-3.173	1.948
Absent:Other reason				1.293	2.587
Table (ref:no table)				18.227	4.303
Table x Malawi				-17.146	4.926
Table x Mozambique				-19.763	4.795
Table x Tanzania				-1.157	5.706
Table x Uganda				-8.559	5.315
Table x Zambia				-17.812	6.242
10 books or fewer at home (ref:no books)				3.801	1.513
11 to 50 books at home				4.315	2.291
51 plus books at home				1.890	2.546
home interest				-0.341	0.877
home interest x Malawi				-0.570	1.051
home interest x Mozambique				-0.726	1.039
home interest x Tanzania				3.823	1.091
home interest x Uganda				0.625	1.244
home interest x Zambia				1.870	1.414
Random Part					
Level: school (N=1005)	5037.51 (258.81)	2715.62	191.19	1605.45	126.37
Level: pupil (n=16687)	3863.73 (127.02)	3864.78	126.60	3418.38	103.95

* (SE) denotes the standard error of the coefficient in the column and SE the standard error of the coefficient in the column preceding. All coefficients are significant at $p \leq 0.05$

APPENDIX 2: MIDDLE INCOME-SMALL POPULATION COUNTRY GROUPING MODEL RESULTS

Countries: Botswana, Lesotho, Swaziland, Namibia (reference)	Model			
	Cons (SE*)	Country (SE*)	final	SE*
Fixed Part				
Cons	481.47 (2.456)	447.11 (4.01)	449.682	7.476
Botswana (ref: Namibia)		73.85 (5.49)	44.916	9.179
Lesotho		4.15 (5.04)	19.434	7.082
Swaziland		82.20 (5.43)	105.882	20.991
Girl (ref: boy)			2.772	1.727
Botswana x girl			16.502	3.029
Lesotho x girl			0.879	2.533
Swaziland x girl			1.659	2.610
age in months			-0.241	0.031
Sometimes speaks LOI (ref: never speaks)			15.329	1.428
Often speaks LOI			4.976	2.341
Lives with relatives (ref: lives at parental home)			-6.017	1.444
Lives in a hostel			-16.285	3.043
Live by myself			-16.251	2.936
small town (ref: rural school)			30.039	8.405
large city			64.606	11.706
small town x Botswana			-26.250	9.763
large city x Botswana			-59.061	12.716
small town x Lesotho			-17.567	9.435
large city x Lesotho			-54.728	13.966
small town x Swaziland			-16.843	11.663
large city x Swaziland			-71.398	15.530
girl x small town			-1.252	2.729
girl x large city			5.657	2.948
no water (ref: water at home)			-6.049	1.404
Electricity (ref: no electricity at home)			4.002	1.902
candle/paraffin/oil (ref: no light)			2.865	2.610
Gas lamp (ref: no light)			-3.798	4.192
Electric lighting (ref: no light)			9.744	3.822
Botswana x candle/paraffin/oil (ref: no light)			14.732	7.188
Lesotho x candle/paraffin/oil			9.290	5.716
Swaziland x candle/paraffin/oil			-7.060	20.569
Botswana x Gas lamp			-3.404	11.703
Lesotho x Gas lamp			20.267	8.442
Swaziland x Gas lamp			-13.448	24.539
Botswana x Electric lighting			26.788	8.318
Lesotho x Electric lighting			3.245	7.079
Swaziland x Electric lighting			-8.783	21.247
Housing Quality			1.460	0.320
under 2 meals per day (ref: 3 meals per day)			-12.833	2.401
Botswana x under 2 meals per day			-23.333	4.599
Lesotho x under 2 meals per day			-2.378	3.727
Swaziland x under 2 meals per day			1.001	4.013

Countries: Botswana, Lesotho, Swaziland, Namibia (reference)	Model			
	Cons (SE*)	Country (SE*)	final	SE*
2 -3 meals per day (ref: 3 meals per day)			-1.386	2.012
Botswana x 2 -3 meals per day			-5.211	3.487
Lesotho x 2 -3 meals per day			1.359	2.947
Swaziland x 2 -3 meals per day			-0.612	3.005
10 books or fewer at home (ref: no books)			4.088	1.319
11 to 50 books at home			8.507	1.838
51 plus books at home			13.520	2.534
Table (ref: no table)			5.594	2.119
Botswana x table			1.448	3.743
Lesotho x table			-6.634	2.986
Swaziland x table			-6.708	3.289
home interest			-1.164	0.263
father educ: some primary (ref: no education)			6.143	1.931
father educ: all primary			0.679	2.390
father educ: some secondary			1.335	2.127
father educ: all secondary			2.296	2.474
father educ: at least some post secondary			10.272	2.465
mother educ: some primary (ref: no education)			0.725	2.309
mother educ: all primary			2.844	2.576
mother educ: some secondary			4.104	2.643
mother educ: all secondary			-2.719	3.046
mother educ: at least some post secondary			1.957	3.350
mother educ: some primary x small town			0.872	5.254
mother educ: all primary x small town			4.542	5.553
mother educ: some secondary small town			7.146	5.618
mother educ: all secondary x small town			10.029	7.059
mother educ: at least some post secondary x small town			13.069	6.605
mother educ: some primary x large city			16.353	6.951
mother educ: all primary x large city			11.470	6.710
mother educ: some secondary x large city			15.382	6.647
mother educ: all secondary x large city			15.246	6.624
mother educ: at least some post secondary x large city			24.507	6.845
Repeated grade once (ref: never repeated grade)			-22.886	1.241
Repeated grade twice			-24.101	1.585
Repeated grade three plus			-28.955	2.298
Proportion ever repeated a year in grade 6			-34.086	9.694
days absent			-0.806	0.240
Random Part				
Level: school (N=785)	4072.79 (283.67)	2622.29 (277.11)	1236.946	109.574
Level: pupil (n=14664)	3427.52 (100.26)	3427.39 (100.25)	2926.872	77.404

* (SE) denotes the standard error of the coefficient in the column and SE the standard error of the coefficient in the column preceding. All coefficients are significant at $p \leq 0.05$.

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