Report No. 28779

Books, Buildings, and Learning Outcomes: An Impact Evaluation of World Bank Support To Basic Education in Ghana

April 27, 2004

Operations Evaluation Department

Document of the World Bank

Abbreviations and Acronyms

AR	Attendance rate
BE/SIP	Basic Education School Improvement Program
CIDA	Canadian International Development Agency
CPI	Consumer price index
CWIQ	
DACF	District Assemblies Common Fund
DEOC	District Education Oversight Committee
DFID	Department for International Development
EdSAC	Education Sector Adjustment Credit
EFA	Education For All
EMIS	Education management information system
EU	European Union
FCUBE	Free, compulsory universal basic education
GER	Gross enrollment ratio
GES	Ghana Education Service
GLSS	Ghana Living Standards Survey
GSS	Ghana Statistical Service
ICR	Implementation Completion Report
IDA	International Development Association
JSS	Junior Secondary School
MDG	Millennium Development Goal
MOEYS	Ministry of Education, Youth and Sports
NDC	National Democratic Congress
NER	Net enrollment ratio
NGO	Nongovernmental organization
NPP	New Patriotic Party
OLS	
PCR	Project Completion Report
PE	Personal emoluments
PNDC	Provisional National Defence Council
PSD	Primary School Development
PTA	Parent Teacher Association
PTR	Pupil-teacher ratio
QUIPS	Quality Improvement in Schools
OED	Operations Evaluation Department
SAR	Staff Appraisal Report
SMC	School Management Committee
SPAM	School Performance Assessment Meeting
SSS	Senior Secondary School
SUR(E)	Seemingly Unrelated Regression (Equations)
TTC	Teacher Training Center
UK ODA	United Kingdom Overseas Dèvelopment Administration
UNDP	United Nations Development Program
UNICEF	United Nations International Children's Fund
URS	University Rationalization Study
USAID	United States Agency for International Development
WSD	Whole School Development

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Foreword

Bank support to basic education has increased greatly over the last two decades. The Ghanaian experience provides a useful test case of the effectiveness of this support. Since 1986 there have been ten Bank education sector projects in Ghana, of which five have directed support to basic education: the Health and Education Rehabilitation Project, which supplied school learning materials; two education sector adjustment credits in support of the reform program; the Primary School Development Project; and the Basic Education Sector Investment Credit.

The main questions addressed in the OED study are: (1) what has happened to educational outputs (school attendance and learning); (2) what are the main determinants of those outputs; (3) which educational interventions have the largest and most cost effective impact on educational outputs; (4) to what extent have Bank-supported activities promoted interventions which support improved educational outputs; and (5) how do improved educational outputs support better welfare outcomes? These questions were addressed through a variety of means, including a nationwide survey carried out by OED in collaboration with Ghana Statistical Service and the Ministry of Education, Youth and Sports. The survey followed up on a living standards survey conducted in 1988 that included data on test score outcomes and school quality. The study is thus in a unique position to analyze school-level changes over the 15 year period, 1988-2003.

A major finding of the study is that both the quantity and quality of schooling have improved over the last fifteen years. Enrolments in basic education have increased by over 10 percent compared to 15 years ago. Moreover, 15 years ago nearly two-thirds of primary school graduates were illiterate, as shown by the fact that they scored two or less on a simple eight question multiple choice English test - the same as guessing. Less than one in five do so badly today. Statistical analysis shows that these improvements in learning outcomes are clearly and strongly linked to better welfare as measured by higher income, better nutrition, and reduced mortality. Analysis of the economic rate of return to education shows that there is no return to simply attending school, but there is a return to learning achievements. The majority of children now benefit from attending school, both educationally and economically, which was not the case 15 years ago.

The data show that gains in educational outputs are directly linked to better school quality, manifested in improved infrastructure and greater availability of school supplies. Today it is the norm to have one textbook per child for math and English, rather than one per class as was common before the advent of reforms. Text book provision is amongst the most cost effective means of improving test scores. School building has contributed to higher enrolments. In one area surveyed in which a new school was constructed enrolments more than tripled. These gains are impressive, but there remains substantial room for improvement. Enrolments lag in some parts of the country, and while test scores are improved they are still weak.

Statistical analysis shows that increased school quality can in turn be linked to the Bank's support which has financed the construction of 8,000 classroom blocks and provided 35 million textbooks over the last 15 years. Nationally, the Bank supported school building

and rehabilitation program has increased enrolments by around four percent. Moreover Bank support helped sustain initially unpopular reforms, demonstrating the efficacy of working in partnership with a government committed to a well-defined sectoral strategy.

The downside of this positive story is that increased reliance on community and district financing means that schools in poorer areas get left behind, especially those in off-road rural communities. There are still some schools with very poor facilities in which little learning takes places.

The lessons drawn from this study are:

- increasing the availability and quality of classrooms and instructional materials directly contributes to both educational attainment and achievement;

- supervision of teachers by the head teacher and circuit supervisor matter, as do the teaching methods adopted by the teacher, including the language used as the medium of instruction, so efforts should also be made to retain trained teachers, to improve teacher morale, and to expand in-service training;

- a class of schools in poorer communities are very poorly resourced, so resources should be directed to the most needy schools to overcome the bias that results from community-based financing; and

- the private sector has been neglected, although it is of growing importance; attention needs to be paid to it in both government strategy and Bank support.

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Preface

This Operations Evaluation Department report has been prepared in response to a request from the World Bank's Board of Executive Directors that the department resume work on impact evaluation. OED has a long history of conducting such studies, in which the meaning of impact has been interpreted in various ways. In this report, impact is taken to imply a concern with final welfare outcomes, and the attempt to establish the counterfactual to isolate the effects of different determinants on those outcomes. The study thus traces the causal chain from inputs through to welfare outcomes. The data constraints and methodological challenges facing such analysis are well known. OED hopes to demonstrate that these challenges can be overcome to illustrate how the Bank's activities contribute toward the alleviation of global poverty.

This report has been prepared by Howard White with the assistance of Edoardo Masset. Preparation of the study was assisted by Alain Barbu and Martha Ainsworth and contributions from the peer reviewers Kwame Akyeampong and Paul Glewwe and from Dean Nielsen. Thanks are due to the co-operation of Ghana Statistical Service (GSS) and the Ministry of Education (MoE) in preparing and implementing the survey — KB Danso-Manu and Thomas Coleman deserve particular mention — and to the Bank's Ghana education team (Benôit Millot and Eunice Dapaah) for their cooperation. Mary Esther Dakubu, of the Institute of African Studies, and Kweku Osam, Linguistics Department, University of Ghana, were responsible for the preparation of the local language questionnaire used in this study. The following World Bank staff provided comments: Helen Abadzi, Victoria Elliot, Deon Filmer, Nils Fostvedt, Patrick Grasso, Benôit Millot, Dean Nielsen, Halsey Rogers, and Yvonne Tsikata. William Hurlbut edited the report. Administrative support was provided by Pilar Barquero.

Collaboration with GSS and MoE extended beyond the survey to data analysis as part of OED's support for evaluation capacity building. Staff from both agencies, with support from OED, conducted analysis of the data collected for this study, which has been drawn on in the preparation of this report.

This study was carried out under the partnership agreement between OED and the UK Department for International Development (DFID).

Executive Summary

1. The Millennium Development Goals aim for universal primary education by 2015 and gender equality in enrolments at all levels of education. The Education for All (EFA) initiative lays out a strategy for achieving these goals. The Bank's own strategy stresses the school quality aspects of EFA, emphasizing the need to focus on preserving learning outcomes while access to education is expanded. This report assesses the impact to date of the efforts over the past 15 years toward increasing the quantity and quality of basic education in one African country, Ghana.

2. Ghana typifies many of the challenges faced by African countries as they strive to meet the MDGs. Having established one of the best education systems in Africa, the number of children attending primary school began to fall in the mid-70s. School quality was falling with non-salary recurrent expenditures being squeezed out. Many schools had no more than one textbook to a class and the majority of primary school graduates were illiterate. In 1986, the government embarked on an ambitious reform program to increase efficiency by restructuring pre-university education and increasing cost recovery among senior secondary and tertiary students, enabling resources to be re-allocated to basic education. In the mid-1990s a policy of free, compulsory universal basic education (FCUBE) was launched. Since 1997, the education sector has been decentralized with increased community management and the introduction of School Management Committees and School Performance Assessment Meetings.

3. The government's efforts to improve education have been supported by the World Bank and other donors. The Bank's assistance began with the Health and Education Rehabilitation Project (HERP), which supplied school learning materials. The reform program was supported by two education sector adjustment credits (EdSAC I and II). These adjustment credits were followed by two investment projects: the Primary School Development Project and the Basic Education Sector Investment Credit (BESIP). The resources provided by the Bank have been predominately used for school building and rehabilitation, and textbook supply. Through these five projects close to 35 million textbooks have been provided and 8,000 school pavilions constructed. Despite the emphasis on the importance of "software" in contemporary education strategies, the Bank's lending has focused almost exclusively on "hardware" and instructional materials (textbooks and teachers' guides).

4. The Bank's support helped the government carry out a reform program that was resisted by the teaching profession and some segments of the population. The strong commitment shown by government, and firm actions it took to implement the reforms, demonstrate the high degree of ownership. In that favorable context, the Bank's financing reinforced the government's position, allowed textbooks to be printed for the new syllabus in Junior Secondary Schools (JSS) and training for 40,000 JSS teachers to prepare them for the new system. While there was opposition to the cost recovery measures in second-cycle and tertiary institutions, the majority of parents were more concerned with the quality of basic infrastructure, the improvement of which — with substantial Bank support — helped maintain the momentum behind the reforms. Alongside formal conditionality for restructuring the education system and introducing cost recovery measures, informal policy dialogue was greatly facilitated by the Bank's senior education specialist being resident in Accra and developing a close working relationship with senior ministry officials. The Bank

operated behind the scenes in facilitating donor co-ordination for the education sector, although donor competition meant that the anticipated sector-wide approach to education in the latter part of the 1990s failed to materialize.

5. This study conducted a survey in collaboration with Ghana Statistical Service and the Ministry of Education, Youth and Sports covering 1,740 households, 706 basic schools, and 3,129 teachers. This nationally representative survey was carried out in the same 85 areas of the country as the education module of the second round of the Ghana Living Standards Survey in 1988/89, enabling a unique and detailed picture of changes in schools over the 15-year period. These data show large improvements in school quality, especially with respect to material inputs. For example:

- In 1988, less than half of schools could use all their classrooms when it was raining, but in 2003 over two-thirds can do so.
- Fifteen years ago over two-thirds of primary schools reported occasional shortages of chalk, only one in 20 do so today, with 86 percent saying there is always enough.
- The percentage of primary schools having at least one English textbook per pupil has risen from 21 percent in 1988 to 72 percent today and for math books in Junior Secondary School (JSS) these figures are 13 and 71 percent, respectively.

6. School quality has improved across the country: in poor and non-poor communities alike. But there is a growing disparity within the public school sector. Increased reliance on community and district financing means that schools in relatively prosperous areas continue to enjoy better facilities than do those in less well off communities. Future investments in school quality cannot be solely demand driven, which will tend to favor the better off. Demand-driven programs should be complemented by interventions in disadvantaged schools, which can be identified through the annual school census conducted as part of the Education Management Information System (EMIS).

7. The importance of the private sector has increased greatly in the last 15 years. Close to 20 percent of the schools in the survey areas are private, compared to fewer than 5 percent five years ago. Private schools are not all elite schools. Many are in relatively poor areas and many do not perform well on quality measures.

8. Improving school quality has been accompanied by increased enrolments, which have grown by over 10 percent over the 15 years. By 2000, over 90 percent of Ghanaians aged 15 and above had attended school compared to 75 percent 20 years earlier. In addition, drop-out rates have fallen, so completion rates have risen: by 2003, 92 percent of those entering grade 1 complete Junior Secondary School (grade 9). Gender disparities have been virtually eliminated in basic enrolments. Primary enrolments have risen in both disadvantaged areas and amongst the lowest income groups. The differential between both the poorest areas and other parts of the country, and between enrolments of the poor and non-poor, have been narrowed but are still present.

9. Rising attainment has been accompanied by higher achievement. It is no longer the case that most primary graduates are illiterate. The survey undertaken for this study conducted math and English tests among 9-55 year olds identical to the tests carried out 15 years ago, enabling

a direct comparison of learning outcomes. Today, less than a fifth of those who have completed grades 3-6 scored two or less out of eight on the short English multiple choice test — the same as guessing — compared to nearly two-thirds in 1988. Test scores are significantly higher today for both math and English. Children completing the nine years of basic education in 2003 scored higher that those with ten years of basic education under the old system 15 years ago. But the shortening of post-basic education from seven to three years has had a small adverse impact on learning outcomes amongst secondary graduates.

10. Using the English test results to measure literacy shows that the literacy rate among those aged 15-24 (one of the MDG indicators) has risen from 49 percent to 68 percent between 1988 and 2003. The increase in school quality (higher scores achieved by those enrolled in school) accounts for over half (57 percent) the increase in literacy, with the remainder coming from increased quantity (higher enrolments).

11. Statistical analysis of the survey results shows the importance of school infrastructure on enrolments. Building a school, and so reducing children's travel time, has a major impact on enrolments. While the majority of children live within 20 minutes of school, some 20 percent do not and school building has increased enrolments among these groups. In one area surveyed, average travel time to the nearest school was cut by 45 minutes with enrolments increasing from 10 to 80 percent. In two other areas average travel time was reduced by nearly 30 minutes and enrolments increased by over 20 percent. Rehabilitating classrooms so that they can be used when it is raining also positively affects enrolments. Complete rehabilitation can increase enrolments by as much as one third. Across the country as a whole, the changes in infrastructure quantity and quality have accounted for a 4 percent increase in enrolments between 1988 and 2003, about one third of the increase over that period. A large part of this improvement can be attributed to the World Bank, which has been overwhelmingly the main funder of better infrastructure in this period.

12. Learning outcomes depend significantly on school quality, including textbook supply. Bank-financed textbook provision accounts for around one quarter of the observed improvement in test scores. But other major school-level determinants of achievement such as teaching methods and supervision of teachers by the head teacher and circuit supervisor have not been affected by the Bank's interventions. The Bank has not been heavily involved in teacher training and plans to extend in-service training have not been realized. Support to "hardware" has been shown to have made a substantial positive contribution to both attainment and achievement. But when satisfactory levels of inputs are reached — which is still far from the case for the many relatively deprived schools — future improvements could come from focusing on what happens in the classroom. However, the Bank's one main effort to change incentives — providing head teacher housing under the Primary School Development Project in return for the head teacher signing a contract on school management practices — was not a great success. Others, notably DFID and USAID, have made better progress in this direction but with limited coverage.

13. School building and rehabilitation has been a cost effective means of increasing enrolments. Other activities are most cost effective in improving test scores, with textbook supply being one of the most effective. The question for the Bank is the balance to be

maintained between these traditional, proven and still necessary activities and other activities such as promoting community management and enhancing the effectiveness of teaching.

14. Better education leads to better welfare outcomes. Existing studies on Ghana show how education reduces fertility and mortality. Analysis of the survey data shows that education improves nutritional outcomes, with this effect being particularly strong for children of women living in poorer households. Regression analysis shows there is no economic return to primary and JSS education, but there is a return to cognitive achievement. Children who attain higher test scores as a result of attending school can expect to enjoy higher income; but children who learn little in school will not reap any economic benefit.

15. The lessons of the Ghana education experience are:

- Increasing the availability and quality of classrooms and instructional materials directly contributes to both educational attainment and achievement. However, such a "hardware" approach will become less relevant as all schools attain the desired level of quality. Ghana is not yet in that position: substantial inputs are still required for the most disadvantaged schools. Even where good school quality is achieved, educational outcomes, while improved, are still far from satisfactory.

- The evidence is clear that supervision of teachers by the head teacher and circuit supervisor matter, as do the teaching methods adopted by the teacher, including the language used as the medium of instruction. Since attempts to remove untrained teachers have been unsuccessful, and since not all trained teachers appear familiar with improved methods anyway, there is a strong case for pushing forward with in-service training. Efforts should also be made to retain trained teachers and to improve teacher morale. Achieving both of these means better teaching conditions, including paying teachers on time.

- The downside of community and district financing of schools is that it leads to disparities in resource availability. There remains a class of schools in poorer communities — particularly but not only in rural areas — which are very poorly resourced. Resources should be directed to the most needy schools to overcome the bias that results from community-based financing. School mapping continues to play an important role, which means that support to EMIS is important.

- While not a major part of this study, it is clear that the private sector has been neglected. But it is of growing importance so attention needs to be paid to it in both government strategy and Bank support.

1. Introduction

SCOPE AND PURPOSE OF THE STUDY

Education and the International Development Agenda

> *"All agree that the single most important key to development and to poverty alleviation is education. This must start with universal primary education for girls and boys equally..."*
>
> James D. Wolfensohn, January 1999[1]

1.1 Education is central to international poverty reduction goals, as reflected in it inclusion in two of the Millennium Development Goals (MDGs): universal primary education and gender equality in school enrolments. Support for education has also manifested itself in the Education for All (EFA) initiative. Launched at Jomtien (Thailand) in 1990, the movement gained international support through a partnership of UNESCO, UNICEF, UNDP, and the World Bank, and was given a further boost by the Dakar World Education Forum in April 2000.[2]

1.2 The World Bank's Education Sector Strategy (World Bank 1999) is complementary to the framework of action adopted at Dakar, with a stress on quality. The goal is to "ensure that, by 2015, every boy and girl in the developing world has access to and completes a free and compulsory primary education of good quality".[3] The emphasis on quality has led to a focus on issues such as parental and community participation and improved teaching methods, which are increasingly incorporated into project design. This study examines the impact of external support provided by the World Bank on the achievement of education goals in the case of one African country, Ghana.

Education in Ghana

1.3 Ghana's education sector, once one of the most respected in Africa, has faced difficult challenges in the past two decades. Basic education was expanded following independence, as was the case in neighboring countries. But by the mid-seventies the number of children attending primary school in Ghana started to fall (Figure 1.1). In 1975 there were over 2.3 million children in primary school: this figure had fallen by over one million by the early eighties. Quality as well as quantity suffered. Non-salary recurrent expenditures were squeezed out; both falling real wages and frequent late payments demoralized the teaching force. The majority of primary school graduates were illiterate. Meanwhile, government spending was excessively oriented toward the tertiary sector.

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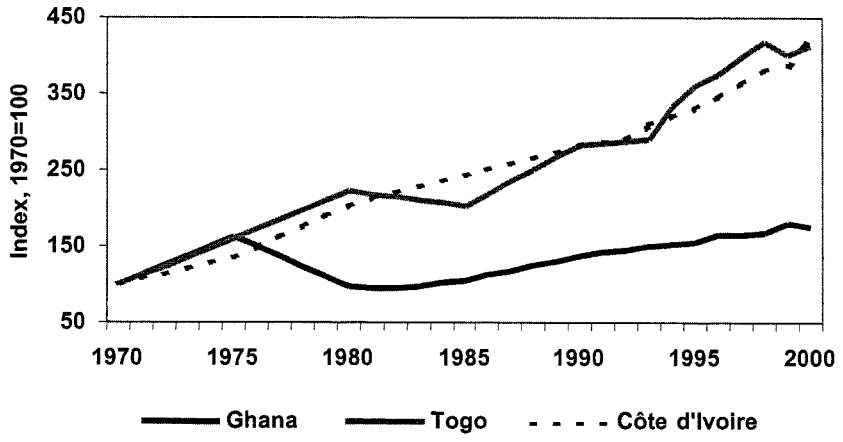
1. Quoted in World Bank *Education Sector Strategy*, July 1999, p. iii.

2. UNESCO *The Dakar Framework for Action*, Paris, 2000.

3. World Bank (2002) *Opening Doors: Education and the World Bank.*

Figure 1.1: Ghana's education system went into decline in the mid-1970s...starting a slow but steady recovery since the mid-1980s (index of total primary enrolments)



Source: World Bank World Development Indicators, 2003

1.4 The government embarked on an ambitious reform program in 1986 to restructure pre-university education and introduce greater cost recovery at secondary and tertiary levels. These changes, together with the higher economic growth resulting from the economic reform program, led to a steady recovery in the number of child attending school (Figure 1.1). While in principle there has always been free universal primary education in Ghana, fees charged at the local level have been one factor in restraining enrolments. Free compulsory universal basic education (FCUBE), introduced in 1996, aimed at eliminating these fees.[4] Since 1997 education services have been decentralized, including the introduction of School Management Committees and School Performance Assessment Meetings for increased community management and accountability.

1.5 The World Bank has supported these developments through 10 projects, of which 5 have assisted basic education: the Health and Education Rehabilitation Project, the Education Sectoral Adjustment Credits I and II, the Primary School Development Project, and Basic Education Sector Improvement Credit. Since 1986 the Bank has lent close to $260 million in support of education in Ghana, accounting for close to half of all external assistance to the sector.

EVALUATION QUESTIONS: WHAT EXPLAINS EDUCATIONAL PERFORMANCE?

1.6 Many factors contribute to educational outcomes. Access to, and quality of, school facilities are important. But so is the home environment, including the importance parents put on their child's education and the time the child has to spend working in household or other enterprises. To what extent can improved educational outputs and the resulting welfare outcomes be attributed to the changes in school inputs and management and the support the

4. Basic education in Ghana is primary (grades 1-6) and Junior Secondary School (JSS, grades 7-9).

Bank has provided to these? The challenge for this report is to answer the following five questions:

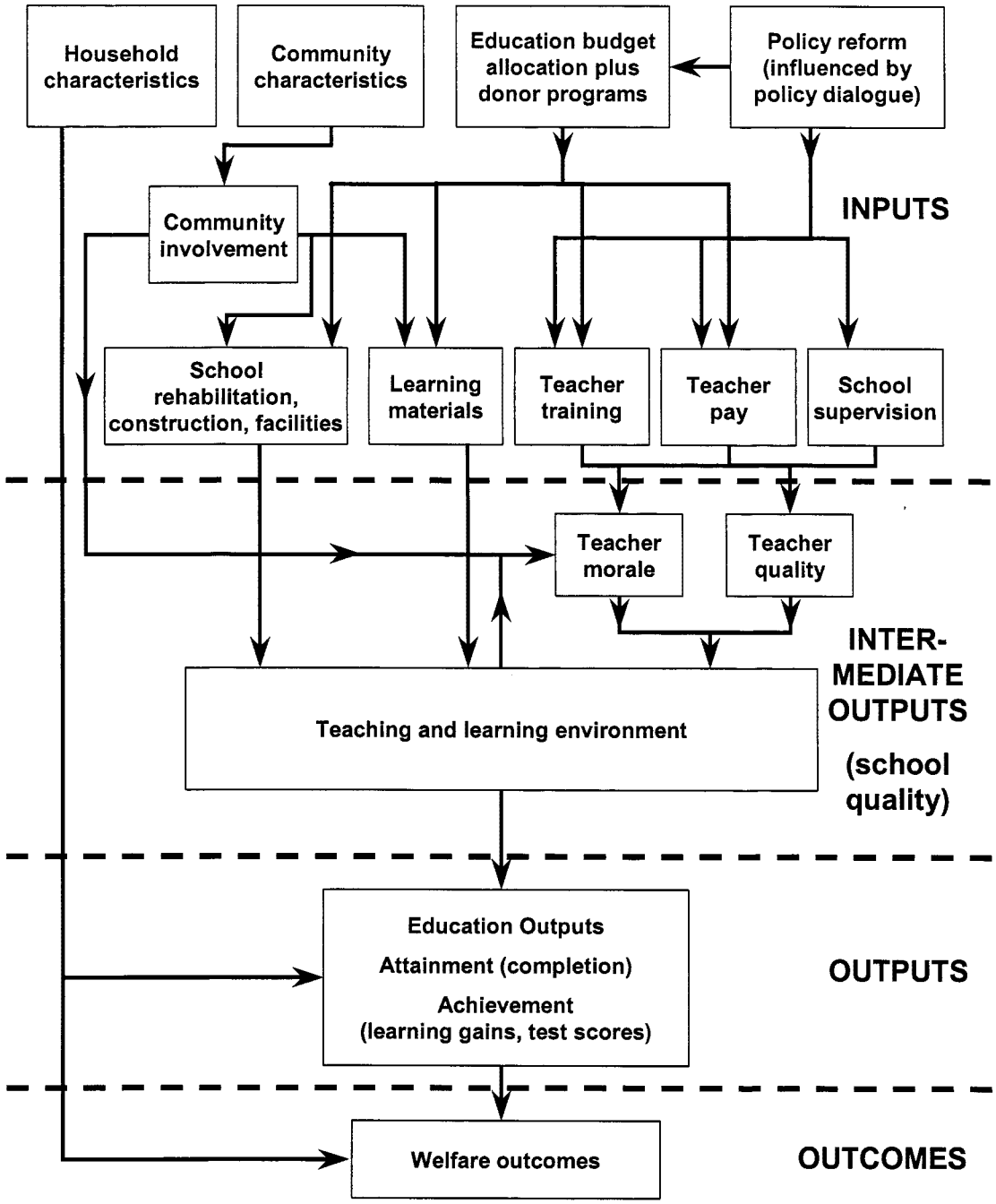
- What changes have occurred to school attainment and achievement (education outputs),[5] including the MDG indicators of completion and gender equality in enrolments, in Ghana since the start of reforms in 1986?
- What are the determinants of changes in basic educational outputs for children of basic school age in Ghana?
- Which education interventions have the greatest impact on the determinants of educational outputs?
- What has been the role of the Bank and other external donors in promoting education interventions that result in improved school attainment and achievement?
- Do improved school attainment and achievement support better welfare outcomes as captured in the MDGs, such as lower child mortality, better nutrition, and reductions in income-poverty?

1.7 This report is thus primarily concerned with determining changes in education outputs and outcomes and attributing, or not as the case may be, any improvements to activities supported by the Bank and other agencies. The study does not therefore cover the same ground as a country sector study, and is less concerned with topics of relevance, efficiency, and efficacy, which are usually central to OED's approach.

1.8 The framework for this analysis is provided by Figure 1.2. The ultimate concern is improved welfare, which is the outcome of, among other things, the higher level of education outputs. Cognitive development is an output of the education system. Producing this output requires that students attend and stay at school, with the quality of the output depending on the quality of the various inputs, both hard (physical infrastructure) and soft (learning environment and methods). The World Bank has supported the inputs into the educational process both directly (e.g., financing school building) and indirectly (support to policy reform).

5. "Educational attainment" refers to the highest level of education and "educational achievement" to test scores.

Figure 1.2 How educational inputs affect welfare outcomes



OVERVIEW OF THE STUDY

Approach

1.9 The evaluation framework for this study was developed through a literature review of the determinants of school attainment and achievement, a review of the Bank's portfolio of education investments and an inception visit to Ghana.[6] Data collection focused on a household and school survey replicating the data collected in the second round of the Ghana Living Standards Survey (GLSS2) in 1988/89. Interviews were carried out in 84 of the 85 clusters covered by the 1988 survey, including 1,740 households, 704 schools and 3,129 teachers (Table 1.1 and Box 1.1).
Achievement tests were taken by over 3,500 people.

1.10 Quantitative data collection was supplemented by fieldwork in Ghana interviewing key informants, visits to district offices and to schools in urban and rural areas. Existing reports on education in Ghana and other donor projects were collected and a review carried out of the relevant World Bank project files.

Table 1.1: Coverage of data collection instruments

	1988	*2003*
Clusters	170 whole survey 85 education module	84[a]
Household survey		
Households[b]	3,190	1,740
Individuals[b]	14,924	7,191
Tests[c]	3,718	3,582
School survey		
Primary	286	417
Middle/JSS	233	289
Teachers	0	3,129

a. One cluster was no longer inhabited in 2003
b. In 1988 approximately half of these numbers were in clusters covered by the education module
c. Number of people taking the Raven's test.

Outline

1.11 Chapters 2 and 3 describe the inputs into Ghana's education system. The former reviews the changes that have taken place in basic education since reforms were initiated in 1986 and chapter 3 reviews the Bank's education portfolio together with that of other donors. Chapter 4 brings these two strands together, identifying the impact of the Bank and other external agencies on education policies and basic education outputs. The analysis of the determinants of educational attainment and achievement in Ghana is presented in Chapter 5, linking these determinants to the interventions supported by the Bank and others. Chapter 6 goes on to examine the relationship between education outputs and welfare outcomes. Chapter 7 concludes with lessons learned and implications for future support to education. The technical annexes present more detailed analysis to substantiate the arguments made in the report.

6. The evaluation methodology is given in more detail in the approach paper (Annex L) and in the design paper for the evaluation (available on the study website).

Box 1.1 Evaluation design: costs and benefits

The main data collection instrument for the impact evaluation was the re-surveying of households and schools in the 85 communities covered in the education module of the 1988/89 Ghana Living Standards Survey (GLSS2). The total cost of this survey, from the household and school listing through to data entry and cleaning, was US$263,000. Household surveys typically cost US$100 per household, suggesting that the survey of 1,740 households accounted for just less than one half of the total survey budget. The school and teacher questionnaires (the latter including application of the English, math and local language tests) cost just under US$50 each.

The unique feature of the study design was the application of the same English and math tests used 15 years earlier. The nationally representative random sample of people taking the same test over this period gives a firm basis for mapping progress in learning outcomes. The study is unusual in linking data on both school and household characteristics with student test scores, allowing analysis of the factors behind changes in school attainment and achievement. The data also allow analysis of changes in school-level inputs over the period of the study.

The quantitative data were supplemented by qualitative information from fieldwork and a review of the literature. Two trips were undertaken during which key informant interviews were carried out with government officials at central and district level, representatives of the teachers' union and NGOs. Schools were visited outside of Accra, meeting with teachers, parents and pupils in different parts of the country.

The data were collected by Ghana Statistical Service, working in collaboration with the Ministry of Education, who advised on the design of the school and teacher questionnaires and provided enumerators for the school survey. Data analysis undertaken by both these organizations has been incorporated into the report.

2. Changes in Basic Education Since the 1980s

In 1986 the Government of Ghana embarked on an ambitious program of education reform. The main element of this reform — the restructuring of the education system — was successfully carried out. A second stage of reforms to decentralize the school system is still underway. There have been substantial improvements in school-level inputs to the education system over the past 15 years. The availability of material inputs — chalk, textbooks, and desks — has risen markedly. The development of school infrastructure has kept pace with growing enrolments and has improved in quality. Some negative aspects can be noted. First, the percentage of trained teachers has fallen and in-service training remains scant. Second, teacher absenteeism has risen and the quality of teaching and supervision of teachers by head teachers and circuit supervisors is uneven. Hence, while physical and material inputs have improved, there is less strong evidence of improved teaching within schools. Finally, the reliance on community financing widens the gap between well-resourced schools in affluent communities and badly resourced ones in the poorest areas. If education targets are to be met, attention necessarily needs to be paid to the latter group where enrolments, attainment, and achievement are lowest.

THE EDUCATION SYSTEM BEFORE 1986

2.1 From a position of having been one of the best in Africa, Ghana's education system was by the early eighties in the throes of a crisis with several underlying sources. Prolonged economic decline prior to the introduction of reforms had led to a compression of educational expenditure from 6.4 percent of GDP in 1976 to just 1.5 percent by 1983. This spending was skewed in two ways: (i) large subsidies to secondary and tertiary levels, meaning that only one-third of education expenditure went to the primary sector, and (ii) recurrent expenditure was almost entirely absorbed by wages of teaching and non-teaching staff, a problem exacerbated by the large number of "ghost workers."[7] The physical quality of basic education facilities was very poor; schools structures were dilapidated and many lacked chairs, desks, and even chalk. The structure of the system was inefficient, the school year was short, as was the school day at just four hours. However, pre-university education could extend to a staggering 17 years.

2.2 At independence in 1957 Ghana's education system consisted of six years of primary education, followed by five years in secondary leading to O-levels, and a further two years ("sixth form") to the A-levels required for university admission. Entrance to secondary was by means of a common entrance exam. However, the majority of students went from primary to middle school for up to four years.[8] Many children from better-off homes attended private primary schools and were able to skip the middle school stage: in 1985, 30 percent of secondary entrants were from private primary schools, most of the rest coming from the fourth year of middle school. Thus the majority went through a 6,4,7 system, totaling 17 years of pre-University education.

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7. That is, people on the pay role who no longer work in that position or may not even ever have existed.

8. Middle schools were created by the Accelerated Development Plan for Education in 1951, replacing the senior primary schools that had been introduced a few years earlier (Graham 1971: Chapter 11).

2.3 Between Independence in 1957 and the mid-1980s there were nine attempts at educational reform, starting with the Botsio Commission in 1960.[9] Most important was the 1972 Dzobo Commission whose report, "The New Structure and Content of Education," formed the basis for the 1986 reforms. The Dzobo Commission recommended that middle schools be replaced with Junior Secondary Schools (JSS), with a stronger vocational orientation, following which 118 JSSs were created on an experimental basis. However, opposition from the middle classes and the teaching profession, including the Ghana Education Service (GES) created in 1974, forestalled extension of the reforms. But 14 years after the Dzobo Commission the PNDC government finally implemented the proposed changes.

THE 1986 REFORM PROGRAM

2.4 The education reform program adopted in 1986 sought to:

- Change the structure of the school system by replacing the 6,4,7 system with 6,3,3, shortening pre-university education from 17 to 12 years. Middle schools were to be replaced by JSSs, which would be an integral part of the system for all children, and O and A-levels replaced with the secondary certificate.
- Improve the teaching/learning process by increasing school hours and the quality of teachers, including the phasing out of untrained teachers (i.e., those with no formal teaching qualification, often called "pupil teachers").
- Increase cost recovery at the secondary and tertiary levels.
- Make educational planning and management more effective.

All four elements of the reform program were implemented and most sustained.

2.5 The restructuring was phased as shown in Figure 2.1. The last cohort of middle school students was admitted in 1986/87; when they graduated in 1989/90 middle schools ceased to exist. Meanwhile, the first JSS cohort was admitted in 1987/88, so that schools simultaneously contained both JSS and middle school students for three years. The first JSS students took the new ninth grade Basic Education exam at the end of the 1989/90 academic year, the successful candidates forming the first cohort to enter the new SSS system in January 1991, completing in December 1993.

2.6 From 1987 to the mid-90s there was a substantial drop in the percentage of untrained teachers from 50 to 20 percent in primary schools, and 35 to 14 percent in JSSs (see paragraph 2.26 below). This decline has been reversed in recent years, particularly in primary schools. The reversal is partly because of the growth of the private school sector, in which most teachers are untrained.

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9. The first Education Committee had been in 1908 (McWilliam and Kwamena-Poh 1975: Chapter 7). More important was that of 1942, whose proposals laid the basis of the Accelerated Development Plan for Education the next decade, which provided the framework for a substantial rise in enrolments in the 1950s (Graham 1971: Chapter 11).

Figure 2.1: Restructuring of education system

	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95
Middle school	Last cohort admitted			Last cohort graduate	**Middle schools closed**				
JSS	JSS not yet begun	First cohort admitted		First cohort take BE exam (end of year)					
SSS (old system)				Last Form 1 cohort admitted				Last cohort complete Form 5	Old system finished
SSS (new System)	**New SSS system not yet begun**				First cohort admitted (Jan 1991)		First cohort complete (Dec 1993)		

2.7 The reform also included three forms of cost recovery: (1) increased charges for textbooks, (2) removing boarding and feeding subsidies for secondary and tertiary institutions, and (3) removal of student subsidies for tertiary education. Charges for textbooks were raised to cost-recovery levels, with the intention of setting up a revolving fund. However, the fund was not well managed (e.g., BESIP SAR: 12) and did not become a basis for sustainable textbook supply, which has continued to be supported by external donors. Moreover, textbook charges were abolished for primary students in 1995. Boarding and feeding subsidies were removed first through an increase in the parental contribution followed by the removal of the government's contribution. Removal of subsidies for university students was delayed for some time on account of its political unpopularity manifested in frequent protests but eventually proceeded with some modifications. The University Rationalisation Study was completed in March 1988 and in September of that year the government announced its intention of removing subsidies from the tertiary sector. However, two months later, the government proposed a loan scheme for tertiary students that contained an element of subsidy. While cost recovery has not been as extensive as at first envisaged, parental contribution to costs for senior secondary and tertiary education have become an established part of the education system in Ghana.

2.8 Improvements to educational planning centered around strengthening the Ministry of Education. The Policy, Budgeting, Monitoring, and Evaluation division was created (with UNDP technical support partly financed by the Bank). The divisions of Curriculum Design and Development, and Supplies, were both relocated in the Ministry from GES. A school mapping was carried out in 1987 (under the project preparation facility from the Bank) and educational statistics began to be collated on a systematic basis since 1988 resulting in the later establishment of the Education Management Information System (EMIS) with World Bank and USAID support.

FCUBE AND DECENTRALIZATION

2.9 Once the new structure was in place, sector policy was outlined in 1996 in the strategy document "Free Compulsory Universal Basic Education (FCUBE)," which stated the government's commitment "to making schooling from Basic Stage 1 through 9 free and

compulsory for all school-age children by the year 2005... [and] to improving the quality of the education services offered" (GoG [MoE], FCUBE, April 1996: 1). In principle, this statement did not signal any change in policy, but was one of the periodic attempts by government to abolish unsanctioned fees that proliferate at the local level.[10]

2.10 The significance of FCUBE was twofold: (1) it provided a basis for a coordinated sector program providing a framework for donor support to education; and (2) it laid out the institutional and other measures to support the nascent decentralization program, including increased community participation in school management.

2.11 FCUBE had three costed components:

- Improving quality of teaching and learning, consisting of (1) the review and revision of teaching materials in line with a revised, more focused, syllabus, (2) new measures on teacher incentives, including teacher prizes and teacher housing in rural areas, and (3) a shift to in-service teacher training using distance learning materials.
- Strengthening management at both central and district level; and
- Improving access and participation, though, *inter alia*, facility construction and rehabilitation and pilot scholarship schemes to encourage girls' participation at primary level.

In addition to the above, measures were to be undertaken to ensure the financial sustainability of the education sector.

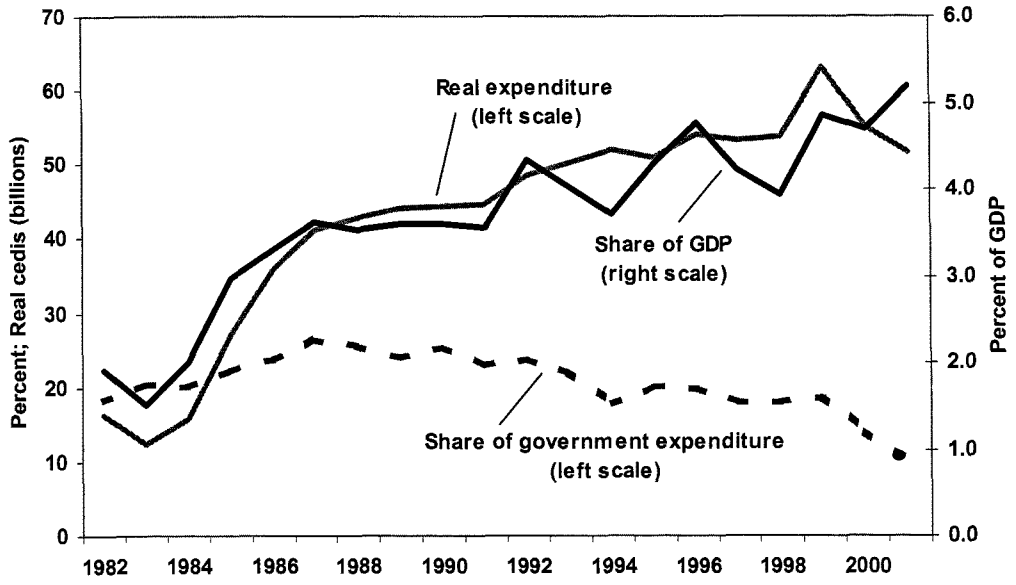
2.12 There has been progress regarding the first two elements of the first component, but the shift to in-service teacher training has not really taken off. The GSS/OED survey data show that less than 5 percent of basic school teachers receive such training on a regular basis. The largest changes have taken place with respect to decentralization. The Local Government Acts of 1988 and 1993 shifted responsibility for the administration of education to the districts, and the 1995 Ghana Education Service Act created District Education Oversight Committees (DEOCs) as well as community-level School Management Committees (SMCs). Whereas PTAs had been expected to play a largely revenue raising function, the SMCs were to act like school boards, which already existed at secondary level. Annual School Performance Assessment Meetings (SPAMs) were to be key events at which the SMC, teachers, and the rest of the community could meet together. Armed with data from the most recent Performance Monitoring Test (PMT), which ranks each school in the district based on test results, they are to prepare a plan to improve school performance.

10. Primary school fees were first abolished on January 1, 1952 (Graham 1971: Chapter 11). The Education Act of 1961 confirmed this position (though materials could be charged for) and made primary schooling compulsory, though the government at the time acknowledged this was not practical in all locations (McWilliam and Kwamena-Poh 1975: Chapter 13). Free compulsory basic education is enshrined in the 1992 constitution.

BUDGET

2.13 In the early 1980s government expenditure fell below 10 percent of GDP. At around one fifth of total spending, education spending was just 1.5 percent of GDP. From 1984-87 education expenditure grew rapidly for three reasons: education claimed a growing share of a budget that was a growing share of a growing GDP (Figure 2.2).[11] Real expenditure grew at an average rate of 35 percent a year over this period, and the share of education spending in GDP more than doubled (see Annex B). The growth in real spending exceeded the growth in student numbers so real spending per student also increased.

Figure 2.2: Government spending on education has risen: central government education expenditure



Source: MoE and GSS data

2.14 These increases were sustained into the early 1990s. Real spending and education's share of GDP continued to rise, passing 5 percent in 2001. Total spending on education rose faster still as a result of (1) increased parental contributions, (2) the growth of the private sector in the 1990s, (3) substantial donor support to the sector since 1990, and (4) the introduction of GETFund in 2001 (see footnote 11). However, the share of education in central government spending has fallen, though partly mitigated by the one-third of Common Fund resources that are spent by District Assemblies on schools.[12]

11. The figure excludes the GETFund created in August 2001 and financed mainly from VAT. In 2002, the GETFund disbursed 140 billion cedis, of which 125 billion were to tertiary education (90 billion of that being student subsidies). The introduction of GETFund thus increases the share of education in government expenditure but reduces the share of basic education in that expenditure.

12. Since 1993, 5 percent of central government revenues are paid to the District Assembly Common Fund (DACF) for investment expenditure by districts.

2.15 The share of basic education in total education spending has fluctuated around an average of 67 percent over the period 1989-2001, being above this average in the early 1990s and again in the most recent years. No substantial reorientation of the education budget appears to have taken place in the period since 1989.[13] However, at an average for the period of 42 percent, the share going to primary education is above the one-third reported for the early 1980s, showing that the shift took place during the major expansion in funding in the mid-1980s.

SCHOOL-LEVEL INPUTS

2.16 School quality can be measured by four different types of inputs:

- Material inputs, such as chalk and textbooks
- Physical inputs, such as classrooms and blackboards
- Teachers
- School management.

Data were collected on each of these aspects in both 1988 and 2003 school surveys and are used here to show how the situation in schools has changed over time (Annex D provides a more detailed analysis).

Physical and Material Inputs

2.17 The main message from the GSS/OED school survey is the overwhelming improvement in physical and material inputs. For example:

- In 1988 less than half of schools could use all their classrooms when it was raining, but in 2003 over two-thirds can do so.
- 94 percent of schools have a blackboard in every classroom today compared to 78 percent 15 years ago.
- Fifteen years ago over two-thirds of primary schools reported occasional shortages of chalk, but today 86 percent say there is always enough.
- The percentage of primary schools having at least one English textbook per pupil has risen from 21 percent in 1988 to 72 percent today; and the percentage of JSS having at least one math book per pupil has risen from 13 to 71 percent.[14]

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13. Although there was a substantial reduction in the length of senior secondary education it was accompanied by increased enrolments at that level, limiting the savings realized by the efficiency gain for reallocation at the basic level.

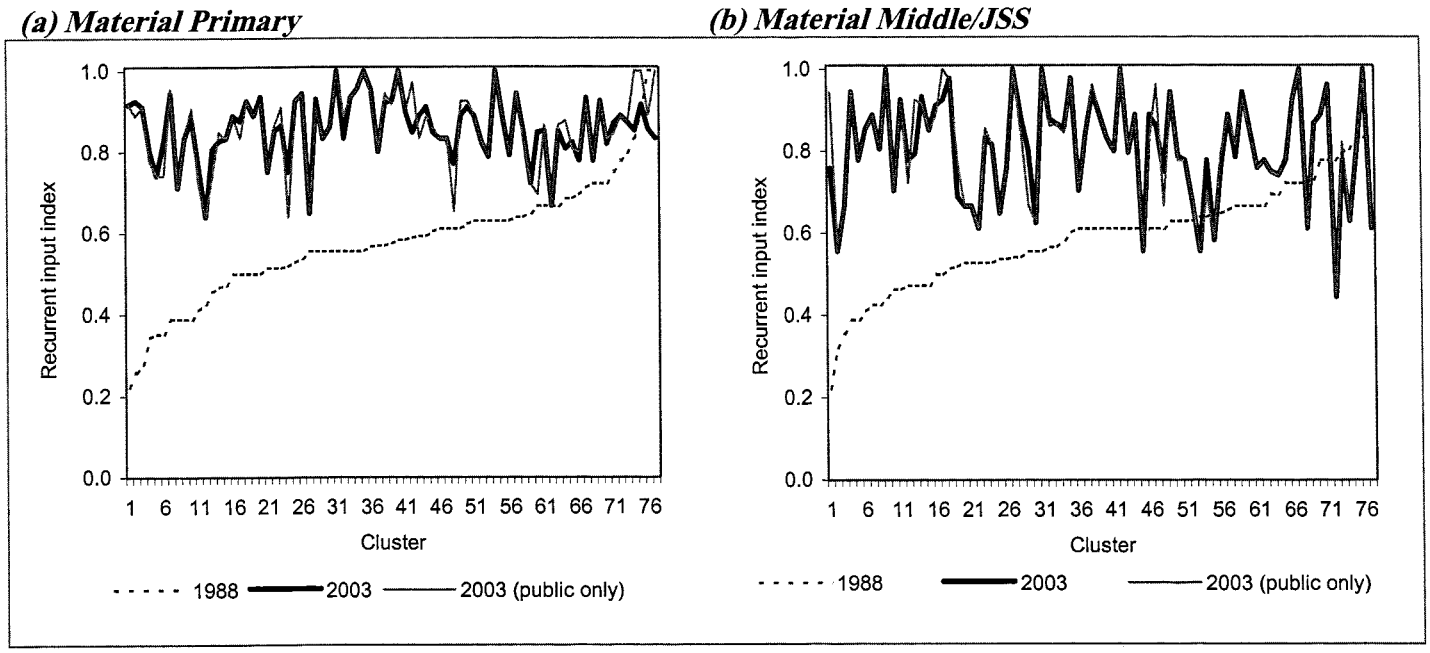
14. It is whether textbooks are being used or not that matters. Responses from the teacher questionnaire show that, where books are available, they were used by over 90 percent of teachers in their most recent math or English class. A study in the mid-90s found that textbooks were indeed used in the classroom provided there were sufficient to go round (Okyere et al. 1997).

2.18 Despite this overwhelmingly positive message there remain some schools, most typically in poor rural areas, in which conditions, while improved, remain poor (see para. 2.25).

Material Inputs

2.19 The four materials inputs for which data can be compared between 1988 and 2003 — availability of chalk, math and English book availability, and desks[15] — were combined into an index of material inputs. [16] For each of these four variables there has been a highly significant improvement in the level of inputs at both primary and JSS level, and the index shows an improvement in nearly every area surveyed (Figure 2.3).

Figure 2.3: Schools in nearly all areas have more material inputs than before: cluster-level material inputs to school quality



Source: GLSS2 and GSS/OED school survey

2.20 Figure 2.3 shows the cluster level average of the material input index for 1988 and 2003, calculated separately for primary and middle/JSS. In each graph the clusters have been ranked according to the value of the index in 1988, so that the clusters with the schools with the fewest material inputs in that year appear to the left of the scale. Where the line for 2003 lies above that for 1988 there has been an increase in the material input index for that cluster. Two points jump out from these graphs:

15. School furniture has been included in the material index although it should arguably be included among the measures of physical quality. However, the latter are restricted to infrastructure.

16. The index is the simple average of the four variables scaled over the range 0-1.

- There has been a substantial increase in the level of material inputs across the country, especially in primary schools. In only two clusters (which had the maximum value of 1 in 1988) has the level of material inputs declined at primary level. For middle/JSS there have been an improvement in all but 9 of the 76 clusters

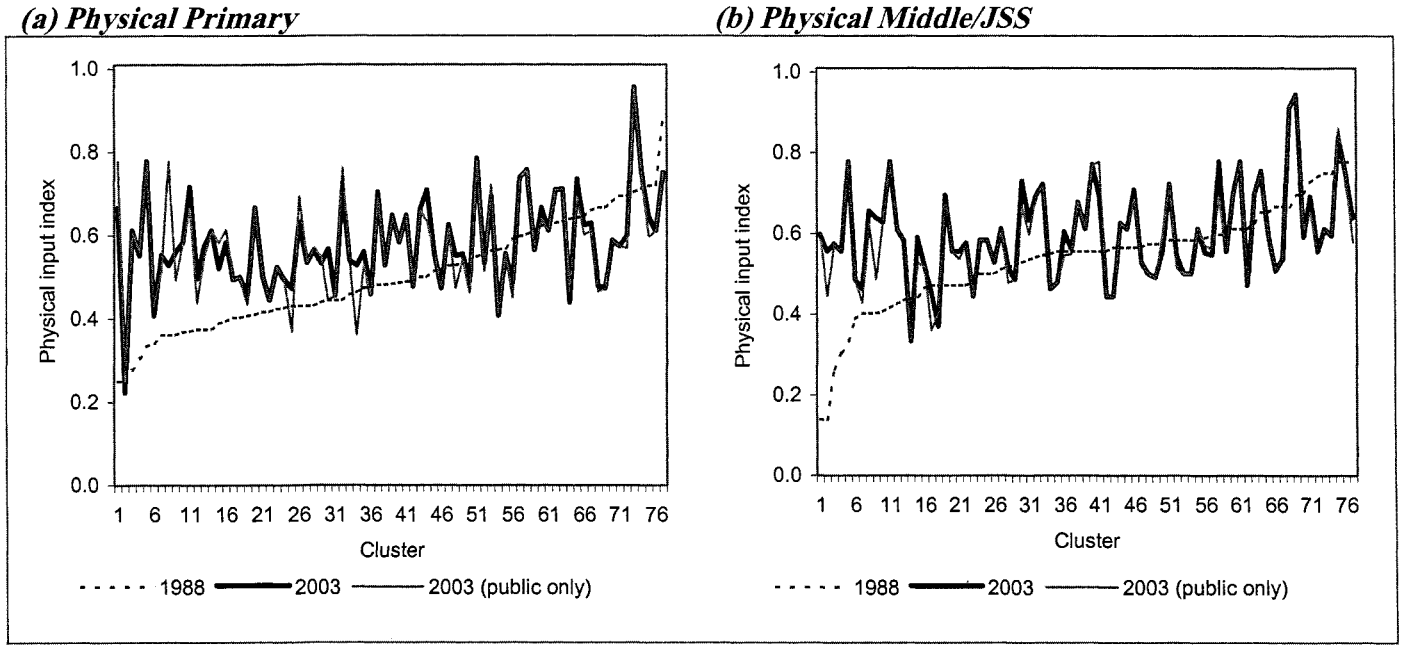
- The improvement has been greatest the lower the initial level of the index, meaning that the clusters in which schools that were the most deprived in 1988 have seen the largest improvements in material inputs.

2.21 The share of private schools in the sample increased from 5 to 20 percent between 1988 and 2003. But the increase in school quality does not result from the better quality of private schools. Figure 2.3 also shows the material input index for 2003 calculated for public schools alone. In general this line is not far removed from the overall cluster average. Indeed it is above it, indicating that public schools have a higher level of material inputs than do private ones, in 22 of the 41 clusters that have private schools. When the changes in the index and its components are calculated for public schools only these changes all remain significant at the 1 percent level (Annex E).

Physical (building) Inputs

2.22 Physical inputs have also increased, though to a lesser extent. The indicators used are the adequacy of the number of classrooms, the proportion that can be used when raining, the proportion with a blackboard and the quality of those boards, the presence of a library and own water supply. Two of these have not improved (number of classrooms and library) for either type of school, one (library) has not for primary schools, and another (classrooms that can be used when raining) for middle/JSS. The lack of change of there being sufficient classrooms shows that classroom building has kept pace with growing student numbers. The number of classrooms has increased, but been matched by more students. Overall, there *has* been a significant increase in the index of physical inputs (Figure 2.4).

Figure 2.4: The quality of school infrastructure has improved in most areas: cluster-level physical inputs to school quality



Source: GLSS2 and GSS/OED school survey

2.23 Figure 2.4 shows the change in physical inputs in the same way as Figure 2.3 showed material inputs. Well over half of the clusters have experienced an overall improvement in physical inputs.

2.24 Once again, although private schools perform better in some respects, their increase does not account for the improvement in school quality that has taken place. In 2003, private schools had superior inputs with respect to the percentage of classrooms that could be used when raining and having their own water supply. They also had slightly better average quality chalkboards, although the difference is not quite statistically significant. There is no difference with respect to having sufficient classrooms, chalkboards, or a library.

Allocation of Material and Physical Inputs

2.25 There were biases in the allocation of material inputs in 1988. By 2003 these had been eliminated, with the exception of desks. But there has been a continued bias against poorer areas in the distribution of physical inputs. The source of these differences is the basic school financing and distribution system. Chalk and textbooks are supplied centrally through GES to their district offices, which distribute them to schools. This system was not functioning in 1988 owing to lack of materials and transport. But today it works so as to ensure sufficient supplies in the majority of schools.[17] However, infrastructure is the responsibility of districts, which may also supply desks, with additional support from the

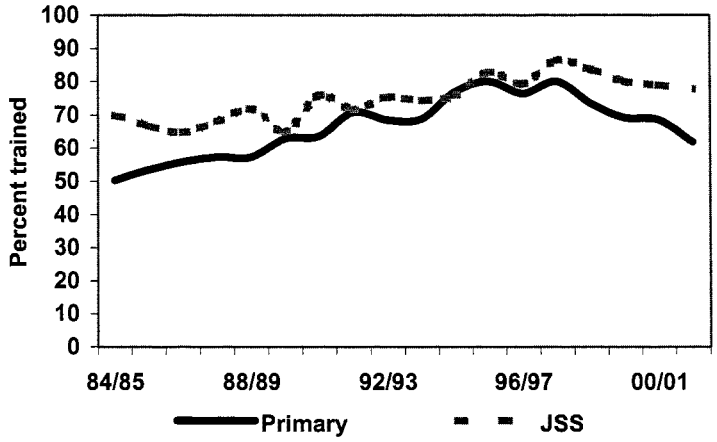
17. It is plausible that the efficiency of the distribution system has been enhanced by decentralization, which has placed more GES officers at district level. This question is beyond the scope of this study.

PTAs. Schools in wealthier districts will benefit from both higher levels of district support and higher parental contributions, resulting in discrepancies in resource availability. The worst-resourced schools are "bush schools" that is schools in off-road rural communities. Such schools have difficulty in attracting teachers[18] and parents who can ill afford any cash contributions. There is growing dichotomy within the public sector between these schools and those of relatively more affluent parents in urban areas.[19]

Teachers

2.26 The number of primary teachers rose from 47,900 in 1980 to 84,400 in 2001. For JSS these numbers are 22,500 and 43,000 respectively. In line with the reform program, the proportion of teachers who are trained rose, particularly in primary school reaching nearly 80 percent from a low of just 50 percent (Figure 2.5). But this trend was reversed in the mid-1990s, so that today only 60 percent of primary teachers are trained. This is partly because of the growth of private schools, which typically do not require their teachers to be trained. In the 2003 GSS/OED school survey 87 percent of public basic school teachers were trained, whereas just 12 percent of teachers in private schools had teacher training. A second explanation is that trained teachers are taking study leave and not returning to basic education — either joining the administration, teaching in secondary school, or leaving education altogether.[20]

Figure 2.5: The proportion of teachers who are trained rose... and then fell again



Source: MoE data

2.27 Ghana has a low pupil-teacher ratio (PTR) compared to other countries. Official policy is to raise the PTR in the interests of efficiency. The increase in the average ratio for primary

18. The two bush schools visited by the study team both only had one teacher, the others having refused to take up their posts (see Hedges 2002, for further discussion of the failure of some teachers to take rural postings). In neither case was the teacher present on the day of the visit.

19. This phenomenon was documented in the reported entitled *A Tale of Two Ghanas* (Kraft et al. 1995).

20. After a certain number of years service teachers qualify for paid study leave, during which they continue to draw their salary while pursuing full-time further education. Being a primary school teacher is thus a well-established stepping-stone to other careers (Hedges 2002; and Akyeampong and Stephens 2002).

schools from 30.6 to 36.0 between 1988 and 2003 therefore represents greater efficiency. Only 13 percent of primary schools now have a low PTR (defined as less than 20) compared to 18 percent 15 years ago (Figure 2.6(a)). But more schools suffer from having too few teachers, defined as a PTR of 50 or more, especially in northern regions where 54 percent of primary schools had a high PTR (Figure 2.6(b)).

2.28 The quality of teachers is measured by teacher training and the methods they employ, including student supervision and time on task. The proportion of trained teachers has fallen and the provision of in-service training is unsatisfactory: 35 percent of the 3,129 teachers interviewed in the GSS/OED survey stated that they received no teacher in-service training at all in the past year. Of those who have received such training, 70 percent have received it three times a year or less. Less than 3 percent of teachers benefit from in-service training once a month or more.

Figure 2.6 (a): Efficiency gains have been realized by increasing the pupil-teacher ratio

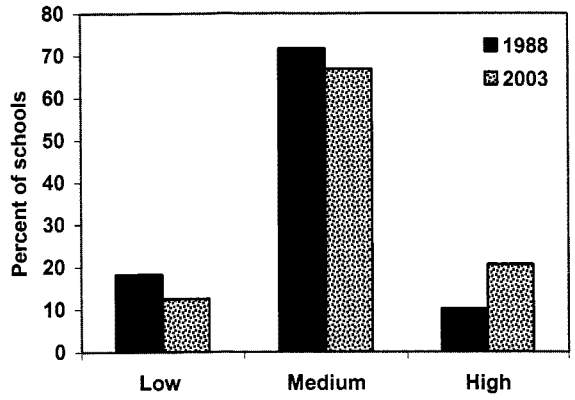
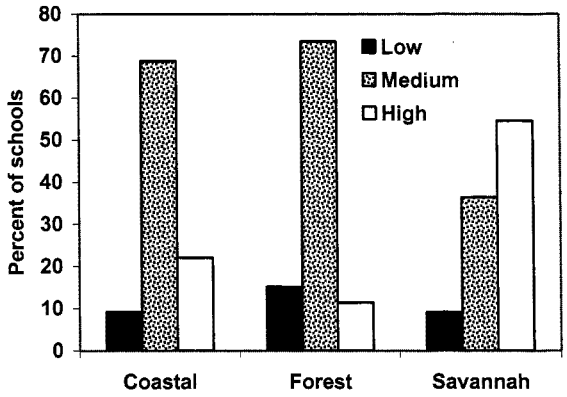


Figure 2.6 (b): But the PTR is too high in the Savannah region (PTR by zone, 2003)



Source: GLSS2 and GSS/OED school survey

2.29 Teaching methods can be broken down into use of improved methods, the frequency with which teachers set homework and time on task. In 2003, teachers were asked three questions to test their familiarity with improved teaching methods. About a third of teachers use a student-centered learning approach and use simulations (role play) on a regular basis, though about a fifth of the latter could not explain them properly. About one-fifth use cues to help explain difficult words. In summary, improved teaching methods are far from unknown, but not widespread, being utilized by a minority of teachers. Trained teachers are significantly more likely to use improved methods than untrained ones, although there is not a significant difference between teachers who have received university-level teacher training and those trained by TTCs (Annex D, section D.5). In-service training also helps. Head teacher supervision of teachers has a significantly positive impact on the use of improved methods, as does the teacher having direct contact with the circuit supervisor.

2.30 In 2003, data were also collected on the frequency with which teachers set homework, look at and assess students' work for both math and English. Homework is set at least once a week by over 95 percent of teachers for math and English, and work assessed with the same frequency by half the teachers surveyed. Less attention is paid to local

languages with homework set frequently by 80 percent of teachers and far fewer assessing work on a regular basis. On average one-third of the time in the classroom is spent on task based on a narrow definition, but 72 percent using a broader definition. There is considerable variation around these averages.

2.31 Teacher absenteeism has increased over the past 15 years. In 2003 nearly 13 percent of teachers had been absent in the past month for reasons other than sickness,[21] compared to just over 4 percent in 1988. Correspondingly, more schools are affected by absenteeism today than in 1988. Fifteen years ago 85 percent of schools did not suffer at all, whereas this figure has now fallen to 61 percent. There is a substantial difference between public and private schools: 80 percent of private schools have no problem with absenteeism, compared to not much more than half of public schools. Absenteeism is greater in rural areas, probably for the following reasons: (1) teachers may live in town some distance from the school and suffer transport problems, (2) they have to travel to town once a month to collect their pay, which they may find is not yet there, and (3) rural teachers attend to their farming activities.[22] More generally, absenteeism is linked to low teacher morale and poor working conditions, in particular not receiving pay on time (see Annex D).

School Management

2.32 The focus on software rather than hardware means an increased focus on issues of school management. At the school level the majority of head teachers are actively involved in the different types of supervision. Notably, less than 5 percent of teachers say that the head teacher does not look at their lesson plans on a regular basis. However, fewer than half say that the head actually discusses the lesson plan with them. And, while the large majority of schools have visits from the circuit supervisor, nearly half (44 percent) of teachers have no direct contact with him or her. This latter finding confirms that from the evaluation of the Primary School Development project in the late 1990s, which found that many circuit supervisors merely checked staffing numbers and enrolments rather than observing teachers in the classroom or other activities that might positively affect learning (Fobih et al. 1999: p.33).

2.33 In 1988, circuit supervisors visited schools just over once every two months on average. By 2003 the mean number of visits rose from 6 to 9 a year for primary schools and a bit less for JSS. There is little variation between areas of the country as to the frequency of visits, but 45 percent of private schools receive infrequent supervision visits, compared to only 7 percent of public schools.

2.34 Virtually all schools have a PTA. Over 99 percent of public basic schools had them in 2003, as did 95 percent of private schools. However, it is not the mere presence of a PTA that will make the difference, but the extent to which it provides support to the school. There is considerable variation in the extent to which PTAs have provided support to schools and in

21. A more detailed study by EARC (2003), taking into account late arrival and not being present in the classroom, finds an even higher degree of absenteeism.

22. A main source of income for urban teachers is extra classes, which necessarily do not take place during school hours. Rural communities, which are more cash constrained, offer fewer opportunities for extra classes.

the value of parents' monthly contributions. Econometric analysis shows that the level of community support to the school through the PTA is closely related to the community's economic well-being. On average, schools in the better-off areas among the survey areas can expect to receive 10 times as much in PTA contributions as can schools in the least well off areas.[23] The actual range is far higher, with several schools not requesting a PTA contribution compared to the maximum of 150,000 cedis per child ($20) (Annex C).

2.35 School Management Committees are also widespread, being present in over 80 percent of the schools surveyed.[24] However, in only half of schools had SMCs met in the preceding month or provided support in the past year, and in even fewer helped the school in dealings with outside agencies. The lower prevalence of SMCs than PTAs is largely explained by the fact that they are not required at private schools: over 90 percent of primary schools have SMCs.

2.36 Virtually all public primary schools (92 percent) have had a School Performance Assessment Meeting, at 98 percent of which an action plan was agreed. However, knowledge of SMCs and the SPAM among households is far less common than the school-level data suggests it should be and participation rates correspondingly low. Only 6 percent of households say that someone attended a SPAM at their child's school.

23. This result follows from statistical analysis of PTA contributions with respect to average community income. This elasticity is found to be close to unity (see Annex D, section D.4).

24. See Condy (1998) for detail on the setting up and intended role of SMCs.

3. The Bank's Education Portfolio in Ghana

Five Bank projects have provided support to basic education: the education component of HERP, EdSAC I and II, PSD, and BESIP. The money from all of these projects has been largely devoted to hardware and instructional materials, mainly school building and rehabilitation, and textbooks and school furniture. The Bank's contribution to more recent changes in school management, such as school management committees and increased emphasis on in-service training, has been rather more limited.

OVERVIEW

3.1 Following the engagement of the World Bank with Ghana's Economic Recovery Program in 1983 the Bank undertook initial education sector analytical work in 1984. Further discussions the following year resulted in a preparation mission in September 1985, which proposed a sector approach.[25] Prior to the sectoral adjustment credit a $0.3 million project preparation facility enabled some planning activities, such as a school mapping exercise as well as purchase of essential school materials such as pens and pencils, and further emergency support was provided under the Health and Education Rehabilitation Project (1986-91, see Table 3.1). The first two education projects were sector adjustment credits EdSAC I (1986-91) and II (1990-94), the first of which was the first SECAL for education by the Bank and foreshadowed the later adoption of the sector approach more generally.[26] These two projects, which were directly linked to the reforms described in the previous chapter, were complemented by two investment projects: (1) Community Secondary School Construction (CSSC, 1991-95) to create the extra capacity at the secondary level, especially in under-served areas, expected to be generated by the reforms; and (2) Tertiary Education (1992-98), which was left out of EdSAC II because of its political sensitivity.

3.2 Two further projects also supported formal basic education: Primary School Development (PSD, 1993-98) and the Basic Education Sector Improvement Project (BESIP, 1996-02). Basic education can include adult education programs, and these have been supported by two additional projects: Literacy and Functional Skills (1991-95) and National Functional Literacy Program (1992-98) and National Functional Literacy. A final project focused on vocational skills training as part of a broader informal sector project.

3.3 Over the period 1986-2002 the Bank disbursed $260 million to projects supporting Ghana's education sector, an average of $17 million a year, peaking at nearly $40 million in 1995 when five projects were disbursing simultaneously (Figure 3.1).

25. Project design also drew on the 1985 Public Expenditure Review.

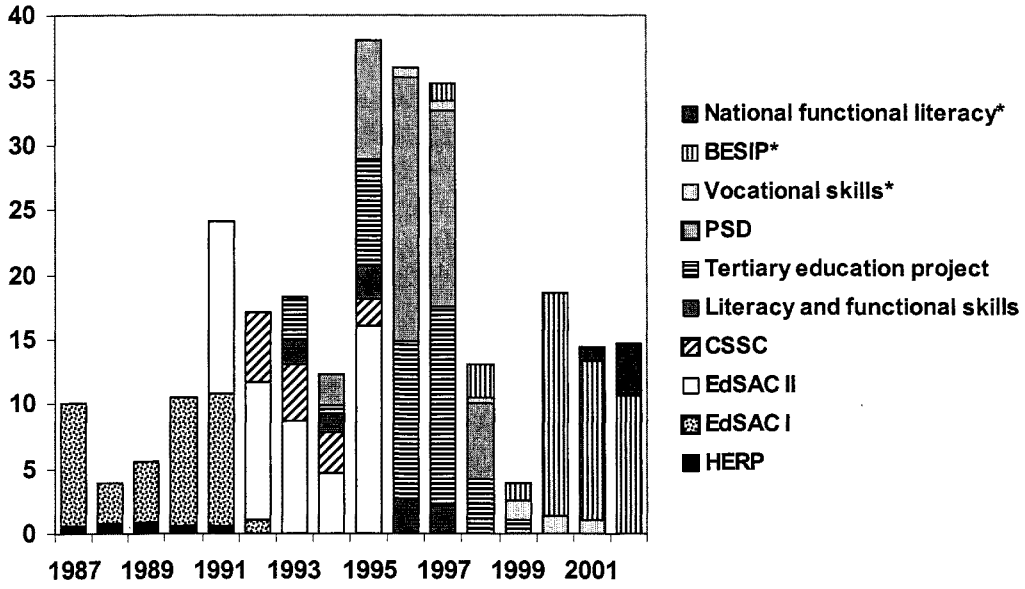
26. The evolution of the portfolio — both the sequencing of reforms under EdSAC I and II (and associated Community Secondary Schools Project), and the timing of the related investment projects for primary and tertiary education — can also be compared to the more recent development of adaptable program lending.

Table 3.1: World Bank support to Ghana's education sector, 1986-2003

Project	*Budget*		*Outcome rating*		*Approved*	*Closed*
	IDA	*Total*	*Bank rating*	*OED*		
Health & education rehabilitation (HERP)	18.0	18.1	Not	S	1/86	12/91
o/w education component	6.1		rated			
Education sector adjustment	38.3	45.5	S	S	12/86	12/91
Education sector adjustment II	53.2		S	MU	5/90	12/94
Community secondary school construction	14.7	19.6	S	MS	6/91	6/95
Literacy and functional skills	27.8		S	S	3/92	12/97
Tertiary education	44.8	51.0	MS[1]	MS	10/92	9/98
Primary school development (PSD)	53.2	56.6	U	MU	6/93	12/98
Basic education (BESIP)	47.9	241.6	S	S	6/96	12/02
Vocational skills and informal sector	5.8		U	U	3/95	6/01
National functional literacy program	23.7		S	n.a.		To close 12/04

Key: S = Satisfactory, MS = Moderately/marginally satisfactory; MU = Moderately/marginally unsatisfactory; U = Unsatisfactory. 1/ The rating system used by the Bank's operational staff allow for only satisfactory or unsatisfactory ratings, but in this case it was stated that the project outcome was "barely satisfactory". Source: World Bank project documents.

Figure 3.1: Bank disbursements on an annual and project basis, FY86-02



*OED estimate of annual disbursement from project supervision data.

Source: World Bank project documents

3.4 This study focuses on the five credits that have supported formal basic education: HERP, EdSAC I and II, Primary School Development, and the Basic Education Sector Investment Project.

THE SECTOR ADJUSTMENT CREDITS: EDSAC I AND II

Objectives

3.5 The objectives of the two EdSACs were linked to the reforms begun in 1986:

- *EdSAC I* (1986-91): (a) Change the structure of the education system; (b) improve pedagogic efficiency and increase access; (c) improve budgeting procedures and effect cost savings and cost recovery measures.

- *EdSAC II* (1990-94): (a) Complete the restructuring of the school system to a 12-year cycle; (b) extend the reform to senior secondary education; (c) consolidate the basic education reforms so that primary and JSS leavers acquire the cognitive skills needed to take advantage of education offered at higher levels; and (d) ensure the financial sustainability of the new system.

Use of Funds

3.6 Since both EdSAC I and II were budget support, it may seem that the attribution of the funds to specific expenditure items is not worthwhile. However, although the funds were budget support, they were disbursed against expenditures on a schedule prepared against a positive list and agreed on a tranche-by-tranche basis with the Ministry of Education,[27] with agreement on the overall education budget as one of the conditions for tranche release. Procurement was carried out by a Project Management Unit (PMU) located in the ministry. The Bank's task manager, who was based in Accra from late 1987, was involved in monitoring procurement decisions and procedures. Hence it makes more sense to say that the Bank financed these items than would usually be the case with budget support (with the partial exception of an early disbursement, which was retroactive finance for textbooks the government had already printed).[28]

3.7 Under the two EdSACs just under 30 percent of IDA funds were used for school building and rehabilitation, and a similar amount for school furniture and equipment (Table 3.2). Other expenses includes items such as vehicles, so about two-thirds of total funds went on "hardware." The next largest item was teaching materials, which includes both the development and printing of teacher materials and textbooks. A relatively small amount (only 2 percent under EdSAC II) was spent on teacher training. However, under each of

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27. Only EdSAC I and II and one credit to Nigeria operated in this way as the Bank's legal department ruled that program aid funds could not be used to finance local expenditures. This decision became irrelevant after February 1996 since when it has not been necessary to account for the use of funds from adjustment loans.

28. The region objected to OED's assessment of EdSAC II on the grounds that it was not what happened to the money that mattered but rather the reforms that were supported. It is argued here that both the use of funds and reform matter.

EdSAC I and II over 20,000 JSS teachers received teacher training to orient them to the new system. Under EdSAC II 24 percent of the funds were allocated to primary education and another 15 percent to JSS.[29] Nearly 95 percent of the funds spent in the primary sector were used for civil works (mainly the construction of school pavilions), as were just under one-third of the funds benefiting JSSs with most of the remainder (61 percent) for textbooks.

Table 3.2: Allocation of resources under EdSAC I and II

	EdSAC I				EdSAC II	
	IDA	Total	IDA	Total	IDA	
	US$ millions		Percent		US$ millions	Percent
School building and rehabilitation	11.3	17.5	29.4	38.3	15.2	28.5
Teacher training	3.4	3.4	8.8	7.5	1.1	2.1
Teaching materials	8.1	8.1	21.0	17.8	12.0	22.5
School furniture and equipment	9.4	10.3	24.4	22.5	18.2	34.1
Other expenses	6.3	6.3	16.4	13.9	6.8	12.8
Total	38.6	45.7	100.0	100.0	53.3	100.0

Source: calculated from project data in Bank implementation completion reports.

3.8 The system of administering budget support has systemic effects, that is, the way in which the donor's system for managing the aid inflow (i.e., procurement, monitoring, and reporting requirements) affects the government's resource allocation procedures. Such effects are frequently negative as donor systems can impose large transaction costs on the borrower (see White and Dijkstra 2003: Chapter 12). However, in the case of EdSAC they appear to have been positive, with the Ministry of Education requesting more frequent supervision. Procurement procedures are prone to corruption and bureaucratic delay. The presence in the field of the Bank's task manager facilitated timely and detailed comments on bidding procedures and familiarized ministry staff with competitive tendering procedures, which were adopted for all ministry procurements in the early 1990s (an EdSAC II condition). These interventions would have been unnecessary if procurement had been problem free, but it had not. Or they could have been costly if there were many donors imposing different procedures. But the Bank was the only donor of substance prior to 1990 (other donors supported education by co-financing EdSAC I). The first significant bilateral support was USAID's $35 million Primary Education Project (PREP, 1990-05) of which $32 million was budget support channeled through the PMU responsible for EdSAC procurement.

Conditionality and Reforms

3.9 Both credits consisted of three tranches. EdSAC II conditionality was simplified to the same set of six conditions for each tranche release, but complicated by the introduction of

29. EdSAC II supported the second phase of the reforms, which was focused on the second and third cycles. While data are not available, EdSAC I, which supported the first phase (reform of basic education), will have allocated a higher proportion of funding to the basic level.

performance indicators that were used to judge progress but which did not have legal status. This ambiguity might explain some of the tensions that emerged between GoG and the Bank in the later period (see below).

3.10 Although the government implemented an impressive range of reforms, this does not mean that the conditionalities attached to the two EdSACs were problem free. Far from it. The policy conditions under the two credits can be divided into four areas (the conditions are listed in full in Annex J):

- Restructuring: these conditions matched the government's own timetable for the introduction of the new system and were met accordingly. Bank reviews of the adjustment credits noted an initial lack of trained teachers for all subjects and teaching materials for JSS. However by June 1987, 7,000 JSS teachers had been trained and the army mobilized to distribute textbooks, indicating that whatever shortcomings there were did not arise from government complacency.

- Budget: EdSAC I required that there should be agreement on the education budget, which was met each time. This condition was kept for EdSAC II with the added requirement that actual expenditure should be in line with the budget and that the share of basic education should stay at least its 1989 level (62 percent). The second of these targets was met, but the first was not with larger amounts going to tertiary and vocational training, resulting in tensions between the Bank and government, the latter accusing the Bank of bringing up arbitrary conditionalities.[30]

- Cost recovery: (1) Boarding and feeding subsidies: Government subsidy to feeding and boarding costs for secondary school students were reduced — although not to the level required by the Bank. This partial slippage was allowed to pass, and the subsidies were later removed altogether. The condition to eliminate the feeding and boarding subsidy at the tertiary level was postponed and the Bank accepted the introduction of a subsidized student loan scheme. Delays in completion of the University Rationalization Study (URS) and its implementation were major factors behind the delayed release of the second and third tranches of EdSAC I. (2) Book charges were introduced and increased at a rate to ensure full cost recovery, with the proceeds paid into a revolving fund. In January 1995, the charge was abolished at primary level. The revolving fund did not become a basis for sustainable textbook purchases with textbook supply continuing to depend on external finance.

- Staffing: (1) A payroll audit was undertaken to eliminate ghost workers, with 5,722 ghosts removed from second-cycle institutions by January 1987. A freeze on new posts was breached in 1988 with GES employment increasing by close to 7,000 (to a total of 158,102) as a result of the hiring of untrained middle school leavers, in contravention of both the condition and government's own policy that no new untrained teachers should be hired. Extensive staff cuts brought GES employment

30. The two main points of dispute were: (1) the Bank objecting to tertiary's share exceeding 20 percent, which GoG said was a convention not a condition, and (2) that the government reduced funding for education materials, apparently exploiting fungibility as more donor funds became available.

down to 146,000 by mid 1990. During EdSAC II negotiations a ceiling of 153,000 was agreed,[31] which was as good as kept until the third tranche[32] was approved, but breached shortly thereafter rising to nearly 155,000 in 1994. The Bank wrote to the government asking it to keep to "its ceiling" of 153,000 but had no leverage since the funds were disbursed. (2) Freezing the size of GES at a time of growing enrolments had the desired effect of increasing the pupil-teacher ratio. At senior secondary level the condition that class sizes for optional subjects be at least 20 was not met (the Bank had originally proposed 25), the Bank responding merely by requesting government to send a further instruction to schools to reduce the number of options taught in schools missing the target. The letter was sent but not complied with by all schools.

3.11 The EdSAC II targets not contained in the legal covenant included designing and implementing a plan for in-service training, the introduction of the new circuit supervisor system and the introduction of performance testing (the Criterion Reference Test). Each of these things was done, though the funding and technical support to do so was provided by USAID rather than the Bank.

INVESTING IN BASIC EDUCATION: PSD AND BESIP

Objectives

3.12 Both the Primary School Development Project (PSD) and Basic Education Sector Improvement Program (BESIP) emphasized increasing access and improving the quality of education:

- PSD: The overall goal of this project was to increase learning achievements and enrollments in primary schools throughout the country. In order to accomplish this, the project had the specific objective of increasing the amount and improving the quality of instructional and learning time in primary schools, particularly as far as 1,983 of the least well-endowed primary schools are concerned.

- BESIP was intended to help the Government of Ghana to implement FCUBE, specifically aiming to (a) improve the teaching process and learning outcomes; (b) strengthen management of the basic education system through better planning, monitoring and evaluation by MOE/GES at central, regional and district levels, and by promoting active involvement of communities in the management of schools; (c) improve access to basic education, especially of girls, the poor and other disadvantaged segments of the population; and (d) ensure financial sustainability of the Government program for basic education over the longer term.

31. The Bank had wanted 152,000 and the government 155,000.

32. There was a negligible excess, with a figure of 153,513 in August 1982.

Project Components and Use of Funds

3.13 For PSD two main areas of activity were identified:

- Policy and management changes: (1) increased instructional time, (2) reducing student fees and levies, (3) improve skills and motivation of head teachers, (4) community involvement in selection of head teachers, (5) orientation of district officials and community leaders, (6) support to school supervision, and (7) school mapping.

- Investment in physical infrastructure: (1) construction of classrooms, (2) construction of head teachers' housing, (3) provision of roofing sheets. Communities were to be responsible for building the external walls ("cladding") for pavilions constructed by the project.

3.14 These activities were to be carried out in the 1,983 most deprived schools. This number of schools covered by the project was later increased to 2,178 in response to pressure from MPs. In the mid to late 1990s there were approximately 11,200 public primary schools, meaning that about 20 percent of all schools received support from the Primary School Development project. Eighty-five percent of PSD funds were spent on civil works (Table 3.3), constructing a school pavilion (a cement floor and roof with girder supports) and house for the head teacher in each beneficiary school. In return for the accommodation the head teacher was to sign an agreement with PTA and DEOC on holding meetings out of school time, providing teacher training, community relations, and attending training. The communities were to sign contracts to clad the pavilion (i.e., construct external walls) within six months of completion.

Table 3.3: Allocation of resources under PSD project and BESIP

	Primary School Development		*BESIP*	
	US$	*Percent*	*US$*	*Percent*
School building and rehabilitation	38.0	67.1	16.3	34.2
Head Teachers' Housing	10.5	18.6	0.0	0.0
Training materials	2.1	3.7	1.3	2.7
Training			1.3	2.7
Teaching materials	0.0	0.0	2.0	4.3
School furniture	0.0	0.0	4.2	8.9
Textbook supply	0.0	0.0	16.4	34.3
Other expenses	6.0	10.6	6.2	13.0
Total	56.6	100.0	47.8	100.0

Sources: World Bank project documents.

3.15 The project was restructured at the mid-term review to better support the FCUBE, incorporating the Education Management Information System (EMIS), provision of teaching materials, a Schooling Improvement Fund (SIF), and an information, education, communication (IEC) program. These changes made little difference to the allocation of funds. Less than 4 percent was spent on training materials and training.

3.16 While components may be important even if they do not have much money spent on them, the Bank's implemenation completion report rated the project as unsatisfactory noting that many required reforms had been only partially implemented. For example, schools did not provide the required length of instructional time, community involvement was negligible other than in some SIF schools, and there was little impact from orientation and training of officials, community leaders, and teachers. PSD's main achievement was the provision of physical infrastructure.

3.17 The BESIP SAR stated that "despite increased resource inputs and enrollments, the reform movement has had very limited success so far in improving the quality of teaching and learning outcomes" (p.5) so that "more attention has to be paid to software" (SAR: 14). However, most Bank resources for the project were devoted to hardware and instructional materials, especially following the Mid-term Review when the project was restructured to focus on three components: (1) civil works, (2) textbook supply, and (3) EMIS. As a result, the allocation to civil works and goods increased by about $19 million, giving rise to the large share devoted to hardware and materials in project expenses: $15.4 million of the total budget of $47.9 were spent on civil works and a further $25.8 million on goods (presumably mostly textbooks and furniture, though also including vehicles and other equipment). Approximately one-third was spent on school building and rehabilitation, just over another third on textbook supply and just under 10 percent on school furniture: in total 77 percent of the project budget was spent on hardware and materials inputs.

THE ROLE OF OTHER DONORS

3.18 The Bank's role should be put in perspective against the contribution of other donors. The main agencies active in basic education are USAID and DFID, and some support to school building through the EU's Micro-projects Program (Annex B). The largest contributions — USAID through QUIPS and DFID through Whole School Development (WSD) — have complemented rather than competed with the Bank's inputs since there has been a focus on software (district management, community participation, teacher training, etc.). QUIPS contains small grants to beneficiary schools that have been used for construction in many cases, but the program will only cover three schools in each district (totaling 330 schools) by the end of 2004. Of more significance is the EU MPP, which has financed some 1,500 classroom blocks (a block usually contains three classrooms) around the country. Regarding textbooks, the main input was $10 million from USAID under PERP in 1991. To some extent these books would have replaced those supplied by HERP, which had become worn out, though USAID also supplied books for social science and sciences, which had been largely neglected in HERP procurements. In summary, the other donors active in basic education have by and large not overlapped in supplying the items provided by the Bank. Where they have overlapped the contribution of other donors are not insubstantial, but are on a smaller scale than those of the Bank.

4. The Bank's Impact on Education Policies and Outputs

The Bank has provided both finance and policy support to the education sector over the past 15 years. Despite the clear government ownership of the education reform program, the Bank can be argued to have played an important role in its implementation. While critics argue that the reforms were carried out too quickly, it is at least as plausible that delays would have resulted in failure. The Bank's policy conditions underpinned the reforms, its finance helped them be realized, assisted by technical support. Over the past 15 years the Bank has provided close to 35 million textbooks and financed the construction of 8,000 school pavilions, being the main provider of both these types of support.

THE BANK AND EDUCATIONAL REFORM

4.1 Critics of the World Bank argue that it forces reform on unwilling countries.[33] The evidence in this case suggests a contrary position. Here was a set of reforms the government wished to undertake, which it used Bank assistance to carry out. The strong domestic ownership was shown by:

- The strong domestic dynamic to education policy issues.[34] The reforms were not designed by World Bank staff, but based on the recommendations of the 1972 Dzobo Commission, restated by the Education Commission of 1985. In the view of the Bank task manager of the time the reforms were accepted by the government in 1973, and the Bank merely helped bring them back to life and simplify the curriculum, ensure that books would be available, and that schools would not be closed because there was no food.

- Aspects of the reforms were not favored by the Bank, notably the increased vocationalization of the curriculum. The Bank accepted this policy in order to retain its position supporting the education sector, staff saying that they saw no alternative at the time in view of the strong position taken by the senior MOE official. The government wished to expand senior secondary education more rapidly than the Bank thought wise. In the end the Bank supported the Community Secondary Schools Project, for which it had tried unsuccessfully to find another donor. As a final example, the Bank quickly accepted the government's view that it was politic to bring in a subsidized student loan scheme at tertiary level once feeding subsidies were eliminated.

- The government, including the President, publicly reaffirmed their commitment to the reforms and made the case for them to the public. The reform program was first announced in national radio and TV broadcasts in October 1986. The more difficult "second phase" dealing with second-cycle and tertiary reforms beginning in 1990

33. For example, Heyneman states this position as "local policy makers have become passive recipients of the Bank's agendas" (2003: 315).

34. The strong domestic dynamic to the politics of the education sector continues to this day, as recently illustrated by the government's decision in late 2002 to make English the medium of instruction from Grade 1 and the strong reaction from both domestic constituencies and donors.

received renewed support from the President. Furthermore, the Minister of Finance frequently spoke of the need for cost recovery in health and education, this case being repeated in the 1987 *National Program for Economic Development*.

- The government took several decisive steps in support of the reform prior to it being launched and to ensure it was followed through, including substantial increases in education spending.

- Finally, the reforms made sense given the political position of the ruling Provisional National Defense Council (PNDC) at the time.

4.2 Why did PNDC embrace reforms that had proved politically difficult for well over a decade, and how was it able to successfully implement them? The opposition to the reforms came from the middle class elite, which were not PNDC's political base. During Rawling's first year in power he directly attacked wealth and implemented stringent anti-corruption measures. His subsequent adoption of the liberalization agenda can be attributed to the fact that it would undermine rent seekers to the benefit of the wider population.[35] PNDC was not overly concerned about middle-class opposition. Students were a special case, since Rawlings did have support in the student-based June the Fourth Movement (JFM). But JFM was on the left wing of the party, which was alienated by the adoption of an IMF program in 1983. The loss of this support base, and Rawlings' populist inclination, implied a need to broaden PNDC's appeal. Reform of the education sector was an obvious candidate. The children of the rural poor were either not attending school at all, or attending second or third-rate facilities, whereas the children of the better off were enjoying the bulk of government spending. Moreover, the benefits of economic reform would take some time to reach rural residents outside of the cocoa producing region, so expanding educational provision and improving quality would build support for reform more generally.[36]

4.3 The political commitment of PNDC is clear from the decisive manner in which reform was handled. As the reforms got underway, key civil servants were replaced and a new PNDC Secretary for Education appointed. She was joined by another prominent PNDC member as Deputy Minister who was to remain in the post for nine years and is widely recognized to have been the central figure in steering through the reforms. A second Deputy Minister, responsible for higher education, was in place for seven years. This team moved to end corruption, weeding out ghost workers (by the end of 1986, 5,722 ghost workers had been removed from second-cycle institutions alone) and regaining control of educational policy from GES by relocating three divisions (Supplies, Curriculum Research and Development, and PBME) within the ministry. To circumvent possible delays from GES opposition the army was mobilized to distribute textbooks to the new JSS schools. Student unrest was also tackled with a firm hand, with arrests and closure of the universities — these

35. For an elaboration of this argument see Sowa and White (2003).

36. The government also invested in rural infrastructure (roads and electricity). Bringing electricity to every district was a strongly held desire of Rawlings, which was also supported by the Bank. See Tsikata (2001) for the argument that the PNDC used the aid-financed expansion of services to build political support. Van Donge (2002) makes this argument specifically for the case of education.

strong moves did not threaten the government's popularity since the universities were widely regarded as elitist (Tsikata, 2001: 73 and Nugent, 1995: 118).

4.4 Three roles can be identified for the Bank in supporting the reforms: (1) money, (2) technical assistance, and (3) donor mobilization.

- The role of money. Unlike some macroeconomic adjustment programs in which there may be nothing obvious to finance, the educational reforms in Ghana required financial support. The main requirements were teacher training in the new curriculum, textbooks and other teaching materials for that curriculum, and school building and rehabilitation for the expansion of enrolments. The Bank supported each of these activities. Even with the growth in spending on education, the government was covering not much more than salaries, so the Bank funding paid for many of these requirements. Bank assessments of the impact of the EdSACs argued that the local cost financing provided by these credits was central to the implementation and sustainability of the reforms, allowing them to be completed before opposition could mount. Paying for activities that facilitated growing enrolments helped build support for the government's educational policy. Money also contributed to the restructuring of the ministry, which helped government to increase its control over GES. It used the reform program implementation and the EdSAC credit to carry out this agenda, such as the relocation of key activities within the Ministry supported by Bank technical assistance.

- Technical assistance. The Bank financed technical assistance for studies that played a role in planning, policy, and implementation. The project preparation facility financed both the school mapping exercise and the University Rationalization Study (URS). Technical inputs on textbook design were provided, as well as more day-to-day support on managing procurement. There was also informal influence on these various aspects, in particular from the Bank's education specialist resident in Accra.[37] For example, he commented on drafts of the URS before it was officially submitted to the Bank. His role in budget monitoring was mentioned in Chapter 3.

- Mobilizing donor support. The Bank helped present the government's case to outsiders. This was the first sectoral adjustment credit in education and the Bank was undoubtedly instrumental in coordinating donors in a way so as to support the reforms.

4.5 While the reforms were government-driven, the Bank did have some influence on the shape of the program. For example, the government was persuaded to restrict vocational training at JSS level to an introduction to tools. But there were other areas where the Bank was the one to give ground. For example, the Bank went ahead and supported senior secondary schools in a more full-fledged program that proved a costly failure, with $18 million wasted on workshop equipment that not used.[38]

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37. The task manager's own view is to be found in Bennett (no date).

38. A Bank review of EdSAC II estimated that $18 million were wasted on workshop equipment for vocational training lying under-used and unmaintained.

Sustainability of Reform

4.6 The restructuring of education is well entrenched. The 1996 manifesto of the main opposition party, the National Patriotic Party (NPP),[39] criticized the restructuring on the grounds that it was rushed and done with inadequate consultation.[40] No intention was announced to reverse to the reforms. To the contrary the origin of the JSS system was traced to Busia's Progress Party[41] with a commitment to ensure access up to JSS 3 for all Ghanaians. While cost recovery measures were criticized, the proposed policies put the state's role as paying teachers' salaries, with communities responsible for much else. Since NPP came to power in 2000 there have been no signs of a policy reversal. The recent education sector strategy makes no reference to changing the structure of the system and reaffirms the decentralization measures introduced in the second half of the 1990s.

Donor Coordination

4.7 Donor support for EdSAC I had the features of a sector-wide approach (SWAp) a decade before the term came into usage and the Bank can claim some credit for achieving this degree of donor coordination. A pre-condition for a SWAp is a clearly defined, government-owned sector strategy, which the first wave of educational reforms clearly were.[42] The Bank was active in promoting donor coordination by facilitating donor discussion on the sector and mobilizing co-financing for EdSAC I. An important stage in this process was a donor meeting held in Vienna in September 1987.[43] Having a clear lead donor helps take a sector program forward and the Bank occupied this position, though it probably helped that the meeting was jointly sponsored by UNICEF, since donors may have resisted being directed solely by the Bank. Donor coordination continued in the early 1990s, helped by the fact that the PMU for EdSAC, which received technical assistance from the Bank, assumed responsibility for the management of all external projects,[44] though not their policy functions, which rested in the ministry. In 1990 the Bank shared with USAID consultants who designed the latter's new project for basic education. The Bank went on to play a role in setting up a donor forum for the education sector in August 1994.

4.8 Similar efforts were made to ensure a coordinated approach to the Basic Education Sector Investment Project (BESIP), but these were far less successful. Having been at the forefront of donor coordination in the early 1990s, Ghana has had no education sector program

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39. In the 1996 elections the NPP won 63 out of 200 seats in Parliament, other parties took 6 seats with the remaining 131 going to the ruling NDC.

40. NPP (1996) *Development in Freedom. Agenda for Change*, Accra.

41. NPP traces its political heritage back to Busia and Danquah (Tsikata 2000: 70).

42. Other pre-conditions relate to the overall policy and budgetary environment, which were satisfied in Ghana at least up until 1992.

43. A Bank staff member drafted the government document "The reform and rehabilitation of the education system, 1987-89" showing the financing gap requiring donor support, which was discussed at the Vienna meeting.

44. The importance of this organizational change has been highlighted in a speech by the Minister for Education in the mid-90s (see Sawyer, 1997).

in recent years. Rather it has had three large donors (World Bank, USAID, and DFID) with remarkably similar projects under different management systems with an undoubted increased transaction costs for government.[45] How did this situation arise? The structure appeared to be in place for a sector program. There was already a donor coordination group and a government strategy (FCUBE). BESIP, the Bank's project, was meant to be synonymous with FCUBE — the FCUBE document is headed "the Basic Education Sector Investment Program" on the cover page. Bank documentation during the preparation of BESIP frequently refers to the fact that a sector approach is to be adopted; the project budget — of $250 million — covered the whole FCUBE program of which $50 million was to come from the Bank.

4.9 The sector approach appears to have foundered on donor competition, despite the efforts of the Bank to encourage a government-led process. In July 1994, the Bank's education specialist in Accra wrote to the Minister of Education referring to discussions they had had on developing a new approach to donor financing of basic education in Ghana, proposing to invite donors to a preliminary assessment of the sector later that month. The letter stressed the importance of Government being seen to be firmly in charge of developing the comprehensive basic education program. It was suggested that the Minister formally write to other donors informing them of the Ministry's plans, and to undertake a Ghanaian-led analysis to develop strategy with a meeting in November to get donors on board. But, whereas in 1987 other donors had no experience in education and were willing to follow the Bank's lead, this was not the case nine years later. The crucial episode appears to have been a workshop in London (supported by the Overseas Development Administration, now DFID) to develop a sector strategy: despite the fact that a strategy already existed and that no other donors were invited to the meeting.[46] From this time onward first DFID and then USAID went their own way with programs to finance basic education. Only during 2003, with the new government strategy providing a basis, has a stronger degree of donor coordination emerged.

EDUCATION SECTOR OUTPUTS

Budget

4.10 The Bank review of BESIP estimated that the IDA credit represented about 8 percent of the annual MOE expenditures (recurrent + investment) on basic education. This estimate under-states the importance of the Bank's resources since over 95 percent of the government's basic education spending is for wages and salaries (see Annex B). Over the period 1989-2001, the value of World Bank disbursements was one-third of total government non-wage spending in education, but much higher for the basic sub-sector. This picture is

45. The mid-term review for QUIPS states that "donor coordination under the FCUBE has been characterized as fragmented and lacking collective consultation on strategic plans and financing... between donors there has been little regular sharing or coordination of the key elements of their programs" (Bonner *et al.*: 11) and "the lack of coordination of donor activities at the district level is negatively affecting DEO operations and attitudes" (*ibid:* 48).

46. Source: interview with DFID education advisor based in Accra at the time. The incident is also reported in DFID's *Development Effectiveness Report*, which notes that both heavy DFID involvement in drawing up the strategy and the bilateral nature of the meeting undermined the sector-wide approach (DFID, 2002, p.26 Box 5).

little changed by taking into account the support schools receive from the districts, whose total spending is less than 5 percent of government spending with about one-third going to education. While schools have benefited from these resources, they do not match the scale of World Bank financing.

4.11 The scale of the Bank's operations has also matched that of other donors. Bilateral aid to education totaled $350 million over the period 1989-2001, compared to the Bank's $260 million. Within basic education the main players have been USAID ($88 million in the Primary Education Project and QUIPS), DFID (£50 million in Whole School Development) and school building by the EU under its Micro-projects program.[47] The value of these bilateral programs approximately equals that of the Bank.

Activities

4.12 Table 4.1 summarizes the physical activities financed by World Bank resources.[48] As shown in the previous chapter, the bulk of financing has been directed to civil works and textbooks.

4.13 HERP began with the distribution of 6.1 million textbooks to basic schools, which were mostly for math, English, and science.[49] In 1990, there were 2.8 million children in public basic schools, so they would have received, on average, two textbooks each. Data collected toward the end of HERP showed 100 percent coverage for 7 of the 20 textbook titles printed, with an average of 82 percent and a minimum of 73 percent. For the 15 teacher guides printed average coverage was 78 percent, with complete coverage for 5 titles. HERP therefore turned the situation around from one of practically no textbooks in most classrooms to having one book per student in most schools for the three core subjects. This book supply supported the reform process by putting in place textbooks adapted to the new syllabus.[50]

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47. These are not the only projects but the main ones. Other active donors include KfW (developing and printing local language textbooks), Japan, and UNICEF, and a large number of NGOs.

48. That is, funds used for technical assistance are not included.

49. The books were printed based on textbooks developed in the preceding years by a textbook committee. Books for other subjects, such as social sciences, were initially excluded as being less essential. Toward the end of the project a small number of social science texts were printed.

50. There were some delays in getting books into the classrooms in the first year.

Table 4.1: Activities in World Bank basic education projects

	HERP	EdSAC I[a]	EdSAC II[1]	PSD	BESIP
Textbooks					
Primary	6.1 million	1.8 million	1.5 million		6.6 million
JSS		5.6 million	8.4 million		4.0 million
Stationary					
Exercise books[b]	7.5 million	$1.9 million unspecified school supplies and equipment	$0.6 million unspecified school supplies to JSS		
Pens and pencils[b]	5.6 million				
School furniture					
Primary					13,800 dual desks
JSS		$ 1.1 million			3,450 dual desk
Both					3,750 library tables and chairs; 893 teachers tables and chairs
Technical equipment for JSS		$ 3.4 million			
Classroom rehabilitation					2,300
New classroom blocks					
Primary		2,000 school pavilions	2,000 school pavilions	3,727 school pavilions (2,908 clad)	101
JSS			350 school pavilions		50
JSS workshops		67 workshops			
Other civil works					
Teacher accommodation				2,178 head teacher's houses	344 four-unit blocks
Toilet facilities					151 pit latrines
Roofing of schools		500 classrooms		999 classrooms	
Other activities					
In-service training		>20,000 JSS teachers Approx. 2,000 primary head teachers	22,000 JSS teachers		

a. Most quantities are imputed from dollar expenditure using an assumed unit cost, based on unit cost from another project adjusted for inflation.
b. Beneficiaries not stated, so that some may have gone to non-basic students.

Source: World Bank project documents

4.14 However, intended textbook lifespan is only three years, the revolving fund for textbook procurement did not become well established, and fees for primary texts were dropped in 1995. Hence the bank has continued to supply textbooks, most recently 11 million books under BESIP. Under all projects combined the Bank has financed the provision of close to 35 million textbooks.

4.15 School pavilions have been the main type of civil works, with over 8,000 of these constructed under the various projects, for which the community was expected to provide the external walls. As noted in various World Bank reports, this was frequently not done. Although the majority of PSD-constructed schools were clad (Table 4.1) — econometric analysis shows that PSD made a significant contribution to schools having a greater proportion of classrooms that can be used when it is raining (Annex D) — pavilions were constructed under all four of the main Bank projects. Many pavilions remain unclad, frequently with low internal walls. PSD alone reached 25 percent of primary schools, overall close to one-fifth of public basic schools have benefited from World Bank civil works in the past 15 years.

4.16 Other civil works include head teachers' housing under PSD, JSS workshops, and improved toilet facilities. There has been some provision of school furniture, notably under BESIP, which rehabilitated 2,300 primary classrooms and provided furniture for them.

4.17 The Bank has been less active in other areas. A notable exception is the teacher training provided at the time of the reforms to both junior and senior secondary school teachers to ready them for the new syllabus. These were short one-off courses. As such they gave teachers some familiarity with the new JSS system and the new syllabus, hence supporting the reform program, but cannot be expected to have had a significant effect on teaching methods. But the further development of in-service training has been much more the provenance of other donor projects, notably QUIPS and WSD, as have support to SMCs, provision of other teaching materials and encouraging improved teaching methods.

5. Educational Performance Has Improved

Both educational attainment and achievement have risen in Ghana over the past 15 years. The enrolment rate has risen and dropouts reduced, so that completion has risen from 60 to 73 percent. The gender gap in primary enrolments has been virtually eliminated and the gap in enrolments between children from poor and non-poor households narrowed. At the same time, test scores have improved. Children completing JSS today with nine years of basic education perform better in the math and English tests than did children leaving middle school after ten years of schooling in the 1980s.

SCHOOL ATTAINMENT: HIGHER ENROLMENTS AND BETTER COMPLETION RATES

5.1 The school system expanded throughout the reform period. The number of basic schools increased by 50 percent from 12,997 in 1980 to 18,374 in 2000. This expansion has enabled rising enrolments. By 2000, over 90 percent of Ghanaians aged 15 and above had attended school compared to 75 percent 20 years earlier (Annex H, Figure 3). The downturn in enrolments that had begun in the mid-70s was reversed. The basic school enrolment rate has risen steadily since the start of the reforms, accumulating an increase of over 10 percentage points between 1988 and 2001.[51]

5.2 GLSS data show continuously improving school attendance rates[52] among children of primary and junior secondary school age (Figure 5.1).[53] On the other hand, attendance rates at the secondary level showed a large initial increase but have since leveled off.

5.3 Growing enrolments have narrowed enrolment differentials. The gap between male and female enrolments has been virtually eliminated (Figure 5.2).[54] Closing of the gender gap is in part a function of growing enrolments: when enrolments are 100 percent then there can be no gaps. The gender gap remains greatest where enrolments are lowest: notably in the Northern region.[55] Enrolments have expanded most rapidly in the savannah (Northern and the two Upper regions), where the attendance rate for 7-12 year olds was just 52 percent in 1988. On the other hand, although rural enrolments have risen, they have not done so more quickly than those in urban areas so that the differential has remained. Finally, primary enrolments have risen more rapidly among the poor than the non-poor, although a substantial gap

51. Official data show no increase in enrolments from 1990 to 2000. Annex H shows the denominator (population) used in that calculation to be progressively under-estimated. Once this error is corrected the Ministry of Education data show the same rise in enrolments as that reported here from GLSS data.

52. Attendance rate is used here, as it is by GSS, to mean the percentage of an age cohort that is currently enrolled in school. It does not mean the percent present at school on a particular day as a percent of those enrolled. See Annex H for a discussion of the different terms and the relationship between them.

53. The minimum age for enrolment is 6, though most children begin school between the age of 7 and 9. The age range 7-12 is thus taken to correspond to primary children and 13-15 to JSS. Enrolment rates, reported in Annex H, tell the same story as these attendance rates.

54. Official data from the school census show a narrowing of the gap, though it still remains. The most recent MoE publication reported 47.2 percent of primary students to be female, compared to their population share in census data of 49.6 percent (MoE 2002, *Education Indicators at a Glance*).

55. Beyond the scope of this study are the barriers girls face in accessing and completing school, including sexual harassment by teachers (on which see Leach et al. 2002).

remains. In 1988 only 60 percent of the poorest quintile attended school compared to 80 percent of the top quintile. By 2003 these figures were 77 and 94 percent, respectively. The narrowing of the gap in enrolments between the poor and non-poor means that support of the expansion of primary education has been pro-poor. But for junior and senior secondary schools enrolments have grown more rapidly among the less poor (Annex H paragraph H.1.20). Spending for these sub-sectors also benefits the poor, but by less than the non-poor have benefited.

Figure 5.1: More children are attending school (attendance rates by age group)

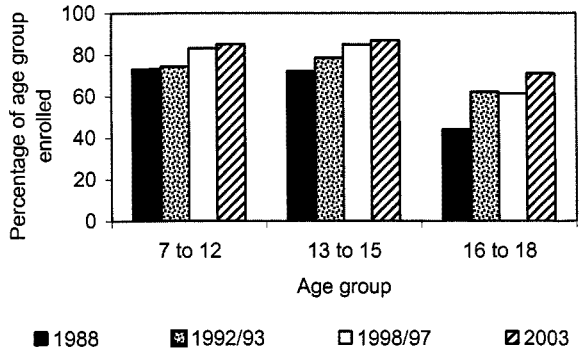
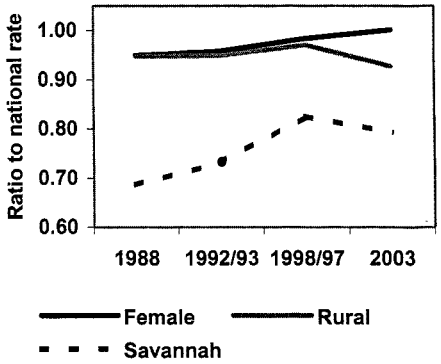


Figure 5.2: And gender and regional gaps are closing (enrolment differentials, 6-11 year olds)



Source: GLSS 2, 3, and 4 and GSS/OED household survey

5.4 Repetition is not a large problem in Ghana since there is automatic progression from one grade to the next provided minimal attendance requirements are satisfied.[56] World Bank data show a repetition rate of less than 5 percent in Ghana, compared to close to 30 percent in neighboring Togo.[57] Students may drop out before completing their education, though the data show this to be relatively rare, and declining. In 2003, 95 percent of those aged 15 or less who began primary school reached Grade 6, and 92 percent went on to complete JSS.[58] Fifteen years ago these figures were 86 and 73 percent, respectively, showing that retention, and so completion, has much improved. But variations remain. Completion rates are lower in rural areas, particularly in the savannah zone, where 9 percent of students do not complete Grade 6 (Table 5.1). Male and female completion rates are comparable until grade 6, and a slightly higher proportion of girls complete JSS than do boys. The poor remain more likely to drop out than the non-poor (Annex H, Table H.13).

56. Teachers in Ghana interviewed during fieldwork blamed poor student quality on the policy of automatic progression. In general, international evidence does not support the view that large-scale repetition improves student learning. N'tchougan-Sonou's (2001) comparison of Togo (which has repetition) and Ghana suggests that in the West African context there may be some effect, but she fails to allow for school quality.

57. World Bank *World Development Indicators* 2003.

58. These results are based on a survival function, which takes account of the censoring caused by children still in school (see Annex H for an exposition).

Table 5.1: Drop-out rates are low (2003)

	Percentage of those enrolling in grade 1 who complete		
	Grade 4	*Grade 6*	*JSS*
Region			
Coastal	97.4	97.4	92.5
Forest	97.0	95.0	91.4
Savannah	93.2	91.5	n.a.
Rural/urban			
Urban	97.8	96.6	92.7
Rural	94.9	93.8	90.4
Sex			
Male	96.1	95.0	90.2
Female	96.9	95.5	93.1

Source: GSS/OED household survey.

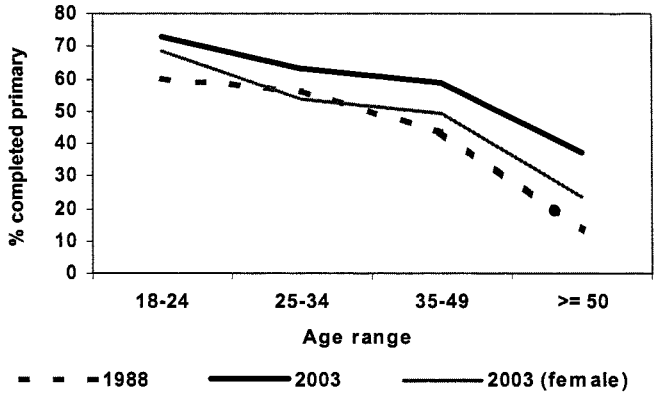
5.5 Figure 5.3, which presents data from GLSS2 and the GSS/OED survey, on the percent of different age groups (all children) which have completed primary. These data confirm the rising completion rate in two ways. First, the line drawn from each survey is downward sloping — within each survey the data show that older age cohorts are less likely to have completed than younger ones. Second, the line for 2003 lies above that for 1988. People aged 18-24 today are more likely to have completed primary than the same age group 15 years earlier, both as enrolments have risen and drop-outs fallen.

5.6 The figure also shows completion rates for females from the 2003 data. The female completion rate has converged on that for male over time, although a gap remains. Completion rates have improved for all income groups. In 1988 only 65 percent of children entering P1 from households in the bottom quintile completed basic education; by 2003, 74 percent do so (some way below the figure of 91 percent for the top quintile).

IMPROVED TEST SCORES

5.7 In 1988, Ghana Statistical Service (GSS) visited 1,524 households in 85 different areas of the country.[59] Each person aged between 9 and 55 years and with at least three years of schooling was asked to take a short English reading test of eight multiple choice questions and a math test of eight sums (two addition, two subtraction, two multiplication, and two division). Those scoring five or more on either test took a longer, more advanced test.[60] The results revealed the poor quality of education being received by

Figure 5.3: More children finish school (primary completion rates)



Source: GLSS2 and GSS/OED household survey

59. This survey was the second round of the Ghana Livings Standards Survey (GLSS2).

60. The short tests are in Annex A of this report together with a sample of the advanced tests. The full version of the advanced tests is available on request.

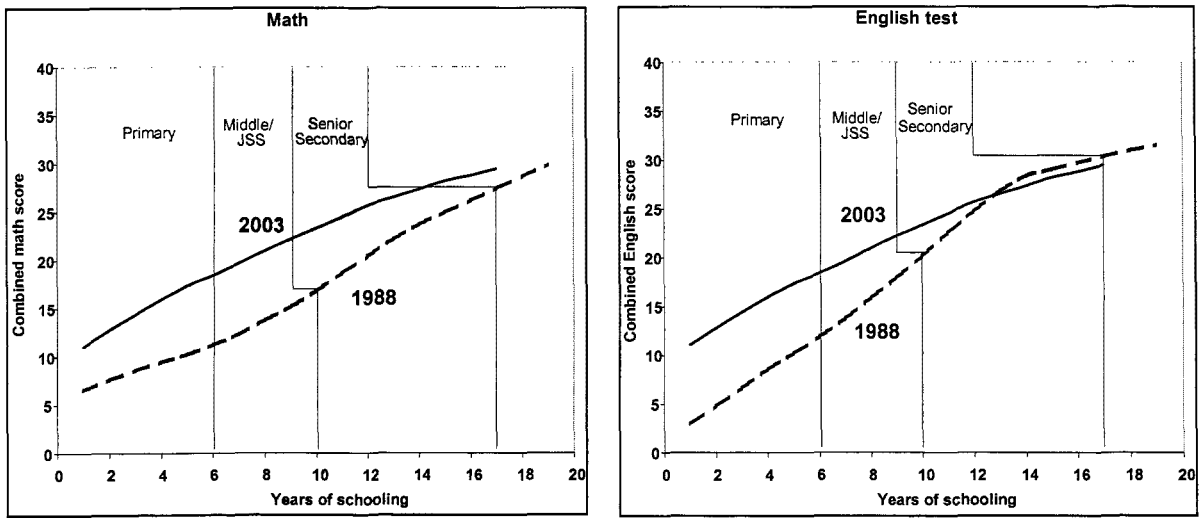
Ghanaian children. Children who had completed three years of primary education scored an average of 0.8 on the short English test — worse than if they had simply guessed all the answers.[61] Children who had completed all six years of primary did not do much better, with an average mark of only 3.1. In the simple math test the average score for primary graduates was 4.9.

5.8 Fifteen years later the GSS/OED survey re-visited the same 85 communities and carried out exactly the same tests in 1,740 households. The results clearly show that children are better educated today than they were 15 years ago. Primary graduates scored an average of 5.6 on the short English test and 5.7 on the math test. These higher scores have been achieved in the context of growing enrolments, so that a greater proportion of those aged 9-55 took the tests in 2003 than in 1988.

5.9 The improvement in the output of the basic education system in Ghana is shown by Figure 5.4, which plots the regression-based mean test score against years of education for 1988 and 2003.[62] The test score shown is the combined test score, which is the sum of simple and advanced test scores, with a resulting maximum of 37 for English and 44 for math.[63] Several points emerge from these graphs. First, children at all levels of basic education (grades 1-10 in 1988 and 1-9 today) score higher marks today than did their counterparts 15 years ago.

Figure 5.4: School outputs have improved: test scores plotted against years of schooling

(a) Math **(b) English**



Source: GLSS2 and GSS/OED household survey

61. The sample is children currently in school, or who left it in the last year, who have completed Grade 3 but not Grade 4.

62. The line is the fitted line from the regression of the combined test score on years of education, using lowess (locally weighted regression) estimation. The sample comprises children in school or who have left in the last three years.

63. See Annex G for a detailed discussion of the analysis of the test score data.

Second, Junior Secondary School graduates score higher than did Middle School graduates, despite the latter receiving 10 rather than 9 years of education.[64] Third, the gain is larger at lower grades and for English is reversed for secondary school graduates who score worse today than did their counterparts 15 years ago. Although not the subject of this report, which focuses on basic education, the shortening of pre-university education from 17 to 12 years may have been at the expense of the quality of senior secondary school graduates.[65] More specifically, the data show that it is the compression of the previous seven years of secondary into three of senior secondary that has caused this deterioration.[66]

5.10 While children of better-off households on average score higher, scores have improved for children of households across the income distribution. There is greater uniformity in performance across income groups for primary school children today than 15 years ago. Nevertheless for math the improvement has been greatest for the children of the relatively better off (Annex G, Table G.4).

5.11 A longer-term perspective is provided by looking at the scores of those leaving school after completing Grades 5 or 6 across all age groups. Table 5.2 shows the decade average scores of primary school leavers. Both the English and math scores show a U shape, declining into the 1980s but then picking up in the past decade.

Table 5.2: Student performance is returning to the levels attained 40 years ago (average test scores of primary school leavers by decade)

	English	*Math*
1950s	5.4	4.2
1960s	2.5	4.1
1970s	3.8	4.1
1980s	0.9	3.2
1990s	3.1	4.6

Notes: calculated for those leaving school after completing Grades 5 and 6. 1990s is 1990-2002. Source: GSS/OED survey

5.12 The finding that educational outcomes are improving appears to run contrary to general concerns about the poor state of Ghana's basic education.[67] There is no contradiction here. While things have got better there is still ample room for improvement. Nearly one-half (46 percent) of children who have completed Grades 3-6 scored 5 or less on the simple English test, meaning they are barely literate and one-fifth (19 percent) scored 2 or less, i.e., the same as guessing, and so are illiterate. But 15 years ago these figures were 78 and 62 percent, respectively. Negative perceptions of the state of education arise from comparing the system today with that pre-crisis, some 30 years ago rather than 15. Such views also arise from continued middle-class discontent regarding the reforms and their impact on senior secondary education.

64. School reforms, discussed in detail in Chapter 2, reduced the length of pre-university education from 17 to 12 years.

65. But it should also be borne in mind that recent graduates of secondary education passed through basic education when quality was lower than today, which would have adversely affected their future learning.

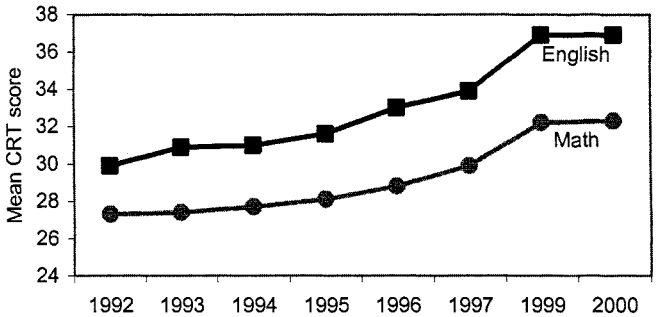
66. The decline in quality of secondary graduates is commonly recognized. The restructuring of pre-university education was accompanied by an increase in the length of B.A. degrees from three years to four in 1994.

67. For example, a recent report states that "not much has been achieved relative to improving the quality of education in Ghana" (Educational Assessment and Research Center 2003). This point of view was borne out in numerous interviews during fieldwork.

5.13 There is corroborating evidence of improved educational outcomes from the Criterion Reference Test (CRT) carried out since 1992, the mean English score rising from 29.9 to 36.9 between 1992 and 2000 and math by a similar amount (Figure 5.5). While covering a shorter time period than the two GSS surveys, the tests show the same clear improvement in test scores. Whilst the CRT confirms the improvement which has taken place it also confirms that standards are still very low: the most recent CRT shows that in 2000 less than 10 percent of children reached mastery level in math, and less than 5 percent did so in English.

5.14 The CRT scores also show the better performance of children in private schools. In 2000 the mean CRT English score was 70 in private schools compared to 39 in public schools. It might be thought that the improvement found in the GSS/OED survey data can be attributed to increasing enrolments in private schools. This is not the case. The CRT data reported in Figure 5.5 are for public schools only and they show an improvement in the 1990s. Similarly in the GSS/OED survey data, whilst students from private schools do better, it does not explain away the improvement in scores. For example, the average score in the simple English test for primary graduates has risen from 3.2 in 1988 to 4.9 in 2003. Considering public schools alone these figures are 2.8 and 4.6. The scores for public schools alone are lower, but the improvement is in fact a bit larger.

Figure 5.5: Criterion Reference Test scores in public schools have risen each year, 1992–2000



Note: No data available for 1998

Source: MoE

5.15 Since a larger proportion of the population are now attending school, the improved test results mean that the average, quality-adjusted, level of education (what economists call the stock of human capital) is rising. The most common education stock measure is adult literacy, which is usually measured indirectly as the percentage of those aged 15 and above who have completed grade 5 (Annex H). However, the test score data allow calculation of actual literacy measures, defining a person as literate in English if he or she scored 5 or more on the simple English test. Using this definition, the literacy rate among those aged 15-24 (which is the age group for the MDG indicator) has risen from 49 percent to 68 percent between 1988 and 2003, and in the population of the whole from 37 to 45 percent. A decomposition analysis shows that the increase in school quality (higher scores achieved by those enrolled in school) accounts for over half (57 percent) the increase in literacy, with the remainder coming from increased quantity (higher enrolments) (Annex H).[68]

68. Literacy rate = No. literate/age cohort = No. literate/no. in school x no. in school/age cohort, where these ratios measure the quality and quantity of schooling respectively. The percentage change in the literacy rate may therefore be decomposed into the sum of the percentage change of these two components.

6. Causes and Consequences of Improved Educational Performance

Both educational attainment and achievement have risen in Ghana over the past 15 years. The World Bank, through its support of the policy reform process and financing school-level improvements in quality (principally classroom construction and rehabilitation) and the availability of teaching materials, has contributed to these improvements. Improved educational performance has been one factor behind better social indicators such as lower fertility and mortality and improved nutrition, as well as sustaining economic growth.

BETTER INPUTS

Improving School Efficiency

6.1 School efficiency has increased over the past 15 years in the following three ways:

- The reduction in pre-university education from 17 to 12 years: the reduction of basic education from 10 to 9 years was achieved with no cost in terms of children's cognitive performance, indeed basic school graduates get better test scores today than they did 15 years ago.
- Increasing instruction time: the school day was increased from four to five hours. Although this reform took some time to take hold it has now become well-established (Annex D).
- The increase in the pupil-teacher ratio: the PTR in primary schools increased from 30 to 36 over the period.

6.2 The Bank contributed to these efficiency improvements through its role in underpinning the reform process, documented in Chapter 4, and its pressure to restrain growth in GES employment.

Improvements in School Facilities

6.3 The funds provided by the Bank have largely been used to improve school facilities, notably the supply of nearly 35 million textbooks and construction of close to 8,000 school pavilions. The contribution of these to the level of outputs was discussed in the preceding chapter. Prior to the Bank's involvement, communities were required to construct their own schools, which were usually mud-walled structures of limited suitability and lifespan. Neither other donors nor the government have been as active in the fields focused on by the Bank so that it has been the major player in improving these aspects of school quality.

Improving Teacher Conditions

6.4 One channel through which school inputs affect student learning outcomes is through their impact on teacher performance. A number of teacher level variables, such as time on task, the use of improved teaching methods and their monitoring of student performance, have an

effect on test scores. These teacher variables depend, in turn on school facilities and management. The GSS/OED teacher survey asked respondents of their perception of their living and working conditions. Unsurprisingly, multiple regression analysis shows the former to be most strongly related to the availability of water and electricity in the home and if lodging is provided. Perceptions of working conditions are related to classroom quality (if disrupted by noise, the presence of internal wall, and quality of the chalkboard) and the availability of teaching materials. School management (an active PTA and contact with the circuit supervisor) also has a positive impact on perceived working conditions.

6.5 Teachers' attitudes to both their working and living conditions are strongly influenced by whether or not they receive their pay on time. The problem of late pay, which is more common for new teachers, has been considerably alleviated over the years but is still an issue, with 28 percent of teachers often not receiving their pay on time.

6.6 How teachers feel about their living and working conditions matters as it affects teacher morale, which affect both absenteeism and the likelihood of remaining a teacher. Teachers were asked if they enjoy being a teacher and if they intend to remain one or not. These two variables were combined to construct a measure of teacher morale. Both living and working conditions are significant determinants of teacher morale. And teacher morale is in turn a significant determinant of the likelihood of a teacher being guilty of absenteeism (Table D.43). Both teacher absenteeism and the outflow of trained teachers constitute considerable sources of inefficiency in the system.

FROM INPUTS TO OUTPUTS (ATTAINMENT AND ACHIEVEMENT)

Increasing Enrolments

6.7 Multivariate analysis of the child-level data from 1988 and 2003 shows that the following factors are significant determinant of whether or not a child attends and stays in school:[69]

- Child characteristics: children with more siblings are less likely to attend school, especially those of lower birth order. This finding fits with the common observation that older children work to pay for the education of their younger sibling, being themselves deprived of education. The female dummy was significantly negative in 1988 but not in 2003, indicating the closing of the gender gap in enrolments.

- Household characteristics: children of higher income households are more likely to go to school, as are children of more educated parents. The latter results means there is an "inter-generational multiplier effect" as children sent to school 15 years ago as a result of improvements in the education system are more likely to send their own children to school today.

69. The regression results are reported in Annex I. The results are from a Cox regression of school attainment, which was used in preference to the censored ordered probit which has been more commonly in the literature. However, the censored ordered probit model and a simple probit of enrolment give similar results. A regression of the cluster-level change in enrolments also gave similar results.

- Proximity of school facilities: the greater the distance to the nearest primary school the less likely is a child to be enrolled. This effect was stronger in 1988 than 2003, as school building means that the vast majority of children now live close to a primary school so there is little variation in the independent variable. In 2003 children were significantly more likely to attend school if there was a private school in the vicinity.

- Quality of school facilities: the school having an adequate number of classrooms to cater for all grades significantly affects the likelihood of a child going to school, as does the availability of other materials such as chalk and desks. [70]

- Staffing: In 2003 parents were more likely to send their children to schools that had a low pupil teacher ratio and less likely to send them to schools with a high ratio. These results are picking up two phenomena. One is that overcrowding deters parents from sending children to school. But a high pupil teacher ratio also results from having insufficient teachers - one or two to cover four or even all six grades, which is not unknown in rural areas — which makes parents doubt that their child will receive an education.

6.8 Building a school, and so reducing children's travel time, has a major impact on enrolments. While the majority of children live within 20 minutes of school, some 20 percent do not and school building has increased enrolments among these groups. In one area surveyed, average travel time to the nearest school was cut by 45 minutes with enrolments increasing from 10 to 80 percent. In two other areas average travel time was reduced by nearly 30 minutes and enrolments increased by over 20 percent. Calculation using the regression estimates suggest that on average building a school in a community in which the children previously had to walk an hour to school will increase enrolments in that community by around 5 percent (Annex I). Building a new classroom block to replace an unusable one will increase enrolments in the school's catchment area by 7.5 percent.

6.9 The regression estimates can be used to examine which have been the most important factors behind enrolment growth:[71]

- The largest single effect comes from the elimination of gender bias, accounting for a 4 percent increase in enrolments. This autonomous effect partly reflects the success of efforts to get girls into school, though these are not something the World Bank has directly supported.

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70. No data were available in 1988 on seating places. Typically a class will have both desks and chairs or neither. Where chairs are not available students bring their own from home, being a substantial "in-kind" parental contribution. The desks variable may also be picking up how the cost of providing a chair deters parents.

71. This is done by decomposing the observed change in enrolments to the sum of the product of the regression coefficients and the difference between 1988 and 2003 of the mean value of each of the explanatory variables. This analysis was carried out using the simple probit estimates of enrolment (Annex I). The enrolment increases sum to more than the actual increase as they are offset by a negative shift in the survey dummy. An important caveat is that the system relies upon government financing teachers' salaries, but the importance of that is not captured in the analysis since government fulfilled this function, leaving little variation in the relevant explanatory variables.

- Higher household incomes have accounted for enrolment growth of about 2.5 percent over the period. Increased parental education accounts for close to another 2 percent.

- Improved school facilities, including reduced distance to school, have accounted for about a 4 percent increase in enrolments between 1988 and 2003, about one third of the increase over that period. A large part of this improvement can be attributed to the World Bank, which has been overwhelmingly the main funder of better infrastructure in this period. However, this attribution must be seen in the context of a functioning education system in which government ensures a supply of trained teachers.

Determinants of Test Scores

6.10 Linking children to the school they have attended allows a regression analysis of the determinants of test score outcomes incorporating both school and household characteristics. These regressions are reported in Annex G. Schooling improves test scores, each additional year of schooling increasing the combined English score by 3.6 points and math by 4.9 points.[72] The 10 percent of the age group attending school who would not have done so 15 years ago can be expected to increase their combined English score by 20 points if they complete primary (as 95 percent do) and 27 if they go on to complete JSS (as do 86 percent). For math these figures are 16 and 21, respectively.

6.11 The direct impacts of the recorded increase in material and physical items between 1988 and 2003 increased math scores by 1.6 and English by 2.0 points. These figures understate the gains in the most deprived areas. Ensuring that a school has one math and English book per child compared to the situation in the mid-1980s of one text per classroom will increase average English scores of children in that school by 6 points and math scores by close to 10 points.

6.12 The 2003 school and teacher surveys collected data not collected in 1988, allowing a more detailed analysis of test score determinants. Measures of the quality of school infrastructure, in particular if classes are disrupted by noise, the presence of internal walls and chalkboard quality, all have a significant impact on for test scores. The combined effect of these three infrastructure variables can improve English scores by 11.3 points and math by 10.1.

6.13 The regressions using the 2003 data also show that process matters. The most important single variable in determining test score outcomes is teaching methods. If all teachers in the school used improved methods then, compared to a situation in which none do so, children's English scores would be 6.2 points higher and their math score 8.8 higher. Important determinants of use of improved methods are teacher training (notably for teachers in the coastal region), including in-service training. Supervision by the head-teacher and contact with the circuit supervisor also increase the likelihood that improved methods will be adopted. None

72. The years of schooling slope dummy included in the regressions was not significant. That means that the school level factors accounting for better test scores are included in the model.

of these are areas to which the Bank can be said to have contributed. Efforts to improve head-teacher performance through the provision of housing were judged to be unsuccessful.[73]

6.14 Questions to teachers regarding the use of classroom time allowed the construction of a time on task variable, and this too was found to significant affect test scores. Time on task itself is a function of teacher training and contact with the circuit supervisor. In addition, the ability of teachers in the school to speak the local language improves student math scores, presumably since they do not have to rely on English, of which students may have a poor grasp, to explain difficult concepts.

6.15 The results reported in the preceding paragraphs pose something of a puzzle. Better teaching methods and time on task improve test scores, and teacher training enhances both of these things. But private schools largely recruit untrained teachers and it is well established that, on average, private schools get better test results (chapter 5). There are two answers to this puzzle. The first is the finding that the private school dummy is significant for English scores but not for math. So, once factors relating to both the student's background and school facilities are controlled for, there is no pure "private school effect" for math. There is however one for English, perhaps reflecting the enforcement of English as the language of tuition in these schools. The second answer to the puzzle is that there are indeed aspects of private schools, such as teacher discipline, which are conducive to good learning outcomes. This fact does not contradict the finding that children will learn better still, even in private schools, if improved teaching methods are employed.

6.16 Home factors also matters to student performance. The two measures of parental involvement in a child's education (membership of PTA and meeting with a teacher) give a combined impact of 3.5 and 3.9 points on math and English scores respectively. Income also matters; economic growth (the between sample rise in incomes) has increased average English scores by 2.2 points and math scores by 1.2 points. As in the case of enrolments, to the extent that education affects these household characteristics there is a multiplier effect whereby the educational performance of children of educated parents improves.

6.17 Textbook provision is a very cost-effective means of improving learning outcomes, with teacher training being the next most cost effective (Annex G). School infrastructure also has a beneficial effect on learning outcomes, but its largest benefit is from enabling higher enrolments.

FROM OUTPUTS TO OUTCOMES

Education and Social Outcomes

6.18 There is a well-established literature linking educational outputs to welfare outcomes, both economic and social. Studies of education and social outcomes tend to focus on the effect of female education (Table 6.1). Where both male and female education is included,

73. An internal Bank review of the Primary School Development project judged that the lack of improvement in teacher performance and supervision showed that the provision of head-teacher housing was an ineffective strategy to improve head-teacher performance as school-level supervisors.

then the latter is shown to be more important.[74] The most commonly studied outcomes have been fertility and child nutrition. All studies from Ghana find that the higher levels of education reduce fertility, normally measured as the number of births.

Table 6.1: Results from studies of education and social outcomes in Ghana

	Education measure	*Child survival*	*Fertility*	*Contraceptive prevalence*	*Nutrition*
Alderman (1990)	Female schooling Male schooling				Insignificant Insignificant
Benefo and Schultz (1996)	Mother's education	Positive	Positive		
Glewwe and Desai (1999)	Test scores				Mostly insignificant (mother's math positive)
Gyimah (2002)	Secondary or higher	Positive			
Gupta and Mahy (2003)	Maternal education: None, 1-7 years, 8 or more		Positive		
Oliver (1999)	Mother's years of schooling, test scores		Positive		
Ruel et al. (1999)	None, primary, secondary				Positive
Maxwell et al. (2000)	Mother's education level				Positive
Sackey (2003)	Mother's years of schooling Father's years of schooling	Positive Positive	Positive Positive	Positive Insignificant	Positive Positive
OED analysis	Maternal education Paternal education				Positive Positive (indirect through income)

6.19 The findings from studies of child nutrition are more ambiguous. An early study found no significant impact, but more recent studies find that education does improve nutritional status. Both Ruel *et al.* (1999) and Maxwell *et al.* (2000) presenting different analyses of the same data from Accra find that mother's education is significantly associated with better child nutrition. In addition, there is a considerable indirect effect from education on improved childcare practices, which also improve nutrition. Good care practices, supported by education, can compensate for lower income. Hence the nutritional status of children of educated mothers

74. Equations that include income as an explanatory variable do not capture the indirect effect of education through income. This will be one of the channels through which male education matters. This argument is supported by Maxwell *et al.* (2000) who instrument for income with father's education, finding it to be significant. The same is true of Alderman (1990), which may partly explain why the education term itself is not significant.

at lower income levels can equal that of children in higher-income families. Children of mothers with little education living in low-income households have the worst nutritional status.

Table 6.2: Percentage reductions in welfare outcomes caused by higher school attainment

	Fertility	*Mortality*	*Nutrition*
Benefo and Schultz	-2.4	-3.6	—
Ruel et al.	—	—	10.3-20.6
Sackey	-4.8	-0.7	—
OED analysis			4.8-27.2

Source: Annex K

6.20 Analysis carried out using the GSS/OED data supports the view that education can substitute for income in achieving better nutritional outcomes. These data show that maternal education has a significant impact on child nutrition (Annex K).[75] This impact is higher for women in poorer households. In the poorest households a woman completing JSS increases the expected nutritional status (measured by height for age) by 4.5 points, sufficient to move the child out of the category of being malnourished.

6.21 A smaller number of studies establish the link between education and lower child mortality. For example, Benefo and Schultz (1996) find a weak impact of mother's education on child mortality (but a strong one on fertility). They show these effects to be stronger when women live in a community with good access to water and weaker when there is poor access to health facilities, thus supporting the view that education facilitates the better use of other amenities so as to improve welfare outcomes. The channels through which education operates are also shown by studies showing education to affect both income and child care practices.

6.22 The results from the studies mentioned above can be used to investigate the scale of education's impact on welfare outcomes. Infrastructural improvements will result in an increase in enrolments of around 10 percent and reduce the dropout rate (Annex I). Hence, the average schooling of mothers will rise. This rise in schooling leads to relatively small, though not negligible, changes in fertility and child mortality (Table 6.2).[76] The study of Accra shows the impact on nutrition (stunting, i.e., the height for age z-score) a more substantial impact of an improvement of between 10 and 20 percent. The channels for this increase are both improved childcare practices and higher income. OED's own analysis supports these substantial effects. The lower increases from education are realized among wealthier families, with the largest absolute gain to poorer households.

Education and Economic Outcomes

6.23 The most comprehensive analysis of the economic returns to education in Ghana is that by Teal (2001), which brings together data from four rounds of the GLSS (1987/88-

75. There is an impact from father's education in some specifications. But in general the impact of father's education is indirect though its effect on household income.

76. The results shown here ignore the feedback loop that operates between lower fertility and reductions in mortality.

1998). He finds that there is a positive return to all levels of education, but that it is higher for higher levels.[77] The rise in the average level of education accounts for about one-third of growth in per capita income that has taken place over the decade

6.24 Analysis of the GSS/OED presents a clear message: education matters only to the extent that it results in higher cognitive achievement (Annex K). Education can affect earnings both directly — more educated people earn more, which may result simply from a screening function — and indirectly through raising their cognitive skills, which are rewarded with higher earnings. OED's analysis shows that there was a direct return to education in 1988 but this is no longer so for primary and JSS in 2003, for which the return in fact appears to be negative. But schooling raises test scores and those with higher test scores earn more. Those who get higher test scores as a result of schooling do enjoy higher earnings. To the extent that poorer children in less well resourced schools are not reaping educational benefits from school attendance nor will they enjoy economic gains, generating a vicious circle of poverty.

77. In most areas of the world the returns are highest to primary education. However, this is not generally the case in Africa (Bennell, 1996).

7. Lessons Learned and Progress Toward the MDGs

PROGRESS TOWARD THE MILLENNIUM DEVELOPMENT GOALS

7.1 The education MDG is to "ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling." In addition, the third MDG of gender equality has two education-related targets (progress toward gender equality in enrolments and literacy). Table 7.1 shows the progress made in the period 1988-2003 and extrapolates these trends to 2015. Ghana has made considerable progress toward both these goals, in particular the gender equality in education has been achieved with respect to primary enrolments and is likely to be achieved, or close to achieved, for the other gender indicators. On the other hand, at current rates of progress enrollments will fall short of the target of UPE and up to nearly a quarter of those aged 15-24 will be illiterate.[78] Closing these gaps will require, among other things, focusing attention on difficult-to-reach areas and ensuring that all schools receive the required level of inputs.[79] This is not simply a matter of regional disparities: there are deprived schools in even the better off districts.

Table 7.1: Progress toward the education related MDGs

	1988	2003	Predicted for 2015[a]	
			Low	High
Goal 2: Universal Primary Education				
Complete Grade Six				
Total	65.4	76.9	82.1	87.5
Girls	55.6	72.1	80.1	88.8
Net enrollment ratio in primary education	72.1	84.1	89.5	95.1
Proportion of pupils starting grade 1 who reach grade 5	88.5	95.8	98.9	100.0
Literacy rate of 15 to 24-year-olds[b]	49.0	68.0	77.6	88.4
Goal 3: Promote gender equality and empower women				
Ratio of girls to boys in primary and secondary education				
Primary	95.0	100.0	100.0	100.0
Secondary	78.0	86.0	88.8	91.7
Ratio of literate females to males[b]	83.0	92.0	95.0	98.0

a. "Naïve" predictions based on simple extrapolation, assuming 1988-2003 growth rate is sustained for high scenario and that it is halved for low scenario. b. Defined as scoring 5 or more on English reading test.

Source: data from GLSS2 and GSS/OED survey.

78. The literacy rates shown here are lower than the official figures since the numbers here are based on actual reading skills rather than school attainment (see Annex H).

79. This report has demonstrated the importance of material and physical inputs in supporting enrolments and student learning. It may be the case that the "last 5 to 10 percent" comprise difficult to reach groups including street children, orphans and disabled and that separate, more costly, measures are required to get these children in school.

LESSONS LEARNED

7.1 The main conclusions from this report, and the lessons to be learned from them, are as follows:

- The Bank focused its spending on hardware and instructional materials, even when the rhetoric of strategy and project documents turned toward software. This focus turns out to have been beneficial. The inputs the Bank has provided (books and buildings) have been shown to have made a significant contribution to both educational attainment and achievement. Two caveats are perhaps in order: (1) the focus on hardware and materials took place within the context of an agreed program of educational reform with a government that has been committed, especially in the early years, to improving the quantity and quality of education; and (2) the projects of the other major donors (DFID and USAID) have focused on software, though the extent of their impact is not yet widespread.

- The lesson to be drawn is that getting enough classrooms and those classrooms being in decent shape is a necessary ingredient of educational strategy. But it cannot be the sole ingredient. Indeed, it will become less important as all schools attain the desired level of physical and material inputs. But Ghana is not yet in that position: substantial inputs are still required for the most disadvantaged schools. Even where good school quality is achieved, educational outcomes, while improved, are still far from satisfactory. Improving them will indeed require attention to software.

- The evidence in this report of beneficial effects from community management is not strong. However, it can be argued that these changes have yet to really take hold so that their effect can be felt. It is shown that parental involvement does matter, but this could well be proxying for parental interest in child's education. But the evidence is clear that supervision of teachers by the head teacher and circuit supervisor matter, as do the teaching methods adopted by the teacher. Since attempts to remove untrained teachers have been unsuccessful, and since not all trained teachers appear familiar with student-centered approaches anyway, there is a strong case for pushing forward with efforts to emphasize the role of in-service training. Efforts should also be made to retain trained teachers, which may suggest some reconsideration of the current policy regarding study leave. Finally, teachers being able to speak the local language helps student math learning.

- The downside of community and district financing of schools is that it leads to disparities in resource availability. There remain a class of schools in poorer communities — particularly but not only in rural areas — which are very poorly resourced and the community can do nothing about it and often lacks the political connections to attract district finance.

7.2 Some immediate implications of the analysis are:

- It is necessary to focus resources on the most needy schools. The bias that results from community-based financing needs to be overcome. School mapping continues to play an important role, so support to EMIS is important.

- The private sector has been neglected, but it is important, so attention needs to be paid to it in both government strategy and Bank support. Possible areas of attention are enforcing registration to avoid very poor schools, but taking care to not be too restrictive. Teacher certification could be required, and while there does not seem a need to require formal teacher training, the provision of in-service training would help promote better learning outcomes.

- Teaching methods matter a lot for test outcomes. Teacher training seems to affect this, but differentially. This supports the idea that teacher training should look at method as well as content. In-service training matters, but there is not much of it at present.

- Teacher morale is reasonable, but is affected by living and working conditions and especially if teachers get their pay on time. Resolving payment problems will raise morale and reduce absenteeism.

- Inputs matter, textbooks in particular. While sustainable textbook financing is a desirable goal, donors should not be averse to large-scale textbook provision, such as the World Bank has done. Thought might also be given to providing exercise books and pencils to the most needy basic schools (perhaps by geographical targeting to bottom 20 districts, but probably not given the substantial intra-district variation in school quality).

Annex A: Test Examples

Short maths test

1. $1 + 2 =$
2. $5 - 2 =$
3. $2 \times 3 =$
4. $10 \div 5 =$
5. $24 + 17 =$
6. $33 - 19 =$
7. $17 \times 3 =$
8. $41 \div 7 =$

Short English Reading Test

John is a small boy. He lives in a village with his brothers and sisters. He goes to school every week. In his school there are five teachers. John is learning to read at school. He likes to read very much. His father is a teacher, and his parents want him to become a school teacher too.

1. Who is John?

   (A) An old man
   (B) A small boy
   (C) A school teacher
   (D) A school

2. Where does John live?

   (A) In a village
   (B) In a city
   (C) In a school
   (D) In a forest

3. What does John do every week?

   (A) Works with his father
   (B) Plays with his friends
   (C) Helps his brothers and sisters
   (D) Goes to school

4. How many teachers are there at John's school?

   (A) One
   (B) Three
   (C) Five
   (D) Six

5. What is John doing at school?

   (A) Helping the teacher
   (B) Talking with his friends
   (C) Learning to read
   (D) Teaching the class

6. Who is a school teacher?

   (A) John
   (B) John's father
   (C) John's brother
   (D) John's mother

7. What do John's parents want him to do?

   (A) Go to school
   (B) Learn to read
   (C) Obey his teachers
   (D) Become a teacher

8. The best title for this story is

   (A) John Learns to Read
   (B) Why Reading is Important
   (C) John's Village
   (D) Schools in Ghana

A sample of questions from the Advanced Mathematics test

3. There are 4 rows of chairs and 12 chairs in each row. How do you find out the total number of chairs?

(A) 12 + 4

(B) 12 - 4

(C) 12 x 4

(D) 12 ÷ 4

---

8. $\frac{1}{2} + \frac{1}{3} =$

(A) $\frac{1}{5}$

(B) $\frac{2}{6}$

(C) $\frac{2}{5}$

(D) $\frac{5}{6}$

---

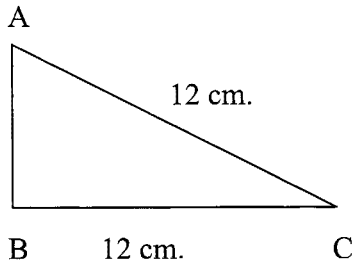
13. 1% of 400 is

(A) 1

(B) 4

(C) 40

(E) 400



Note: figure not drawn to scale

14. If the perimeter of the triangle ABC is 30 centimetres, what is the length, in centimetres of side AB?

(A) $2\frac{1}{2}$

(B) 3

(C) 6

(D) 18

---

36. Which CANNOT be the intersection of 3 planes?

(A) 1 point

(B) 1 line

(C) 3 concurrent lines

(D) 3 parallel lines

A sample page from the Advanced English test

(...) The cat brushed against the old man. He did not move. He only stood, staring in the window of the house. The party inside looked warm and friendly, but no one noticed him. The old man walked sadly on, followed by the cat

8. What was inside the house?

(A) A party

(B) Some dogs

(C) An old lady

(D) A meeting

9. The man is described as being

(A) Old

(B) Young

(C) Thin

(D) Small

Directions: For questions 10-15, read the passage below. Each line of the passage has a number. In each line, there is a box with four possible choices. Pick the choice that best completes the sentence in each numbered line. Mark the letter (A,B,C, or D) of the choice on your answer sheet.

10. Sound is something we

(A)	hears.
(B)	hearing.
(C)	heard.
(D)	hear.

It comes to your

11.

(A)	Eyes
(B)	nose
(C)	ears
(D)	mouth

in different ways. It might be pleasant,

12. like the voice of a friend,

(A)	when
(B)	as
(C)	or
(D)	since

unpleasant, like the <u>yelp</u> (...)

Annex B: Budget Analysis

1. Education expenditure data were obtained from the Ministry of Education (MoEYS), which compiles annual data as provisional (budgeted) and actual, broken down to budget lines and functional classifications. These data were provided to the study team by the ministry for the period FY 1989-2001, although the data for 1993 could not be located.

2. This annex is primarily a technical note that explains how the analysis was performed. Some observations are made as to the results insofar as are required to support the argument in the main report.

Trends in Education Spending

As a percent of government expenditure and GDP

3. Data on expenditure as a percent of GDP were collected from both the Ministry of Finance and Ghana Statistical Services. However, the education expenditure data from these sources did not correspond to those provided by the Ministry of Education, although the discrepancy was relatively minor (in most years it was around 5 percent, which was the median, in only one year did it exceed 7 percent, reaching 17 percent). Since the MoF/GSS series were only available until 1997, the presentation here is based on OED's own calculations, using the MoEYS expenditure data and GDP data from World Development Indicators. The latter series is identical to those from MoF/GSS other than 1990-92. For the years 1982-88, the MoF/GSS data were used. The discrepancy in 1988 (the year in which the series are joined) is just 0.2 percent of GDP, so no adjustments were made in linking the data. However, five new budget lines were added under the Ministry of Education budget heading in 1999. Since these budget lines are for existing institutions they have been excluded from the totals shown here.[1] The resulting data show a substantial rise in education's share of GDP over the period 1984-87 and a continued, but erratic, rise since then.

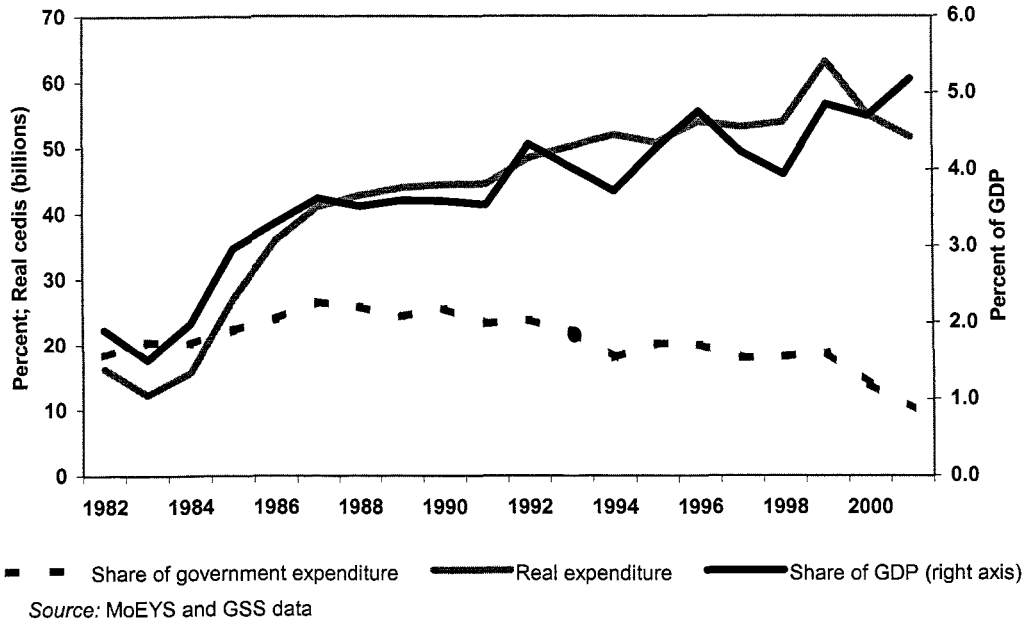
4. Data on education's share of government spending are available from the *Quarterly Digest of Statistics* published by Ghana Statistical Service. The tables provide the total of recurrent and capital (development) expenditure of education. The resulting percentage is shown in Figure B.1. The share of education rose from 1982-87 and then leveled off before falling in the 1990s. This decline has been slightly mitigated by spending through the districts, which is discussed below.

5. In August 2001 the Ghana Education Trust Fund (GETFund) was established by act of parliament to provide additional resources to all levels of education financed out of an equivalent to two and one half percent out of the prevailing rate of the Value Added Tax and any other contributions. In practice the bulk of the funds have been used for Tertiary education: in 2002 of the 140 billion cedis disbursed, 125 billion (89 percent) were allocated to the tertiary level, the bulk of it (90 billion) being a contribution to the student loan scheme.

1. The five are UNESCO Commission, West Africa Exams Council, Ghana Library Board, National Service Scheme, and the Ghana Book Development Council. These five budget lines account for just over 2 percent of total expenditure.

This use of general taxation to finance tertiary education is a regressive fiscal policy. The value of GETFund disbursements is around 10 percent of government spending on education, thus boosting overall education spending but reducing the share of basic education in that spending.

Figure B.1: Trends in education expenditure



Source: MoEYS and GSS data

Real education expenditure

6. Analysis of real expenditure trends often deflates expenditure by the consumer price index (CPI) or sometimes the GDP deflator. However, this procedure is inappropriate if there has been a change in real wages, especially if wages are a substantial component of total expenditure. The correct approach is to separate out wage and non-wage elements of expenditure and deflate the former by a wage index and the latter by a price index.

7. The latter approach was followed here, using the non-food component of the CPI as the price index, re-based for 1989=100. There is a break in Ghana's CPI with a new series reported since 1998 and no GSS data provide an overlap between the two series. However, the IMF *Statistical Annex* reported an annual inflation rate for the non-food CPI for 1998. This figure was used to link the two series.

8. The wage index was constructed as follows. Data are available on the personal emoluments for all budget headings. However, we do not have employment data corresponding to each of these budget heads. But data are available on the number of teachers employed in primary and JSS. The implicit salary per person was calculated by dividing personal emoluments for primary by the number of teachers in public primary schools. The same calculation was performed for junior secondary. A weighted average was

taken of the two series using the respective weights in employment over the whole period (66:34 for primary:JSS). This wage series was re-based at 1989=100.

9. The wage and price series were used to deflate personal emoluments and the non-salary component of expenditures respectively. The resulting series were summed to give total real expenditure.

10. The result is shown in Figure B.1. There has been a continual, if slightly erratic, increase in real expenditure throughout the period 1989-99, which has been reversed in the last two years for which data are available, though GETFund began disbursements in 2001.

Basic Education Share of Education Spending

Data and method

11. The education budget is divided into the following headings: 140, covering MoEYS headquarters, 141 for GES, 142 for regional services, which includes both the cost of district offices and the funds flowing to school facilities themselves, 143 for special education for the handicapped, 144 for national culture (including archives), and 145 for tertiary education. Each of these codes is divided into several lines corresponding to the departments and units within the various organizations.

12. The Ministry of Education spreadsheets show provisional (budgeted) and annual expenditure by each budget line, separated into personal emoluments and non-salary items. Recent spreadsheets provide a different breakdown of non-salary items, including investment costs, whereas data for earlier years refer solely to recurrent costs. The share to basic education is calculated by applying a coefficient to each line item. For items solely dedicated to basic education (that is, the basic education staff within GES, and the primary school and middle/JSS budget lines) a coefficient of one is assigned. The coefficient for other budget lines varies, the most common value being 0.6. All central MoEYS budget lines have a weight of zero. These coefficients are set by the ministry based on their experience and are adopted here.

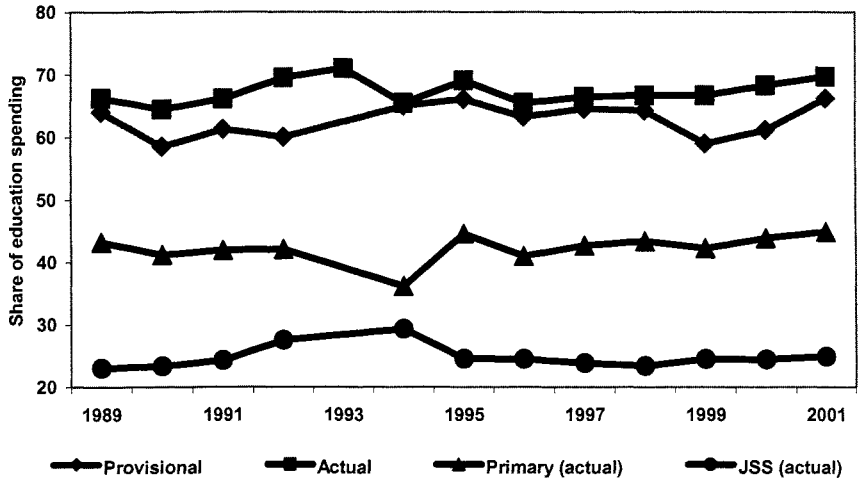
13. The basic education share shown in Figure B.2 was calculated from the MoEYS spreadsheets using the MoEYS's own methodology. The results were checked against the MoEYS's own reported figures for the basic share and discrepancies reconciled.[2] MoEYS estimates of the basic share were not available for 1999-2001, but replication of MoEYS's figures for 1989-98 is a safeguard that the figures reported are accurate.

14. The MoEYS spreadsheets break down the basic share into primary and JSS by using a set ratio of 0.7:0.3. Following this procedure results in the same trends being observed as can be seen in the basic education data. However, the procedure loses the information contained in the fact that the two largest single line items — primary and middle/JSS, which together

2. Two revisions of more than half a percentage point were made to the MoEYS basic share figures. In the 1992 spreadsheet, the basic education line item had been omitted from the calculation, and in the 1995 spreadsheet, the central administration line for regional services had been given a weight of 1 rather than 0.6.

account for over half of total spending and over 80 percent of basic education expenditure — can be allocated to these two categories. The primary school share reported here was calculated by (1) deducting the sum of the primary and middle/JSS budget lines from the basic school total; (2) adding the primary school line to the pro-rated (0.7) residual; and (3) calculating the resulting share. The equivalent procedure was followed for middle/JSS, using a share of 0.3.

Figure B.2: Basic education share of central government spending



15. This methodology implicitly distributes administrative costs, other than those of MoEYS HQ, across the sectors proportional to their share of spending. Hence "basic share" is not a measure of funds flowing to basic schools. An alternative approach is to attempt to separate out administrative costs into another line item. However, according to an academic researcher who has analyzed these data,[3] the school budget lines (primary, etc.) also contain some administrative costs of an unknown, and varying, amount, making an accurate figure for the administrative overhead difficult to obtain. Given these uncertainties, the appropriate procedure was to adopt the same approach as MoEYS.

16. The basic share has fluctuated, but with no trend.

District-Level Expenditure

17. The PNDC government expressed its commitment to decentralization in 1983, but the first concrete steps were taken five years later in 1988 when the current structure of 110 districts was set up (an increase from 65) and the District Assemblies created. Article 35 of the 1992 constitution embodies the principle of decentralization, with the parameters elaborated in Chapter 20. Article 252, states that through the District Assemblies Common Fund (DACF) not less than 5 percent of government revenue should be provided to districts. The Common Fund, formally created by the DACF Act in 1993, is allocated by a formula

3. Dr. Samer Al-Samarri, Institute of Development Studies, University of Sussex (personal communication).

including a needs-based component to ensure poverty targeting. Of the seven indicators used in the district allocation rule, two relate to education. A parliamentary-approved formula also provides guidelines on the use of funds, all of which should be used for investment purposes.

18. In addition to the Common Fund, districts can raise their own funds from taxes, fees, and levies, as well as receiving ceded revenue from central government by which the income from certain taxes is meant to be given to the districts. In practice, the Common Fund is the main source of district revenue, accounting for two-thirds of district income on average and more in poorer and rural districts.[4]

19. While the constitution allowed for the handing over of all responsibility for local services to the district this is not what has happened in practice. District-level offices of the various ministries and agencies have been created, such as the Ghana Education Service (GES), which are accountable to their central body rather than the District Assemblies. Hence GES is responsible for the distribution of recurrent inputs to schools, and teachers' salaries are paid centrally,[5] with the districts being responsible for infrastructure such as school rehabilitation, although they also provide school furniture.

20. Expenditure data show that total district expenditure is just over 4 percent of central government expenditure (Appiah et al. 2000), but between 20-25 percent of the government's development budget (Boko 2002). Of this amount, on average a little over one-third is spent on education. Hence the creation of the DACF has increased the share of government spending on education by just over 1 percent over and above the increase seen in Figure B.1. The district spending may safely be assumed to be virtually entirely devoted to basic schools, so that the share received by basic education has also been increased by the introduction of the DACF. However, the magnitudes involved are not sufficient to make any substantial difference to the trends noted above. This does not mean that the spending does not matter at school level. Since central resources are largely financing salaries (see next section) additional financing at local level has the potential to create notable variations in school quality.

Functional Distribution of Expenditure and Relative Importance of Donor Finance

21. The MoEYS spreadsheets show the breakdown of spending for each budget line under the following headings: (i) personal emoluments (PE), (ii) traveling and transport, (iii) general expenditures, (iv) maintenance and repairs, (v) supplies and stores, (vi) investment costs, and (vii) subventions. Since 1999, headings (ii) to (v) have been replaced by two headings: (i) administrative costs and (ii) service costs, which are listed under items (iii) and (iv) in Table B.1.

22. From 1989-98, PE accounted for between 70 and 80 percent of total expenditure. The share jumped after that because of a change in the system of financial administration.

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4. Commonwealth Local Government Forum (2002), Boko (2002), and Appiah et al. (2000).

5. Salaries are paid direct to the banking system by the Controller Accountant General (CAG) using funds received directly from the Ministry of Finance (Canagarajah and Ye 2001).

Support to tertiary institutions was made entirely through subventions until 1998,[6] so that tertiary spending on other categories is not reflected in the table. But from 1999 the subventions stopped, so that wages and salaries previously covered by the subventions now appear as PE. To ensure comparability, in the data shown here spending on tertiary education in the period since 1999 has been treated as though it were a subvention.

23. In the basic education sectors that are the focus of this study, an even greater proportion of spending has been for PE — staying at 99 percent in primary until 1997 and never falling below 96 percent. In primary, virtually nothing was spent on the three areas that have benefited most from Bank support — maintenance, repairs and renewals, supplies and stores, and investment costs. The figures are little different for JSS, though with a small (but still negligible) amount of spending on maintenance. The PE share is lower in teacher training and secondary, but in the former case, the difference is largely consumed by traveling and transport. A slightly larger amount is spent on supplies and stores for secondary, but this presumably includes the costs related to boarders. From this discussion it is clear that the larger percentage of supplies and stores in total expenditure reflects supplies and stores purchased for administrators in MoEYS HQ and GES, not for schools.

Table B.1: Functional classification of education spending (percent)

	Total expenditure	*Personal emoluments*	*Traveling and transport*	*General expenditures*	*Maintenance repairs and renewals*	*Supplies and stores*	*Investment costs*	*Subvention*
Primary								
1989	100.0	99.3	0.5	0.2	0.0	0.0	0.0	0.0
1990	100.0	99.3	0.5	0.2	0.0	0.1	0.0	0.0
1991	100.0	99.4	0.3	0.2	0.0	0.0	0.0	0.0
1992	100.0	99.6	0.2	0.2	0.0	0.0	0.0	0.0
1994	100.0	98.8	0.5	0.6	0.0	0.1	0.0	0.0
1995	100.0	98.8	0.5	0.6	0.0	0.1	0.0	0.0
1996	100.0	99.3	0.3	0.2	0.0	0.2	0.0	0.0
1997	100.0	98.4	0.3	0.2	0.0	1.1	0.0	0.0
1998	100.0	97.4	0.7	0.5	0.5	0.8	0.0	0.0
1999	100.0	95.9	3.8	0.2	0.0	0.0	0.0	0.0
2000	100.0	97.5	0.0	2.5	0.0	0.0	0.0	0.0
2001	100.0	98.6	0.0	1.4	0.0	0.0	0.0	0.0
JSS								
1989	100.0	97.5	1.5	0.5	0.5	0.0	0.0	0.0
1990	100.0	98.0	1.0	0.4	0.6	0.1	0.0	0.0
1991	100.0	98.7	0.6	0.3	0.4	0.1	0.0	0.0
1992	100.0	99.2	0.3	0.2	0.3	0.1	0.0	0.0

6. Tertiary accounted for the bulk of subventions in each year. The other line receiving subvention payments was the general administration. These subventions also stopped in 1999.

	Total expenditure	*Personal emoluments*	*Traveling and transport*	*General expenditures*	*Maintenance repairs and renewals*	*Supplies and stores*	*Investment costs*	*Subvention*
1994	100.0	98.9	0.4	0.3	0.3	0.1	0.0	0.0
1995	100.0	98.9	0.5	0.5	0.1	0.1	0.0	0.0
1996	100.0	99.3	0.3	0.2	0.1	0.1	0.0	0.0
1997	100.0	97.8	0.3	0.2	0.1	1.7	0.0	0.0
1998	100.0	98.1	0.5	0.6	0.3	0.6	0.0	0.0
1999	100.0	97.0	2.8	0.2	0.0	0.0	0.0	0.0
2000	100.0	97.6	0.0	2.4	0.0	0.0	0.0	0.0
2001	100.0	98.7	0.0	1.3	0.0	0.0	0.0	0.0
Secondary								
1989	100.0	90.2	5.3	3.5	1.0	0.0	0.0	0.0
1990	100.0	88.9	4.3	3.2	1.2	2.4	0.0	0.0
1991	100.0	92.1	3.1	2.3	0.8	1.8	0.0	0.0
1992	100.0	94.4	1.8	1.6	0.5	1.7	0.0	0.0
1994	100.0	93.1	2.8	2.4	0.8	0.9	0.0	0.0
1995	100.0	85.3	3.1	8.4	0.9	2.3	0.0	0.0
1996	100.0	84.4	3.8	8.0	0.8	3.0	0.0	0.0
1997	100.0	85.5	4.1	7.8	0.1	2.4	0.0	0.0
1998	100.0	85.6	3.2	6.0	1.5	3.8	0.0	0.0
1999	100.0	84.4	6.7	0.2	8.7	0.0	0.0	0.0
2000	100.0	79.5	0.0	5.3	0.0	0.0	15.2	0.0
2001	100.0	95.8	0.0	2.7	0.5	0.0	1.0	0.0
Teacher training								
1989	100.0	83.2	9.9	3.7	1.2	2.0	0.0	0.0
1990	100.0	84.6	8.5	3.5	0.9	2.5	0.0	0.0
1991	100.0	86.1	7.0	3.5	0.9	2.5	0.0	0.0
1992	100.0	93.7	2.6	1.8	0.5	1.5	0.0	0.0
1994	100.0	94.1	2.5	1.7	0.5	1.2	0.0	0.0
1995	100.0	92.5	2.0	4.2	0.2	1.1	0.0	0.0
1996	100.0	93.6	2.3	2.7	0.5	1.0	0.0	0.0
1997	100.0	94.5	2.0	2.3	0.3	0.9	0.0	0.0
1998	100.0	95.3	1.3	1.5	0.6	1.3	0.0	0.0
1999	100.0	97.7	1.4	0.1	0.8	0.0	0.0	0.0
2000	100.0	95.5	0.0	3.9	0.0	0.0	0.7	0.0
2001	100.0	96.8	0.0	2.6	0.2	0.0	0.4	0.0

	Total expenditure	Personal emoluments	Traveling and transport	General expenditures	Maintenance repairs and renewals	Supplies and stores	Investment costs	Subvention
Total expenditure								
1989	100.0	74.8	1.7	1.3	0.5	5.0	0.0	16.8
1990	100.0	71.0	1.4	1.5	0.8	7.6	0.0	17.7
1991	100.0	76.8	1.1	1.0	0.7	3.8	0.0	16.5
1992	100.0	78.9	0.7	1.1	1.0	5.2	0.0	13.1
1994	100.0	75.3	1.1	1.5	2.2	2.8	0.0	17.2
1995	100.0	78.2	1.3	2.4	1.2	3.4	0.0	13.4
1996	100.0	77.4	1.4	1.9	1.0	3.0	0.0	15.2
1997	100.0	77.4	1.5	2.1	1.1	2.7	0.0	15.2
1998	100.0	76.1	2.0	2.7	1.5	3.0	0.0	14.6
1999	100.0	85.5	0.0	8.3	4.4	0.0	1.8	0.0
2000	100.0	88.7	0.0	5.7	3.9	0.0	1.7	0.0
2001	100.0	95.0	0.0	3.7	0.8	0.0	0.5	0.0

Source: MoEYS expenditure spreadsheets

The role of donor finance[7]

24. As a first approximation, it can be said that in basic education government is financing "nothing but salaries." There is a small amount for supplies such as chalk and some infrastructure improvements and school furniture are financed by the districts. Communities also finance some inputs, but these amounts will be small compared to official funding, especially since responsibility for construction was taken away from communities in the 1990s. It is clear that most of what has been done in upgrading school infrastructure as well as textbook supply has come from elsewhere. The relative importance of donor finance illustrates this point.

25. Data are available for Bank disbursements on an annual basis from Implementation or Project Completion Reports (ICRs and PCRs). These data are reported in Table B.2(a). These totals were converted to cedis using the average exchange rate. The disbursement figures can then be expressed as a percentage of total expenditure and of total non-PE expenditure, see Table B.2(b). Figure B.3 shows total Bank disbursements on an annual basis and the ratio of these to non-PE expenditure. If the Bank funds are entirely outside of the budget then they have provided up to an additional 40 percent of resources compared to government's non-wage spending. But if Bank funds pass through the budget they have accounted for up to 70 percent of non-wage

7. This section draws on Mettle-Nunoo and Hilditch (2000).

Table B.2 (a): Donor support to education (annual disbursements, US$ millions)

	Total	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
HERP	3.47	0.62	0.68	0.93	0.62	0.62											
EdSAC I	38.32	9.36	3.16	4.67	9.90	10.21	1.02										
EdSAC II	53.20					13.30	10.60	8.70	4.60	16.00							
CSSC	15.18						5.41	4.31	3.26	2.20							
Literacy and functional skills	10.63						0.00	2.02	1.39	2.51	2.64	2.07					
Tertiary education project	44.80							3.20	0.60	8.20	12.20	15.40	4.20	1.00			
PSD	53.20								2.50	9.20	20.30	15.20	5.90	0.10			
Vocational skills*	5.80										0.80	0.80	0.40	1.50	1.30	1.00	
BESIP*												1.28	2.57	1.28	17.30	12.37	10.70
National functional literacy*																1.00	4.00
Total World Bank	256.9	9.4	3.2	4.7	9.9	23.5	17.0	18.2	12.4	38.1	35.9	34.7	13.1	3.9	18.6	14.4	14.7
Total bilateral (DAC)	317.6	1.2	0.9	6.9	12.3	18.6	19.2	5.0	3.3	13.4	24.4	56.2	104.4	37.3	14.2	n.a.	n.a.

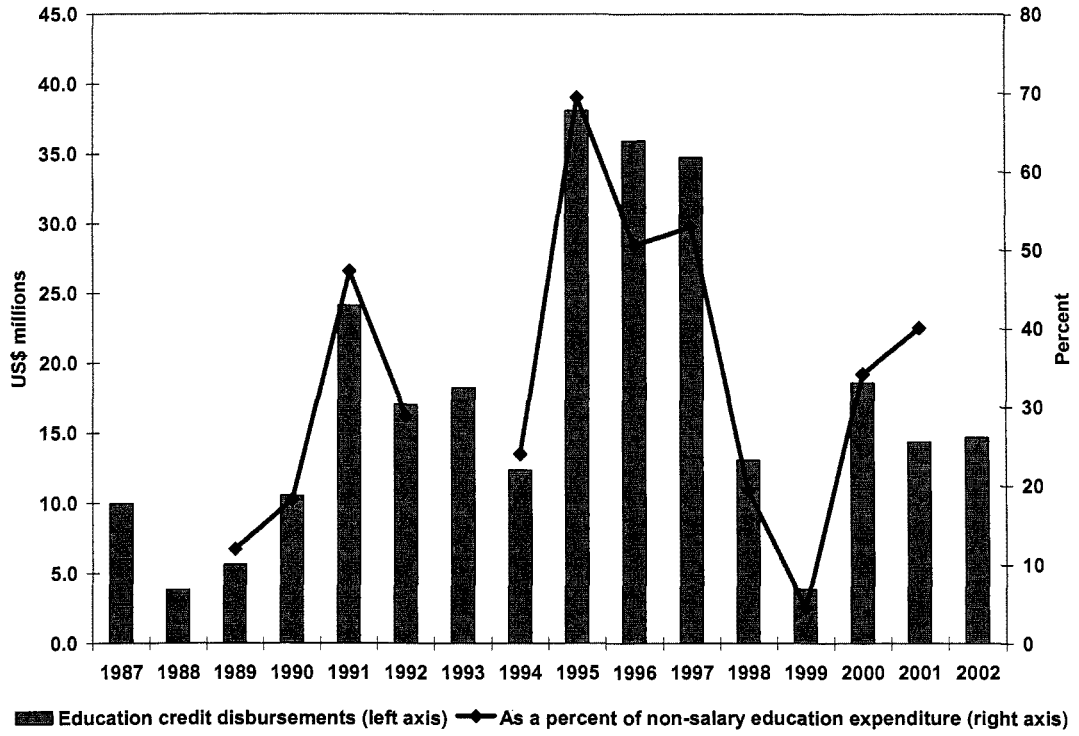
Note: *OED estimate

Table B.2 (b): Donor support to education (total and as percent of government expenditure)

	1989	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
Expenditures (billions)													
World Bank	1.1	3.0	8.2	6.9	9.9	9.9	41.1	51.0	64.1	28.5	9.7	75.6	90.7
Bilateral	1.6	3.7	6.5	7.7	2.7	2.7	14.5	34.7	103.6	227.9	93.0	57.5	0.0
Total government expenditure	43.9	59.2	76.5	112.9	..	166.9	271.9	445.8	534.4	614.9	914.6	1110.9	1664.2
Wages and salaries	32.9	42.0	58.8	89.1	..	125.6	212.7	345.0	413.4	468.2	698.7	889.9	1437.6
Non-wage	11.1	17.2	17.7	23.8	..	41.3	59.2	100.8	121.0	146.7	215.9	221.0	226.6
World Bank													
Percent total	2.5	5.0	10.7	6.1	..	5.9	15.1	11.4	12.0	4.6	1.1	6.8	5.5
Percent non wage	10.0	17.2	46.0	28.8	,,	24.0	69.4	50.6	52.9	19.4	4.5	34.2	40.0
Bilateral													
Percent total	15.8	20.8	24.3	17.0	..	2.0	4.9	5.5	10.5	17.0	4.1	1.3	..
Percent non-wage	14.8	21.3	36.5	32.6	..	6.5	24.4	34.4	85.6	155.3	43.1	26.0	14.8

expenditure. It is likely to be the norm that the funds are off-budget. It is most likely that some EdSAC resources passed through the budget. The figures are serious under-estimates for the Bank's contribution to the non-wage component of basic education spending, since it has been shown that government finances little other salaries in that sub-sector. The value of the Bank's resources for non-salary spending in basic education is many times that of the government.

Figure B.3: Total Bank disbursements



26. Data on bilateral flows are more difficult to come by. The Development Assistance Committee (DAC) online database provides annual commitment data to each recipient by country and sector. The coverage of these data is somewhat uneven, so there is a danger of under-reporting. In addition, the data refer to commitments rather than disbursements. For what they are worth, the data show that total bilateral support to education has been about $318 million, compared to $257 million from the Bank. There was very little bilateral funding before 1990, when the first large USAID project began, which was in fact budget support, as was EdSAC. In the early 1990s, Bank and bilateral funding were on a par. In the later part of the 1990s, bilateral funds have exceeded those from the Bank. Over the period as whole, the Bank has provided about 45 percent of external support to the education sector.[9]

9. This figure excludes direct support from NGOs (as opposed to NGO-implementation of officially financed projects). The scale of NGO activities is too low to substantially affect the figures reported here.

27. The main donors involved in basic education have been the World Bank, USAID, DFID (each of which has put a comparable amount into the sector), and the EC through the micro-projects program. These activities are summarized in Table B.3.

Table B.3: Main bilateral (and EC) supported activities in basic education

	Project/Program	*Period*	*Budget*	*Activities*
DFID	Whole School Development	1988-2005	UK£50 million	Support to 2 pilot schools in each district. Construction of 125 classroom blocks.
EC	Micro-projects	1990-91 1991-94 1994-96 1996- ?	ECU1.1 million ECU6.0 million ECU7.0 million ECU9.0 million	District allocated fund for community activities with allocation guideline of 20% for education. In practice about 30% used for education (classroom rehabilitation, VIP construction etc.). 1,855 projects financed over period covered by these data.
Japan	School block construction through Grant Assistance for Grassroots Projects	2000-2002	US$0.5 million	Approximately 80 classroom blocks.
USAID	Primary Education Project (PREP)	1990-1995	US$ 35 million	US$32 million budget support plus US$3 million TA
	Quality Improvements in Primary Schools (QUIPS)	1997-2004	US$ 53 million	US$14 million budget support US$39 million for improvements in 330 schools (includes demand-driven infrastructure component for program schools only).

Annex C: School Costs

28. GLSS2 and the GSS/OED collected data on school costs from three separate survey instruments:

1. The school survey contained a question on school expenses (see Box C.1).
2. The household survey collected data on various categories of educational expenditure for each child.
3. The price questionnaire collected data on the prices of school supplies.

This annex presents a summary of these data for 2003.

Box C.1: School questionnaire questions on school expenses

Please tell me the amount in cedis that students have to pay for the following items. If the amount varies by grade, please tell me the average for all grades.

	Amount	Comments
1. Enrolment fee		
2. School fee		
3. Sports and culture fee		
4. PTA levy		
5. Other fees (e.g., District Assembly levy)		
6. Value of materials for practicals		

PRESENTATION OF TABLES

29. Tables C.1 and C.2 show the costs of fees and materials for primary and junior secondary schools, respectively, from the school survey. These costs are calculated as averages for urban and rural areas, and for three ecological zones separately. The information on the amount in cedis paid by households for pupils' education is obtained through interviews with the head-teachers of each of the surveyed schools. These figures are not the amounts actually paid by households, but averages estimated by the head-teachers interviewed. Since fees can vary across different grades within the same school, the head-teachers were asked to provide a figure that was the most representative of what was paid by children of all grades attending the school.

Table C.1: School costs: Primary schools (cedis)

		Enrol-ment fee (1)	*School fee (2)*	*Sports & culture fee (3)*	*PTA levy (4)*	*Other fees (5)*	*Materials (6)*	*Total (7)*	*Total fees (sum of cols. 1, 2, 3, and 5)*
Coast	Urban	13341	42813	5019	8374	4629	1319	75494	65802
	Rural	1400	6640	6436	2112	3240	2120	21948	17716
Forest	Urban	6801	33820	4998	9050	8633	3748	67051	54252
	Rural	1835	15608	3912	3519	8589	2330	35793	29944
Savannah	Urban	1615	16308	3258	5538	4850	0	31569	26031
	Rural	343	5829	3834	2040	1100	3	13149	11106
Average		**5884**	**26476**	**4630**	**6393**	**6558**	**2242**	**52182**	**43548**

Table C.2: School costs: Junior secondary schools (cedis)

		Enrol-ment fee (1)	*School fee (2)*	*Sports & culture fee (3)*	*PTA levy (4)*	*Other fees (5)*	*Materials (6)*	*Total (7)*	*Total fees (sum of cols. 1, 2, 3, and 5)*
Coast	Urban	10071	39869	7316	9136	6971	3107	76470	64227
	Rural	0	0	7574	2553	5095	6526	21747	12669
Forest	Urban	7361	29458	5244	8760	10638	6369	67830	52701
	Rural	850	7150	4378	3917	4247	12608	33150	16625
Savannah	Urban	1588	12882	3994	4388	8000	0	30853	26464
	Rural	0	0	4126	2079	527	3211	9942	4653
Average		**5358**	**22500**	**5572**	**6741**	**7239**	**6302**	**53712**	**40669**

30. Tables C.3 and C.4 show household educational expenses for children attending primary and junior secondary schools. The information on these expenses was obtained from the household questionnaire. Parents were asked how much they had spent during the 12 months preceding the interview on the items presented in the table. The expenses were reported in the questionnaire for each child separately, thus allowing the distinction between primary and JSS (and higher levels of education). The figures are average expenses per pupil calculated across ecological zones and for urban and rural areas separately.

31. Comparing table C.1 with C.3, and C.2 with C.4, shows some differences between reported school and household costs. In the case of primary, the total fees of cedis 43,500 is close to the tuition and registration fees households say they pay (cedis 46,200). In the case of JSS the households claim to pay rather more than the schools report. This may reflect the differing composition of attendance, but may also reflect under-reporting of fees, especially unofficial ones, by schools. Government policy is that there are no fees, such as enrolment fees, in public basic schools. Hence, in the government's view the non-zero values shown in the public school section of tables C.7 and C.8 reflect either respondent or data entry error.

Table C.3: Households' costs: Primary schools (cedis)

		PTA levy (1)	*Uniforms & clothes (2)*	*Books & supplies (3)*	*Transport (4)*	*Cafeteria & lodging (5)*	*Tuition & registration fees (6)*	*Other (7)*	*Total (8)*
Coast	Urban	8074	42946	53320	59641	244890	89565	45653	909793
	Rural	2594	23308	15364	10573	121094	23099	14549	314399
Forest	Urban	10195	39693	42839	33733	237249	66674	45695	591333
	Rural	2833	30845	18640	12090	146202	29468	18337	305793
Savannah	Urban	9658	26216	9868	180	64216	24641	22018	207774
	Rural	2641	22122	6891	618	44066	7519	6786	112898
Average		**6008**	**33079**	**28729**	**24311**	**164012**	**46272**	**28400**	**462024**

Table C.4: Households' costs: Junior secondary schools (cedis)

		PTA levy (1)	*Uniforms & clothes (2)*	*Books & supplies (3)*	*Transport (4)*	*Cafeteria & lodging (5)*	*Tuition & registration fees (6)*	*Other (7)*	*Total (8)*
Coast	Urban	10378	64920	88480	116227	246908	75239	54513	1418049
	Rural	4386	47500	88273	101409	157500	38068	40955	785227
Forest	Urban	24496	53708	79375	103843	339843	74915	87407	891814
	Rural	4774	31870	47496	44521	223432	40449	30615	531570
Savannah	Urban	4938	19438	29250	0	82813	41813	25188	245475
	Rural	4557	43273	25309	2045	64977	18109	21259	224961
Average		**12055**	**50033**	**68305**	**80149**	**235719**	**58378**	**53407**	**876883**

32. Table C.5 shows the costs of selected school items. These costs were obtained through market surveys carried out in each of the selected clusters. In every locality, three different shops selling stationery and clothes were interviewed, and the average prices of each item per locality were calculated. The figures shown are again averages across ecological region and rural/urban areas.

Table C.5: Prices of education items

		Exercise book (1)	*Pencil (2)*	*Eraser (3)*	*School uniform (boys) (4)*	*School uniform (girls) (5)*
Coast	Urban	1111	270	253	41674	41493
	Rural	1033	280	217	26875	27167
Forest	Urban	977	232	239	22077	22205
	Rural	1072	255	228	22800	21909
Savannah	Urban	1050	267	242	24250	23417
	Rural	1153	331	220	24909	24091
Average		**1069**	**267**	**236**	**29848**	**29429**

33. Table C.6 shows the number of school of each type (private and public) and level (primary and JSS) that were covered by the survey. The table displays their geographical distribution.

Table C.6: Distribution of schools by level, type, and location

		Primary schools			*Junior Secondary schools*		
		Public	*Private*	*Total*	*Public*	*Private*	*Total*
Coast	Urban	62	29	91	57	13	70
	Rural	22	3	25	18	1	19
Forest	Urban	108	35	143	86	18	104
	Rural	75	22	97	54	6	60
Savannah	Urban	21	5	26	14	3	17
	Rural	32	3	35	19	0	19
Average		**320**	**97**	**417**	**248**	**41**	**289**

34. Table C.7 and C.8 are disaggregations of Tables C.1 and C.2 for primary and private schools. Similarly, tables C.9 and C.10 are disaggregations of tables C.3 and C.4.

Table C.7: School costs in public and private schools: Primary (cedis)

		Enrol-ment fee *(1)*	*School fee* *(2)*	*Sports & culture fee* *(3)*	*PTA levy* *(4)*	*Other fees* *(5)*	*Materials* *(6)*	*Total* *(7)*	*Total fees (sum of cols. 1, 2, 3, and 5)*
					Public schools				
Coast	Urban	262	246	6504	10459	6675	1869	26016	13688
	Rural	0	500	7223	2082	3682	2045	15532	11405
Forest	Urban	792	3190	5856	9178	4055	2426	25495	13892
	Rural	107	2547	4727	4124	3388	2887	17779	10768
Savannah	Urban	0	952	3581	6143	52	0	10729	4586
	Rural	94	0	4100	1763	1203	3	7163	5397
Average		**353**	**1823**	**5483**	**6802**	**3824**	**1999**	**20282**	**11482**
					Private schools				
Coast	Urban	39933	129367	1998	4467	468	200	176433	171767
	Rural	11667	51667	667	2333	0	2667	69000	64000
Forest	Urban	25343	136909	2351	8657	22761	7829	203850	187364
	Rural	7727	60136	1136	1455	26318	432	97205	95318
Savannah	Urban	8400	80800	1900	3000	25000	0	119100	116100
	Rural	3000	68000	1000	5000	0	0	77000	72000
Average		**23888**	**109784**	**1855**	**5163**	**15456**	**3036**	**159181**	**150982**

Table C.8: School costs in public and private schools: JSS (cedis)

		Enrol-ment fee *(1)*	*School fee* *(2)*	*Sports & culture fee* *(3)*	*PTA levy* *(4)*	*Other fees* *(5)*	*Materials* *(6)*	*Total* *(7)*	*Total fees (sum of cols. 1, 2, 3, and 5)*
					Public schools				
Coast	Urban	0	687	5283	10736	8791	3355	28852	14761
	Rural	0	0	7550	2583	5378	6889	22400	12928
Forest	Urban	4541	5905	5920	9581	5031	7057	38035	21397
	Rural	37	2194	4559	4278	4459	6972	22500	11250
Savannah	Urban	0	0	4171	4829	786	0	9786	4957
	Rural	0	0	4126	2079	526	3211	9942	4653
Average		**1596**	**2700**	**5360**	**7313**	**5182**	**5500**	**27650**	**14837**
					Private schools				
Coast	Urban	47000	212867	2500	3267	300	2200	268133	262667
	Rural	0	0	8000	2000	0	0	10000	8000
Forest	Urban	20833	202544	2794	7833	4094	3083	241183	230267
	Rural	8333	51750	2750	667	2333	0	65833	65167
Savannah	Urban	9000	122333	3167	3667	1667	0	139833	136167
	Rural	...	...	...	...	...	...	...	...
Average		**26907**	**174798**	**2833**	**4814**	**2260**	**2058**	**213670**	**206798**

Table C.9: Households' costs in public and private schools: Primary (cedis)

		PTA levy (1)	*Uniforms & clothes (2)*	*Books & supplies (3)*	*Transport (4)*	*Cafeteria & lodging (5)*	*Tuition & registration fees (6)*	*Other (7)*	*Total (8)*
					Public schools				
Coast	Urban	4401	20664	23627	13503	132379	13222	26460	681220
	Rural	2260	21122	13450	7481	109012	13055	10302	283901
Forest	Urban	6557	33019	26926	12573	156941	16479	21793	356998
	Rural	2344	27054	17656	4079	139512	13095	13658	261147
Savannah	Urban	4914	16978	8175	0	46860	9054	16032	160170
	Rural	2425	21840	6733	656	34627	3707	7203	100814
Average		**3638**	**24893**	**16987**	**6419**	**111212**	**11617**	**15588**	**302521**
					Private schools				
Coast	Urban	11810	65612	83526	106575	359342	167224	65177	1142306
	Rural	6250	47167	36250	44333	253000	132750	60917	647333
Forest	Urban	16563	51371	70688	70763	377787	154515	87522	1001419
	Rural	6023	55554	25052	64304	189804	136189	48830	596791
Savannah	Urban	34167	73944	18611	1111	153889	105172	52944	453728
	Rural	6167	26700	9467	0	197600	69533	0	309467
Average		**13205**	**57936**	**64384**	**78640**	**324339**	**151501**	**67305**	**946354**

Table C.10: Households' costs in public and private schools: JSS (cedis)

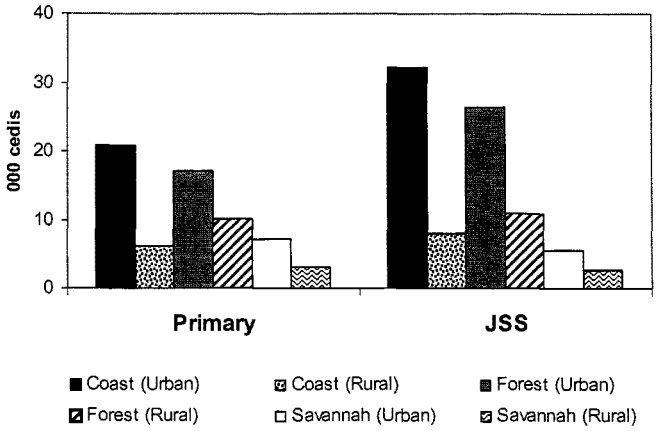
		PTA levy (1)	*Uniforms & clothes (2)*	*Books & supplies (3)*	*Transport (4)*	*Cafeteria & lodging (5)*	*Tuition & registration fees (6)*	*Other (7)*	*Total (8)*
					Public schools				
Coast	Urban	4173	29407	47619	67272	187247	22805	39420	1452985
	Rural	4325	50000	92950	93550	135750	32125	39650	754450
Forest	Urban	19554	47873	66889	88542	329446	33936	65229	724693
	Rural	3562	29315	41557	26215	221315	23111	33122	485705
Savannah	Urban	3933	20733	28200	0	52333	14467	23867	188373
	Rural	4663	39628	23828	2093	66488	8088	21753	213030
Average		**8269**	**36730**	**50217**	**53625**	**206044**	**24018**	**41845**	**770316**
					Private schools				
Coast	Urban	23605	140618	175579	220579	374079	187008	86684	1343579
	Rural	5000	22500	41500	180000	375000	97500	54000	1093000
Forest	Urban	40904	73080	120826	154640	374360	210965	161040	1446655
	Rural	14625	52625	95750	193250	240625	181325	10250	904225
Savannah	Urban	20000	0	45000	0	540000	452000	45000	1102000
	Rural	0	200000	89000	0	0	449000	0	738000
Average		**27555**	**104487**	**142342**	**188720**	**357187**	**199027**	**100733**	**1313096**

DISCUSSION

Regional Disparities

35. The regional disparities in the above data are very marked. Education costs are usually highest in the urban coastal areas and lowest in the rural savannah. The second most expensive area is urban forest. Next is urban savannah. That is, costs are higher in all three urban areas than all three rural areas. This result partly reflects the concentration of private schools in urban areas. Looking at public schools only, the same pattern holds for JSS, but not primary, for which costs are higher in rural forest than either savannah region and for JSS quite above those of rural coast (Tables C.7-C.10).

Figure C.1 Fees collected at public schools retained by school (including PTA levy)



36. For primary schools in aggregate, total fees in the coastal region are six times those in the savannah (Table C.1). The difference is even greater for JSS (Table C.2). The household data show an even greater divergence, with costs being eight times as much for primary and nearly seven for JSS (Tables C.3. and C.4).

37. These disparities are not much explained by differences in the cost of school supplies, which do not vary too greatly other than the greater cost of uniforms in urban coastal (Table C.5).

Levels of Schooling

38. As is to be expected, JSS costs more than primary, though these differences are not particularly fee related (Figure C.1). The aggregate data from the school survey show similar levels of both fees and total costs (Tables C.1 and C.2). But the household data show that parents spend nearly twice as much to send a child to JSS as they do to primary. Expenditures are greater for JSS for all the expenses shown, but the difference is greatest for transport and books and supplies. Comparing public schools only, JSS appears more expensive according to both school-level data and household data, with the gap being large for the latter (Tables C.7-C.10).

Public versus private

39. Private schooling of course costs more than public (Tables C.7-C.10), with the differential appearing larger from the school data than the household data. This is since items

not included in the school data — uniforms, transport, and cafeteria/lodging — have a much lower differential.

Funds available to schools

40. The sports and culture levy is the only official school fee set by government. In addition, the PTA levy is intended to benefit the school. Figure C.1 shows the average of fees other than the sports and culture levy, these being amounts likely to be retained by the school. From this figure, the differentials seem quite large. In fact, they are even larger. For example, of 317 public primary schools 233 reported charging no enrolment fee compared to a maximum charged in one school of 40,000 cedis (Table C.11). There are 57 schools not even charging a PTA levy, compared to a maximum of 150,000. The table shows in brackets the number of responses to each question. It cannot be assumed that non-responses are zero, since zero was an accepted response. It is just as likely that respondents were reluctant to provide the information since such fees are not meant to be charged. This would mean that the school costs under-estimate charges. The household data show higher fees than the school data for JSS, though they are similar for primary.

Table C.11: Zero and maximum responses in primary school cost data

	No. of schools for which zero	*Maximum value (cedis)*
1. Enrolment fee	233 (253)	40,000
2. School fee	223 (254)	190,000
3. Sports and culture fee	9 (317)	40,000
4. PTA levy	57 (312)	150,000
5. Other fees (e.g., District Assembly levy)	79 (306)	120,000

Annex D: School-Level Changes in Inputs, Management, and Methods

INTRODUCTION

1. This annex reports the data from the school and teacher surveys on school quality. Tabulations are presented on variations of school quality by zone (coastal, forest, and savannah), rural/urban, and the economic well-being of the community in which the school is situated. For some variables regression results are presented to explore the determinants of different aspects of school quality. Insofar as the data permit, comparisons are made with 1988. These comparisons are reported in two ways: (1) comparisons of the whole sample of 519 schools in 1988 with the 706 surveyed in 2003, and (2) comparison based only on the panel of 196 schools that could be matched between the two survey rounds.[1] A teacher survey was not carried out in 1988, although limited information was collected from the teacher roster in the school questionnaire.

Table D.1: Sample sizes

1988	
Primary schools	286
Middle/JSS	233
Total	519
2003	
Primary schools	417
JSS	289
Total	706
Teachers	3,129
Memo item: matched schools	
Primary schools	128
JSS	68
Total	196

2. The next section discusses the variables to be used in more detail, with subsequent sections discussing in turn monetary (capital and recurrent) inputs, teacher quality, methods, morale, and school management.

FOUR DIMENSIONS OF SCHOOL QUALITY: VARIABLE SELECTION

3. The school survey from 1988 and the school and teacher surveys provide a number of variables that can be used to measure school-level inputs to the education process. Four dimensions of school-level inputs can be identified:

- Physical
- Material
- Teachers
- School management

Table D.2 identifies the variables that can be used to measure the quantity and, where possible, quality, of these various inputs. Few data on the last dimension, school management, were collected in 1988, so that comparisons across time are largely restricted to the first three dimensions. The subsequent sections of this annex present the main findings

1. Since the surveys took place in the same clusters in the two rounds, all schools surveyed in the first round should also have been surveyed in the second round, unless they closed. However, school name information was not entered with the data in the first round and could not be recovered for all schools. Matching was attempted during field work and checked against location, year of establishment, and whether the school was public or private.

with respect to each dimension. This section provides an overview of the variables to be used.

Table D.2: Survey-based measures of school quality

	Quantity	*Quality*
Physical		
Classrooms	Adequate number of classrooms	% of classrooms that can be used when raining
		Classes held in shared classrooms*
		Height of internal walls*
		Noise disruption*
Chalkboard	% of classrooms with chalkboard	Board quality
Water	% of schools with own water supply	Type of Water/Storage
Library	% of schools with library	
Material		
Chalk	Availability	
English textbooks	English Textbooks — Pupil Ratio	Textbook usage*
Mathematics textbooks	Mathematics Textbooks — Pupil Ratio	Textbook usage*
Desks	Writing Places — Pupil Ratio	
Chairs	Seating places-pupil ratio*	
Teachers and teaching methods		
Teachers	Adequate number of teachers	Teacher morale (subjective)*
		% trained teachers
		Absenteeism
		Teacher test scores
		Head's assessment*
		Teaching methods*
		Frequency of homework*
School management		
Community involvement	Existence SMC and PTA*	Active SMC and PTA*
	SPAM*	Role of SPAM*
Circuit supervisor	Frequency of visits	Activities of circuit supervisor*
Head teacher		Activities of head teacher*

Note: * not collected in 1988.

4. Most of the variables are self-explanatory. Explanation is provided here for those that are not (Annex F provides a variable list with definitions):

(1) Adequate classrooms and adequate number of teachers are both based on dividing the actual number available by the required number. The required number is the number of classes taught in the school, taking into account multiple streams and shifts. If a primary school teaches grades 1 to 6 and has two streams without shifts it needs 12 classrooms and 12 teachers.[2] But if that school operated a shift system it would need only 6 classrooms but still require 12 teachers. Classrooms in such

2. Teachers teach for just one of the two shifts. The head teacher is meant to be present for both shifts.

poor state of repair that they cannot be used are excluded from the number available (the numerator). The 2003 data contain additional variables on classroom quality. Detached head teachers are excluded from the numerator.

(2) The percentage of classrooms that can be used when it is raining is 100 less those that cannot be used when it is raining plus those that cannot be used at all divided by total number of classrooms (including those that cannot be used at all).

(3) Board quality is a subjective assessment. In 1988 this assessment was made by the respondent (usually the head) for the whole school. The same question was asked in 2003 and is used for the purposes of comparisons. However, in 2003 teacher-level data on board quality (and more specific questions on that quality) are also available and used for analysis specific to 2003.

(4) Textbook availability. The number of books at each grade is summed across grades and divided by total enrolments, which is equivalent to an enrolment-weighted average for the school.[3]

(5) Writing places. For 2003 desks per pupil is calculated in an analogous way to textbook availability, but using adjusted enrolments where the adjustment takes account of a split shift (i.e., the same desk can be used by different pupils in morning and afternoon). However, for 1988 there is a categorical variable on whether there are enough, some, or no desks. The 2003 data are categorized for comparability (see Annex F for cut-offs).

(6) Teacher morale is a subjective measure based on two questions, whether the respondent enjoys being a teacher, and if he or she plans to remain a teacher for their whole career. The head's assessment is a categorical classification of all teachers as very good, good, average, poor, or very poor. None of these data were collected in 1988. Teacher morale is analyzed in para. 84 ff.

(7) Teaching methods were assessed through three questions in the teacher questionnaire designed to assess the extent to which the teacher claims to use "improved methods," including a check on their knowledge of these methods (more detail is provided below).

PHYSICAL AND MATERIAL SCHOOL-LEVEL INPUTS

The Main Message: School Quality Has Improved

5. The main message from the school survey is the overwhelming improvement in school quality. For example:

3. If it were the case that some grades had books while others did not then grade-specific textbook indicators would be required. However, analysis of the data shows this not to be the case, so that the school-wide average will suffice.

- In 1988 less than half of schools could use all their classrooms when it was raining, but in 2003 over two-thirds can do so.
- Today 94 percent of schools have a blackboard in every classroom compared to 78 percent 15 years ago
- Fifteen years ago over two-thirds of primary schools reported occasional shortages of chalk, only one in twenty do so today, with 86 percent saying there is always enough
- The percentage of primary schools having at least one English textbook per pupil has risen from 21 percent in 1988 to 72 percent today and for math books in JSS these figures are 13 and 71 percent, respectively.

6. Despite the greatly improved school quality, variation remains across the country, with some "biases" in the allocation of school resources. Analysis reported below shows that the strongest bias comes from the ability of better-off communities to better support schools in their locality. It is also shown that the Bank's Primary School Development Project made a significant contribution to aspects of school quality.

Material Inputs

7. The material inputs for which data can be compared between 1988 and 2003 are the availability of chalk, math and English books, and desks. For each of these four variables there has been a strongly significant (all significant at 1 percent level) improvement in the level of inputs at both primary and JSS level (see Table D.3). This statement is also true for the panel of 196 schools.

Table D.3: Significant changes in the availability of material inputs

	Primary	*Middle/JSS*	*Total*
Chalk	***	***	***
English books	***	***	***
Math books	***	***	***
Desks	***	***	***

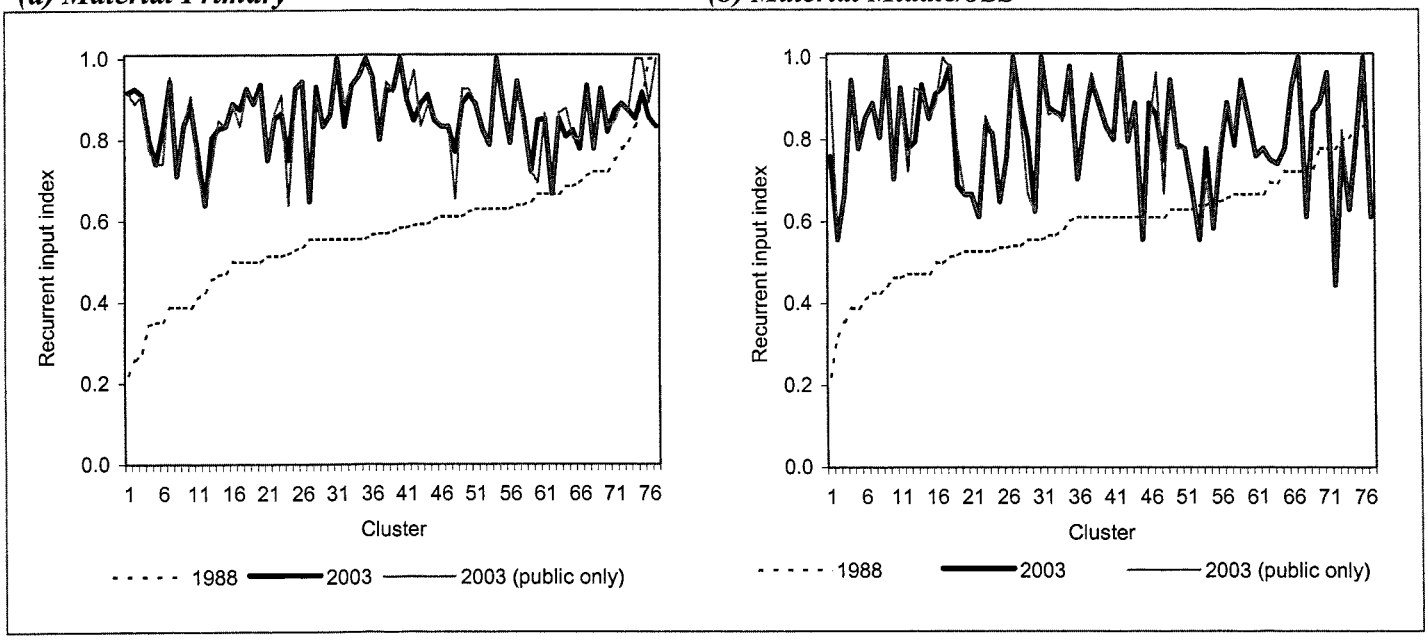
Note: *** significant at 1%, ** significant at 5%, * significant at 10%. Significance is based on chi-squared statistic based on cross-tabulation of categorical version of variable against year (1988 and 2003). See Annex E for cross-tabulations and Annex F for variable definitions.

8. The four variables were combined into a simple index of material inputs. The resulting figures are shown in Figure D.1.[4]

4. The index was constructed by scaling each of the four variables over the range 0-1 and then taking a simple average. The resulting index in principle ranges from zero to one, though no school has the minimum score of zero. A principal components analysis of the four variables was also conducted. Each of the four variables entered the first component, which accounted for about half of the variation, with approximately equal weights.

Figure D.1: Schools in nearly all areas have more material inputs than before: cluster-level material inputs to school quality

(a) Material Primary *(b) Material Middle/JSS*



Source: GLSS2 and GSS/OED school survey

9. The figures show the cluster level average of the material input index for 1988 and 2003, calculated separately for primary and middle/JSS. In each graph, the clusters have been ranked according to the value of the index in 1988, so that the clusters with the schools with the fewest material inputs appear to the left of the scale. Where the line for 2003 lies above that for 1988 there has been an increase in the material input index for that cluster. Two points jump out from these graphs:

- There has been a substantial increase in the level of material inputs across the country, especially in primary schools. In only two clusters (which had the maximum value of 1 in 1988) has the level of material inputs declined at the primary level (Table D.4). For middle/JSS there have been, mostly small, declines in nine of the 76 clusters.[5]

5. There were 85 clusters in the 1988 survey. One of these was no longer inhabited so that the 2003 survey covered 84 clusters. A further six clusters with low populations in 1988 were also skipped in 2003 as a result of the self-weighting sample design. School data were not available for two clusters from 1988. Hence comparisons across time may be made using data from 76 clusters.

- The improvement has been greatest the lower the initial level of the index, meaning that the clusters in which schools that were the most deprived have seen the largest improvements in material inputs (Table D.5).[6]

Table D.4: Summary of observations in Figures D.1 and D.2

	Primary	*Middle/JSS*
Number of clusters experiencing deterioration		
Material	2	9
Physical	22	31
Number of clusters in which public schools have lower quality than private schools		
Material	19	13
Physical	29	17
Memo: *Number of clusters with private schools in 2003*	41	24

10. The panel data for chalk availability in primary schools provides a clear example of how the improvement of school quality has been concentrated in the most disadvantaged schools. In the general sample it has been seen that 86 percent of schools today say there is enough chalk compared to 67 percent 15 years ago. In Table D.6 most the observations lie on the upward sloping diagonal from the bottom left. All schools that said there was never enough chalk in 1988 today have enough. Of the 102 suffering occasional shortages 15 years ago, 88 (86 percent) now always have sufficient. And all but 3 of those which had sufficient in 1988 still do so today. Simply put, the 28 schools already having sufficient chalk had no room for improvement. But the 16 who never had enough could at worst stay the same — though in the event all those 16 now report having sufficient supply.

Table D.5: Correlation coefficient between cluster-level change in index and the initial (1988) value

	Material	*Physical*
Primary	-0.88	-0.65
Middle/JSS	-0.71	-0.65

6. This result may be partly explained from measurement error, though this would require substantial systematic under-reporting of basic school quality variables.

11. The share of private schools in the sample increased from 5 to 20 percent between 1988 and 2003. Hence it might be argued that the observed increase in school quality simply results from the better quality of private schools. This is not so. Figure D.1 also shows the material input index for 2003 calculated for public schools alone. In general this line is not far removed from the overall cluster average. Indeed it is below it, indicating that public schools have a superior level of material inputs than do private ones in 22 of the 41 clusters that have public schools (Table D.4). When the changes in the index and its components are calculated for public schools only these changes all remain significant at the 1 percent level (Annex E, Tables E.6-E10).

Table D.6: Change in chalk availability against initial availability for primary school panel

	Chalk availability in 1988			
Change in rating (2003-1988)	*Never enough (=1)*	*Occasional shortages (=2)*	*Always enough (=3)*	*Total*
-2	0	0	2	2
-1	0	7	1	8
0	0	7	28	35
1	0	88	0	88
2	16	0	0	16
Total	**16**	**102**	**31**	**149**

12. Private schools do have a higher level of material inputs in some respects. Although there is no overall significant difference in the material input index for public and private schools in 2003 this result conceals that private schools do significantly better on two of the four components of the index (English books and desks), but significantly worse on two (chalk and math books) (Annex E, Tables E.15-E.19). Private schools on average have higher levels of some inputs than do public ones, but this is not the main reason for the observed improvement in school quality between 1988 and 2003.

Physical Inputs

13. The index for physical inputs comprises the adequacy of the number of classrooms, the proportion that can be used when raining, the proportion with a blackboard and the quality of those boards, the presence of a library and own water supply. Two of these have not improved (sufficient number of classrooms and library) for either type of school, one (library) has not for primary schools, and another (classrooms that cannot be used when raining) for middle/JSS (Table D.7). The lack of change with respect to there being sufficient classrooms shows that classroom building has kept pace with growing student numbers. So the number of classrooms has increased, but been matched by more students. For many schools there has been no shortage of physical facilities (although their quality is a different matter), so that no improvement in this measure is expected or required. Overall, there *has* been a significant increase in the index of physical inputs.

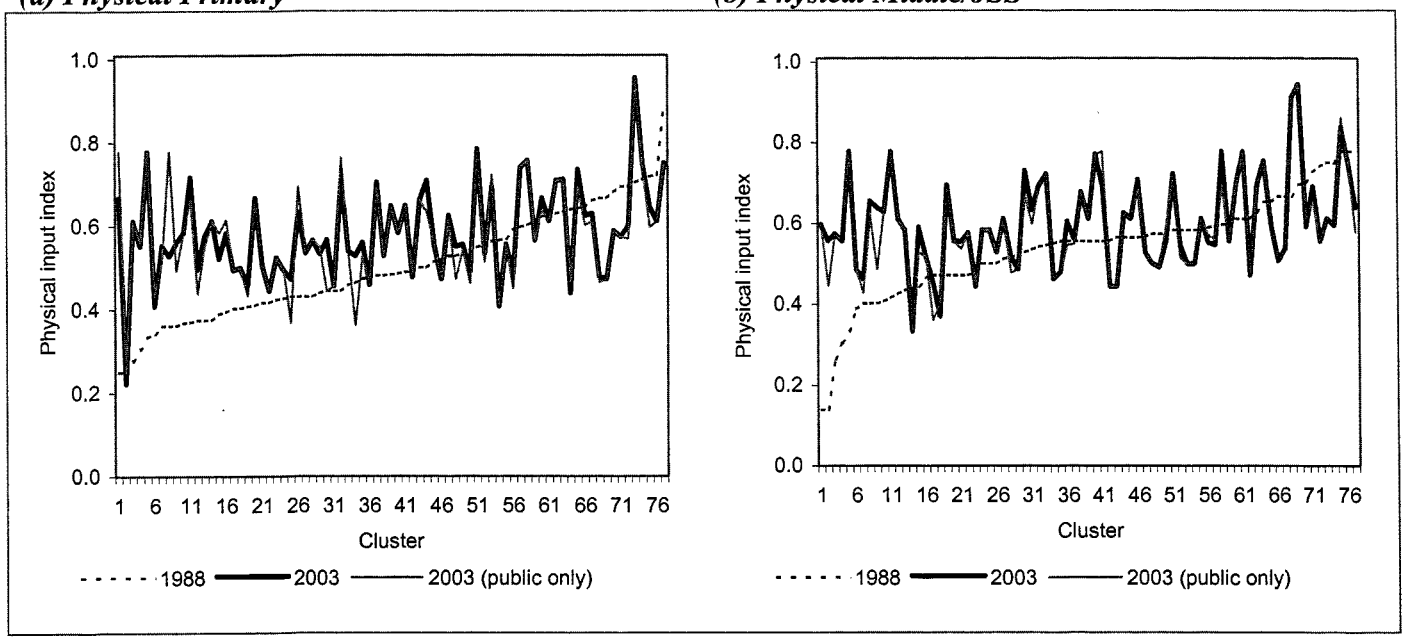
Table D.7: Significant changes in physical inputs to school quality

	Primary	*Middle/JSS*	*Total*
Adequate classrooms	-	-	-
Classrooms which cannot be used when raining	***	-	***
Percentage of classrooms with a chalkboard	***	***	***
Chalkboard quality	***	***	***
Own water supply	***	***	***
Library	-	**	**

Note: *** significant at 1%, ** significant at 5%, * significant at 10%, and — indicates no significant change. Significance is based on chi-squared statistic based on cross-tabulation of categorical version of variable against year (1988 and 2003). See Appendix E for cross-tabulations and appendix F for variable definitions.

Figure D.2: The quality of school infrastructure has improved in most areas: cluster-level physical inputs to school quality

(a) Physical Primary *(b) Physical Middle/JSS*



Source: GLSS2 and GSS/OED school survey

14. Figure D.2 shows the change in physical inputs in the same way as Figure D.1 showed material inputs.[7] There are now many more clusters, though still well less than half (Table D.4), which have not experienced an improvement. Once again, although private schools do perform better in some respects, their increase does not account for the improvement in school quality that has taken place.

7. The index was constructed in the same way as that for material inputs. In this case principal components analysis suggested that water and library should enter with a slightly lower weight than the other four variables.

15. In 2003, private schools had superior inputs with respect to the percentage of classrooms that could be used when raining and having their own water supply. They also had slightly better average quality chalkboards, although the difference is not quite statistically significant (prob value=0.11). There is no difference with respect to having sufficient classrooms, chalkboards, or a library.

Allocation of School Inputs

16. Tables D.8 and D.9 summarize some distortions in the allocation process. Looking first at income (Table D.8), a difference can be seen with respect to material and physical inputs. In the former case, allocation biases that existed in 1988 have been reduced or eliminated except for the number of desks per student. However, in the case of physical inputs the bias has continued for three of the six measures, and emerged in one case where it was not previously present. Only in one case has it been reduced and in one eliminated. Based on the chi-squared statistic, the bias in allocation has increased for physical inputs, while it has declined for material ones. While these biases should be a source of concern to policymakers, they must be seen in the context of the overall rise in the level of inputs that has taken place across virtually the whole country.

Table D.8: Allocation of education resources by expenditure quintile (public schools only)

	1988	*2003*	*Comment*
Physical			
Adequate number of Classrooms	No bias	Significant (5%)[1] bias against poorer clusters	Allocation bias emerged
Classrooms cannot be used when raining	Significant (1%) bias against poorer clusters	Significant (10%) bias against poorer clusters	Reduced bias against poorer clusters
Chalkboard	Significant (1%) bias against poorer clusters	No bias	Allocation bias eliminated
Board quality	Significant (10%) bias against poorer clusters	Significant (10%) bias against poorer clusters	Continued bias against poorer clusters
Library	Significant (10%) bias against poorer clusters	Significant (5%) bias against poorer clusters	Continued bias against poorer clusters
Water	Significant (1%) bias against poorer clusters	Significant (1%) bias against poorer clusters	Continued bias against poorer clusters
Material			
Chalk	Significant (1%) bias against poorer clusters	Significant bias (10%) in favor of poorer clusters	Allocation bias eliminated
English books	Significant (5%) bias in favor of poorer clusters	Significant (10%) bias in favor of poorer clusters	(Progressive) allocation bias reduced
Math books	No bias	No bias	(Progressive) allocation bias reduced[2]
Desks	Significant (1%) bias against poorer clusters	Significant (1%) bias against poorer clusters	Continued bias against poorer clusters
Adequate number of Teachers	Significant (5%) bias against poorer clusters	Significant (5%) bias against poorer clusters	Continued bias against poorer clusters

Notes: 1/ The percentage in each cell, where shown, is the level of significance of the chi-squared statistic in the cross-tabulation against income quintile. 2/ Although there is no significant relationship in either period the prob value is 0.102 in 1988, with the allocation favoring poorer clusters, and 0.654 in 2003.

17. Table D.9 incorporates table D.8 and presents biases in allocation by zone that may underlie these income biases (since non-coastal zones, particular savannah, are poorer, as are rural ones). Considering first biases against rural areas, these are much less today than they were 15 years ago. The only significant biases against rural areas are in water supply, which is clearly linked to their location, and their relatively lower likelihood of having a library. Previous biases, notably in school infrastructure, have been rectified.

18. However, in the case of regional allocation the opposite appears to be the case, biases having appeared in the allocation of both physical and material resources. In general, where such bias exists, then the coastal region is most well provided for. The exception is for math books, for which the forest region has the greatest availability. In all cases, the savannah zone is the least well resourced, except for the mild exception of the presence of a library. But in general, the forest and coastal regions are relatively close in resource availability, with schools in the savannah region trailing behind.

Table D.9: Biases in the allocation of educational resources, 1988 and 2003 (bias is *against* poorer households and rural areas unless otherwise noted)

	Income		*Region*		*Rural/urban*	
	1988	*2003*	*1988*	*2003*	*1988*	*2003*
Physical						
Adequate number of Classrooms	-	**	-	***	***	-
Classrooms cannot be used when raining	***	•	-	-	***	-
Chalkboard	***	-	-	**	***	-
Board quality	*	*	-	***	*	-
Library	*	**	***	***	-	*
Water	***	***	***	***	***	***
Material						
Chalk	***	*1	-	***	-	**2
English books	**	*	-	-	***2	-
Math books	-	-	-	*	*2	-
Desks	***	***	***	***	*	-
Adequate number of Teachers	**	**	-	***	***	***

Explanatory note: The more stars the more significant the bias in resource allocation. A — indicates no significant bias. The bias is against poorer, non-coastal and rural communities unless otherwise stated. Significance is based on the chi-squared statistic calculated from the bivariate cross-tabulation of the school measure against each characteristic (income quintile, region, rural/urban) in turn.

Notes: 1/ in favor of poorer communities; 2/ in favor of rural communities.

More on variations in monetary school inputs

19. According to broad aggregate measures, biases in the allocation of resources have lessened. Yet Figures D.1 and D.2 show considerable variation in the community-level averages. This suggests that the differences in the levels of school inputs are not well explained by broad aggregate categories such as rural/urban or zone. This view is supported by an analysis of variance, which finds that the variation within zones is significantly greater

than that between them for both indices, and all their component parts with just two exceptions (English books and classrooms that can be used when it is raining). Two possible explanations are pursued here for the large within-area variations: the role of projects and community support.

20. There have been three major project initiatives providing direct support to primary schools for infrastructure and supplies: the World Bank's Primary School Development project (PSD), USAID's QUIPS, and the Whole School Development (WSD) program supported by DFID. Data on support from WSD and QUIPS, which are ongoing, were collected in the school questionnaire. PSD beneficiary schools within the GSS/OED sample were identified from a list of all beneficiary schools. There are 19 of the latter in the panel of 196 schools, 14 WSD schools and just 5 who have benefited from QUIPS.

Table D.10: Impact of projects on change in school inputs (panel data)

	PSD	*QUIPS*	*WSD*
Material inputs			
Chalk	..	..	..
English books	..	..	..
Math books	..	..	..
Desks	+ve (***)	-ve (*)	..
Index	..	..	..
Physical inputs			
Sufficient classrooms	..	..	..
Use classrooms when raining	+ve (***)	-ve (*)	..
Chalkboard	..	..	..
Chalkboard quality	+ve (***)	-ve (**)	..
Library	..	..	..
Water	..	..	..
Index	+ve(**)	-ve (**)	..

Note: *** significant at 1% level, ** 5% level and * 10 % level.

21. Bivariate analysis of the panel data shows that PSD (Table D.10) is associated with significantly larger improvements in the proportion of classrooms that can be used when it is raining, availability of desks, and quality of blackboards — as well as with the physical input index. Since PSD's main activity was the financing of new classroom blocks (which don't leak and have good blackboards), usually to replace old ones, and to provide desks for these blocks, these results make sense. Many classrooms in Ghana are in pavilions, that is, a roof on supports but with low or no wall. These cannot be used during heavy rain. In the 1980s, these were often community-made structures from tree trunks/large branches and thatch. PSD replaced these with concrete and corrugated iron pavilions. The construction of walls (cladding) was left to the community as their contribution, though this was not always done.

22. By contrast, QUIPS appears to have had a perverse impact on the change in some school inputs, though the sample size is very small and endogeneity is the likely cause of

these results.[8] No impact appears from WSD. These findings are not surprising in light of the fact that neither project has focused on hardware and are both of more recent vintage and still ongoing.

23. A second approach to the analysis is to estimate regressions for the school input variables using the 2003 data only. In addition to the project dummy variables, measures are also entered of community well-being (per capita expenditure), the level of fees, if support has been provided by the PTA or SMC, and the value of the PTA levy. Dummies are entered for zone, rural/urban, and private schools. The results are summarized in Table D.11.

24. The main points to emerge are as follows:

- The regression models do not explain the distribution of textbooks; none of the variables are significant in the model for math books and only the primary dummy in that for English books. On the other hand, financial resources do matter for desks and, to a lesser extent, chalk availability.
- Financial variables matter for physical inputs, being highly significant for the index as a whole and some of them at least being significant for classrooms that can be used when it is raining, chalkboard quality, library, and water supply. The PTA levy is never significant, but is correlated with other financial variables. Moreover, the school-level data reflect the levy set, not the amount actually collected in additional contributions.[9]
- The positive impact of the PSD project on classrooms that can be used when it is raining is supported by this analysis, as is its impact on the number of classrooms.

25. These findings indicate that the level of inputs to schools reflects the economic well-being of the surrounding community — directly through the level of fees they can afford, the level of the PTA levy, and the likelihood of help from the PTA or SMC. On top of these, the community's level of expenditure matters, presumably picking up other channels through which support is provided. However, the wealth of the community does not matter for textbooks, and matters less for chalk, since these are things provided centrally through GES. It does matter for desks, which are increasingly likely to be provided by the district, whose resource availability depends on that of the population's income.

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8. The levels analysis suffers from the potential bias that beneficiary schools are worse off than the average when selected for program participation, which will be picked up as a negative program effect, especially in schools new to the program. This problem is not so evident for PSD, which was completed some time ago, but may explain the chalkboard result. It is, however, a plausible explanation for QUIPS. Ideally, a program selection equation could be estimated and a two-step estimation procedure applied. This only makes sense for PSD for which the 1988 data are not too far removed from the date of selection and sample size is reasonable (the panel data have to be used since it is only in those data that the schools can be identified in the earlier data set). A selection equation was estimated for PSD. The main determinants of inclusion are: (1) being in a poor community, (2) shortage of desks, (3) urban. Lack of chalkboards had the expected sign but was not significant.

9. The PTA levy recorded in the questionnaire is that set by the PTA as a minimum, with better off parents expected to pay more. More is said on the PTA contribution below.

Table D.11: Significant determinants of level of monetary school inputs, 2003

	Material					*Physical*						
	Chalk	*English books*	*Math books*	*Desks*	*Index*	*Sufficient classrooms*	*Classrooms can be used when raining*	*Chalkboard*	*Chalkboard quality*	*Library*	*Water*	*Index*
Financial resources												
School fees	*	..	..	*	..	..	..	..	***	*	***	***
Per capita expenditure	..	..	..	**	..	..	*	..	**	..	***	***
Help from PTA	..	..	..	..	..	..	..	..	..	..	**	**
Help from SMC	..	..	..	..	..	..	..	..	..	**	..	*
PTA levy	*	..	..	..	*	..	..	..	..	..	..	..
Area dummies												
Forest	**	..	..	..	*	..	..	..	..	..	..	..
Savannah	***	..	..	..	***	**	..	**	***	..		**
Rural	..	..	..	..	..	..	..	..	..	..	*	..
School type dummies												
Private	..	..	..	..	..	..	..	..	..	..	***	..
Primary	*** (-ve)	**	..	..	..	..	..	..	..	..		..
Project dummies												
PSD	..	..	..	..	..	**	**	*** (-ve)	*	..	..	..
QUIPS	..	..	..	..	..	..	*** (-ve)	..	..	..	..	..
WSD	..	..	..	..	..	..	..	..	..	..	..	..

Notes: (1) all coefficients are positive unless otherwise stated, except the area dummies, which are negative, (2) *** significant at 1%, ** 5% and * 10%; (3) PTA and SMC help were entered separately, when entered together neither is individually significant though they are so jointly; and (4) the expenditure variable is logged.

SCHOOL MANAGEMENT

Supervision by Head Teacher and Circuit Supervisor

26. The focus on software means an increased focus on issues of school management. Data on two aspects of school management are available for both 1988 and 2003: the frequency of visits of the circuit supervisor (formerly school inspector) and the presence of the PTA.[10] The former, which has increased over time, is shown later to be a significant determinant of the quality of teaching methods. The latter variable is not very revealing, since virtually all schools have a PTA, although some private ones do not. What matters is the extent to which the PTA supports the school. In 2003, considerably more data were collected on the activities of the circuit supervisor and the head teacher in supervising the work of teachers. Data were also collected on the support provided by the PTA and the workings of the SMC and SPAM.

Frequency of Supervision Visits

27. In 1988, circuit supervisors visited schools just over once every two months on average (Table D.12). But there was considerable variation around this average, with over a fifth of middle schools/JSS and a quarter of primary schools receiving only two visits or less a year. By 2003 the mean number of visits rose, from 6 to 9 a year for primary schools and a bit less for JSS. And the proportion of schools receiving infrequent visits fell to 11 percent for JSS and 16 for primary.

Table D.12: Frequency of school visits by circuit supervisor/school inspector, 1988 and 2003 (percent)

	1988		*2003*	
	Primary School	***Middle school/JSS***	***Primary School***	***JSS***
Twice a year or less	25.2	21.0	16.3	11.1
Between three and six times a year	37.4	44.2	39.6	41.2
Between every one to two months	21.3	18.9	21.6	31.8
Once a month or more	16.1	15.9	22.5	15.9
Total	**100.0**	**100.0**	**100.0**	**100.0**
Memo items				
Sample size	282	230	417	289
Mean number of visits	6.40	6.30	9.07	7.89

28. Perhaps surprisingly, bivariate analysis does not reveal any significant difference between rural and urban schools (Table D.13). Rural schools were less likely to be among either the least visited or the most visited, more of them falling into the category "between

10. Data on both of these was collected from the school questionnaire for which the respondent was usually the head teacher or the proprietor in the case of private schools.

three and six times a year" than is the case for urban schools. However, there is a pattern regarding ecological zones. Schools in the forest zone are more likely to be visited by circuit supervisors. This was the case in both 1988 and 2003. In addition, in 1988 schools in the coastal zone were visited less frequently than those in the savanna area, whereas in 2003 the situation was reversed. Finally, there were few private schools in 1988 and the difference in supervision rates was not significant. But by 2003 there is a large gap, with 45 percent of private schools receiving infrequent supervision visits.

Table D.13: Bivariate analysis of frequency of circuit supervisor/school inspector visits, 1988 and 2003 (percent)

	Urban	*Rural*	*Coastal*	*Forest*	*Savannah*	*Public*	*Private*	*All*
1988								
Twice a year or less	27.4	19.9	32.7	13.4	26.9	23.0	29.6	23.4
Between 3-6 times a year	37.1	43.3	39.6	43.8	34.4	40.3	44.4	40.4
Between 7-11 times a year	18.1	22.0	14.4	21.9	29.0	20.2	18.5	20.0
Once a month or more	17.3	14.9	13.4	21.0	9.7	16.5	7.4	16.2
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
No. of observations	**237**	**282**	**202**	**224**	**93**	**491**	**27**	**519**
2003								
Twice a year or less	14.4	13.7	14.6	14.4	12.4	6.7	44.9	14.0
Between 3-6 times a year	36.4	47.1	35.1	39.6	53.6	41.2	36.2	41.5
Between 7-11 times a year	27.9	22.0	32.7	23.0	22.7	29.2	11.6	24.8
Once a month or more	21.3	17.3	17.6	23.0	11.3	22.9	7.2	19.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
No. of observations	**451**	**255**	**205**	**404**	**97**	**568**	**138**	**706**

29. These differences are partly supported by multivariate analysis (Table D.14). Since there are 49 schools receiving no visits at all the estimated model is a two-part estimation model to allow for sample selection (Heckman).[11] The selection equation is a probit model of the factors affecting whether a school is visited at all. Private schools are less likely to receive any visits at all, and those that do have fewer of them. The same is true of rural schools. Conversely, large schools are more likely to be visited and to receive more visits. Finally, there has been an "autonomous shift" with schools more likely to be visited, and to have more visits, in 2003 than in 1988. The zone dummies are not significant.

11. A tobit regression for a censored dependent variable is not appropriate here, since tobit should only be used if the latent variable (desired number of visits in this case) can in principle take the censored values. Since the number of visits cannot be negative, this condition is not met.

Table D.14: Multivariate analysis of the number of visits from the circuit supervisor

	Coefficient	*z-stat*	
Number of visits			
Rural	-0.95	-1.86	**
Primary	0.64	1.33	
Private	-5.65	-7.75	***
2003	3.01	6.09	***
Number of teachers	0.13	2.36	**
Intercept	8.07	5.94	***
Selection equation			
Rural		-1.86	*
Forest	0.00	0.00	
Savannah	0.00	0.00	
Number of teachers	0.02	2.36	**
Private	-0.70	-7.55	***
2003	0.37	6.00	***
Intercept	0.96	5.55	***
/athrho	13.38	0.89	
/lnsigma	2.09	101.82	
Number of obs	1218		
Censored obs	49		
Uncensored obs	1169		
Log likelihood =	-4144		

Note: *** significant at 1%, ** 5% and * 10%

Activities of the Head Teacher and Circuit Supervisor

30. Table D.15 reports results on the engagement of the head teacher and circuit supervisor with teachers in five supervision activities. The majority of head teachers are, according to the teachers in their schools, actively involved in the different types of supervision. Notably, less than 5 percent of teachers say that the head teacher does not look at their lesson plans on a regular basis (meaning at least once a week, which is the frequency with which it is expected to be done). However, less than half say that the head actually discusses the lesson plan with them. Somewhat higher percentages look at samples of students' work and sits in class at least once a week.

31. While the large majority of schools have visits from the circuit supervisor, 44 percent of teachers have no direct contact with him or her (Table D.15). The reported figures suggest that those that do have contact with teachers carry out the full range of activities shown in the table, though not much more than half discuss career development.

Table D.15: Head teacher and circuit supervisor supervisions

	Head teacher			*Circuit supervisor*		
	QUIPS	*WSD*	*% in all schools doing so on a regular basis*[1]	*QUIPS*	*WSD*	*% in all schools doing so at all*
Sits in on class	..	..	61.3	*	**	41.4
Looks at a sample of students' work	**	..	52.4	..	**	43.6
Looks at lesson plans	..	**	95.4	***	..	51.3
Discusses lesson plans	..	..	45.7	**	**	41.7
Discusses career development	..	..	57.2	..	***	27.4
Memo item:						
Percent of teachers responding "Yes" to question whether they had had direct contact with the circuit supervisor	n.a.	n.a.		70.3	62.5	55.7

Notes: *** significant at 1% level, ** 5% level and * 10 % level. 1/ Regular is at least once a week for all categories other than career development, which is if head teacher ever does so.

32. Table D.15 also reports tests of significance for these variables for teachers in schools supported by QUIPS and WSD (the full results are given in Annex E, Tables E.47 and E.48). There are only 2, out of a possible 10, significant results for schoolteachers. However, it is worth remarking that no teachers at all in QUIPS and WSD schools reported that head teachers do not look at their lesson plans. By contrast with the results for head teachers, there are seven significant results for circuit supervisors — four out of five for WSD, and the case that is not significant is only marginally not so. However, legitimate questions can be raised about the direction of causation since both projects are have begun work first in districts considered to have the necessary capacity to administer the project.

Involvement of the Community: the PTA, SMC, and SPAM

33. The Parent Teacher Association (PTA) provides a means by which parents can support the schools attended by their children usually financially but also by providing help in kind. Virtually all schools have a PTA. Over 99 percent of public basic schools did so in 2003, as do 94 percent of private schools (Table D.16). Since PTAs are so widespread, statistical analysis will not be able to pick up any effect they may have on school processes and outputs. However, it is not the mere presence of a PTA that will make the difference, but the extent to which it provides support to the school. There is considerable variation in the extent to which PTAs have provided support to schools and in the value of parents' monthly contributions (see below).

Table D.16: Presence of PTA at public and private schools, 1988 and 2003

	1988			*2003*		
	Public	*Private*	*Total*	*Public*	*Private*	*Total*
Yes	96.3	96.2	96.3	99.1	95.7	98.4
No	3.7	3.8	3.7	0.9	4.3	1.6
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	488	26	514	568	138	706

34. SMCs are also widespread, being present in over 80 percent of the schools surveyed (Table D.17). However, in only half of schools had SMCs met in the preceding month or provided support in the past year, and in even fewer helped the school in dealings with outside agencies. Where the school had not asked for support from the SMC this was often because it was felt that the SMC would be either unwilling or unable to help (48 percent of cases for primary and 39 percent for JSS). The lower prevalence of SMCs than PTAs is largely explained by the fact that they are not required at private schools: over 90 percent of public schools have SMCs. But the facts remain that these SMCs are not active in a large number of schools. For most of the questions asked, the PTA was seen as a more supportive organization.

Table D.17: School management organizations, 2003

	PTA		*SMC*	
	Primary	*JSS*	*Primary*	*JSS*
Organization associated with school	97.8	99.3	81.06	85.8
Organization met in the last month	53.4	51.1	50.3	42.3
School asked for or got support from organization in the last year	87.3	88.9	38.1	61.6
Organization provided support in the last year	63.7	66.6	50.0	46.8
Organization helped with dealings with district or outside agencies	40.7	45.3	44.1	44.0

35. Virtually all public primary schools (92 percent) have had a SPAM, at 98 percent of which an action plan was agreed. The most common actions agreed at the SPAM were (remembering that it is a teacher replying to the survey) that parents should ensure children attend school (41 percent) and parents should provide pencils and exercise books (38 percent). The most common actions for teachers were to provide extra classes (33 percent) and to be punctual (17 percent). Problems of absenteeism were mentioned in less than 10 percent of cases.[1] Responsibility for implementation of the action plan was seen to rest with the head teacher (47 percent of cases) or the circuit supervisor (24 percent). In only 20 percent of cases were the PTA or SMC said to be responsible. Finally, in only 6 percent of cases was it said that the planned actions were not being carried out at all, and in 42 percent they were claimed to be being carried out completely.

1 It should be recalled, however, that the respondent for these questions was the headteacher.

36. The school survey suggests there is little difference between rural and urban areas with respect to any of the variables shown in Table D.17. If anything, school respondents reported PTAs to be more active in urban areas, though there was no difference for SMCs. But the data collected from households give a different picture. Households with children in basic school were asked if there was a PTA and SMC at the child's school and if any household member was a member of the organization. They were also asked if there had been a SPAM at the child's school and if any household member had attended. The rates for rural households are significantly higher than those for urban households for all six questions (Table D.18). Knowledge and participation in PTAs is widespread. However, knowledge of SMCs and the SPAM is far less common that the school-level data suggests it should be, and participation rates correspondingly low. Only 6 percent of households say that someone attended a SPAM at their child's school.

Table D.18: Household knowledge of and participation in school management organizations (households with children in public basic school only, percent)

	Urban		*Rural*				*Total*	
	Exists	*Member/ Attend*	*Exists*		*Member/ attend*		*Exists*	*Member/ Attend*
PTA	92.7	96.4	97.5	***	96.7	***	95.1	96.5
SMC	42.5	5.0	59.3	***	11.3	***	51.0	8.2
SPAM	19.5	3.2	27.6	***	9.1	***	23.6	6.2

Note: *** significant difference between rural and urban at 1% level.

37. But while rural communities may be easier to mobilize in support of schools, they also tend to be less well off, reducing their ability to provide financial support. Table D.19 reports regression results from the analysis of average PTA contributions per pupil at the community-level.[12] The elasticity of PTA contributions with respect to community income is close to two. That means that doubling community income increases the value of contributions to schools nearly threefold. In 2003, the richest community in the sample was more than five times richer than the poorest, suggesting that schools in the former will receive 15 times as much money through PTA contributions than schools in the latter. The actual range is far higher, since some schools collect no contribution compared with a maximum of 150,000 cedis (see Annex C). On top of that, the rural dummy is significantly negative: rural communities give less cash support to schools through PTA contributions, most probably reflecting the fact that there is less cash around in rural areas (which rely far more on own production and barter than do urban areas).

12. The average was calculated only with respect to children in basic school. In four communities the average was 0. Since the dependent variable is logged these observations were assigned a value of ln(100), compared to the observed non-zero minimum of 400. Excluding these four observations does not make a substantive difference to the results.

Table D.19: Community-level regression analysis of determinants of (logged) PTA expenditure per pupil

	Model 1			Model 2		
	Coeff.	*t-stat*		*Coeff.*	*t-stat*	
Community variables						
Average community income (logged)	1.86	3.43	***	1.95	3.98	***
Forest	-0.17	-0.45		..	..	
Savannah	-0.14	-0.23		..	..	
Rural	-0.85	-2.16	**	-0.86	-2.40	**
School variables						
Head teacher supervision	4.37	2.39	**	3.59	2.61	**
Activities						
Teacher social relations	-0.01	-0.38		..	..	
PTA	-1.15	-0.57		..	..	
SMC	0.80	0.78		..	..	
SPAM	-2.13	-1.71	*	..	..	
SMC participation	2.57	1.66		2.97	2.30	**
PTA participation	-0.26	-0.25		..	..	
SPAM participation	0.77	0.40		..	..	
Dummy (cluster 40)[1]	2.34	1.75	*	2.40	1.90	*
Intercept	-19.78	-2.06	**	-22.46	-2.72	***
R^2		0.44			0.43	
N		80			80	

Notes: *** significant at 1%, ** significant at 5% and * significant at 10%.

1/ Exceptionally high PTA contributions are probably explained by some PTA-managed investment, such as constructing a classroom block.

38. School-level variables also affect the level of PTA contributions. Contributions are higher when head teachers are active in monitoring teachers' work (this variable is discussed more below). This result may be picking up one of three things, or a combination of them: (1) parents appreciate a good headmaster; (2) a good headmaster is also one who is active in soliciting support from the community (i.e., the variable proxies for an unobserved variable of head teacher-community interaction); or (3) it is indirectly picking up the effect of teacher quality, which is improved by a good head teacher. The cluster of school management variables is highly inter-correlated. In the full model the two SMC variables are both positive but insignificant (Model 1) — but either one alone is significant, with SMC participation being the stronger of the two. The SPAM variables are particularly highly correlated with the SMC variables. Including just one SPAM variable, and no SMC variable, makes the former significantly positive. Given the extent of this inter-correlation no weight should be given to the negative coefficient on the SPAM variable in Model 1. While the PTA variables have

negative coefficients, neither is significant (and do not become so in any model specification). Teacher social relations with the community were not significant.[13]

39. Similar results were found from a household-level analysis of the determinant of PTA contributions, but also some differences (Table D.20). The dependent variable in this case is the log of PTA contributions with respect to each child in basic school (so the model is only estimated for households that have a child currently enrolled in basic school). Many such households make a zero contribution, so that OLS estimation would be biased. Instead the Heckman model is used, which is a two-part estimation procedure. First a probit model is estimated of whether or not the household will pay any contribution and second the determinants of the level of that contribution estimated for those households that are contributing. The lower part of Table D.20 reports the results of the selection equation. An obvious omission is whether the child is at a private school with no PTA (recall that applies to 4 percent of private schools). However, the variable of whether the respondent states that there is a PTA at the child's school is a good proxy for this (as well as picking up the small number of public schools with no functioning PTA), and appears as the most significant determinant of whether a PTA contribution is paid or not.

40. Both community and household income (expenditure) matter for how much is paid to the PTA. The higher a household's income the more likely it is to make a PTA contribution, although the average community income does not matter for this decision, which is a sensible result. These results make sense since the PTA/school set the PTA levy as a minimum amount, which will be done with reference to community income. But whether a household actually pays depends on its own resources, not those of the surrounding community. Average community income is the stronger (larger and more significant) determinant of the level of PTA contribution, although household income also matters. The elasticity of PTA expenditure with respect to community expenditure appears as 1 in this model (ranging from 0.90 to 1.05 in the various model specifications estimated). This is lower than that estimated in the community-level model, but is an under-estimate of the effect of income. Doubling community income means doubling the income of every household, so the income elasticity is the sum of the coefficients on the two income terms, which is 1.3. This is still an underestimate, since the doubling of income will, through the selection equation, make households more likely to contribute at all. The other household characteristic included — education of the household head — matters for the level of the contribution but not whether it is made or not.

13. This is a composite variable based on if the teacher is the member of any community-based group and a 1-4 scale of how cordial they judge their relations with the community to be.

Table D.20: Determinants of household PTA contributions (Heckman maximum likelihood estimation)

	Full model			*Parsimonious model*		
	Coeff.	*z-stat*		*Coeff.*	*z-stat*	
Dependent variable: PTA expenditure (logged)						
Household expenditure (logged)	0.29	2.70	***	0.25	2.69	***
Average community expenditure (logged)	1.01	6.73	***	0.99	6.74	***
Education of household head	0.12	3.95	***	0.13	4.19	***
Average community knowledge of SMC	0.51	2.24	**	0.54	2.37	***
Household participation in PTA	0.71	3.24	***	0.74	3.48	***
Average community participation in PTA	0.23	0.78		..	..	
Knowledge of SPAM	0.12	1.40		0.13	1.43	
Participation in SPAM	0.05	0.32		..	..	
Teacher social index	0.00	-0.56		..	..	
Supervision activities of head teacher	1.47	3.08	***	1.48	3.28	***
Dummy for high observations	2.20	4.93	***	2.19	4.94	***
Rural	-0.61	-5.53	***	-0.58	-5.61	***
Forest	-0.17	-1.68	*	-0.20	-2.07	**
Savannah	-0.38	-2.52	**	-0.41	-2.89	***
Intercept	-12.17	-4.40	***	-11.49	-4.47	***
Selection equation						
Household expenditure (logged)	0.44	5.04	***	0.44	5.59	***
Average community expenditure (logged)	0.02	0.13		..	..	
Education of household head	-0.02	-0.49		..	..	
Average community knowledge of PTA	0.73	2.23	**	0.62	2.01	**
Household knowledge of PTA	2.33	8.57	***	2.35	8.80	***
Average community participation in PTA	-0.20	-0.64		..	..	
Participation in SMC	0.57	3.29	***	0.59	3.47	***
Supervision activities of head teacher	1.11	2.37	**	1.07	2.35	**
Teacher social index	-0.02	-2.69	***	-0.01	-2.67	***
Rural	-0.40	-3.65	***	-0.40	-4.33	***
Forest	0.19	1.68	*	0.20	1.76	*
Savannah	-0.10	-0.57		-0.09	-0.57	*
Intercept	-8.38	-3.08	***	-8.09	-5.68	***
/athrho	0.33	0.86		0.17	0.61	*
/lnsigma	0.08	1.62		0.07	2.31	**
No of observations	1348			1348		
Of which censored	365			365		
Log likelihood	-2116			-2117		

41. School management organization variables are important for PTA contributions. For reasons already given, the household stating that there is a PTA matters for if a contribution is made. But average community knowledge of the PTA matters as does whether the household has been actively involved with the SMC. Community knowledge of the PTA and

SMC both matter for the level of the contribution. The implication is that where these school management organizations are active in the community that each household feels more inclined to make a contribution and that contribution is larger.

42. As with the community results, the presence of a head teacher who is actively involved in supervising teachers increases both the likelihood that a payment is made and the level of that payment. The only possibly perverse result in the regression is that the better teacher-community relations then the less likely are households to pay PTA fees. This finding may reflect either that teachers with good social relations are less well placed to enforce payment, or that relations are good precisely because they do not do so.

43. Finally, and unlike in the community results, the location dummies are significant. Forest region residents are more likely, and savanna ones less likely, to pay PTA fees than those in coastal region. But both regions pay a smaller amount than do coastal regions. Rural residents are both less likely to pay, and to pay less if they pay at all, than urban residents. This finding is consistent with the community-level results. These location variables may reflect variations in the availability of cash in the local economy, which is required if fees are to be paid.

TEACHING CONDITIONS AND METHODS

Teacher Training and Test Scores

44. Table D.21 shows the teacher test scores for 1988 and 2003. No change is expected in the Raven's test unless teachers are now being drawn from a different segment of the population. In fact, there is a small but significant drop. However, mirroring progress in the rest of the population, the math score has risen significantly, though English has not. These results thus do not give any clear message regarding the academic ability of teachers.

Table D.21: Teacher test scores, 1988 and 2003

	1988	*2003*	*t-stat*	
Raven's test	29.6	29.0	-3.23	***
Standard error	(3.2)	(6.5)		
No. of observations	430	3,061		
English	22.6	22.5	-0.35	
Standard error	(2.5)	(4.0)		
No. of observations	436	3,051		
Maths	19.9	21.4	8.01	***
Standard error	(3.4)	(5.5)		
No. of observations	435	3,050		
Local language	n.a.	24.9		
Standard error		3.9		
No. of observations		1,793		

Note: *** significant at 1%. Figures for 1988 are mean of school-level average.

45. The level of schooling among teachers has risen. In 1988, only 40 percent were secondary school graduates, compared to three-quarters today (Table D.22). Two factors lie beyond changes in the education levels of teachers. One is the rise of private schools. These schools typically do no require recruits to have teacher training but use secondary school graduates. In 2003, 94 percent of private school teachers have at least secondary education, compared to 72 percent of teachers in public schools. But less than 15 percent of private school teachers had teacher training, compared to 88 percent in public schools.

Table D.22: Teacher schooling (percent)

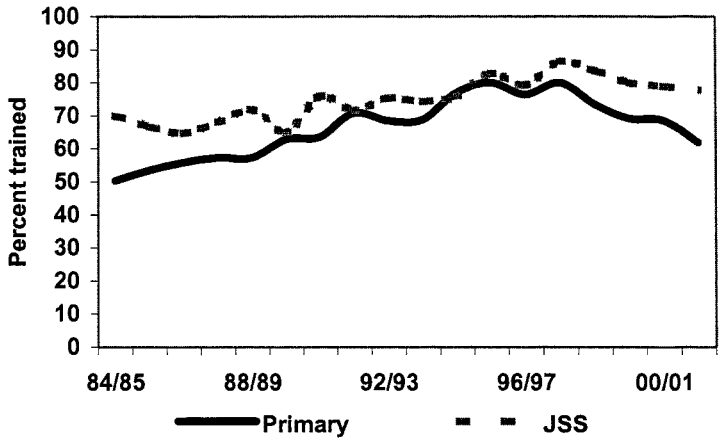
	1988	*2003*
Primary	1.7	0.0
Middle/JSS	57.2	19.5
Senior Secondary	40.8	75.6
Tertiary	0.4	5.0
Total	100.0	100.0
No. of observations	4547	3129

Table D.23: Teacher education and training by public vs. private, 2003

	Public	*Private*	*Total*
Schooling			
Middle/JSS	22.4	6.2	19.5
Senior Secondary	72.3	90.1	75.6
Tertiary	5.3	3.7	5.0
Total	100.0	100.0	100.0
Teacher training			
Yes	87.5	14.7	74.4
No	12.5	85.3	25.6
Total	100.0	100.0	100.0
No. of observations	*2564*	*565*	*3129*

46. The more general trend in trained teachers is shown in Figure D.3.[14] In public schools untrained teachers are called "pupil-teachers." These are teachers on the teaching staff, and should be distinguished from parental volunteers who may also help out, especially when class sizes are large or a school short of teachers. Official policy has been to eliminate pupil-teachers, and as part of the reforms in the 1990s they were given a period to acquire training. If they failed to do so they would lose their jobs. This policy resulted in the rise in

Figure D.3: Fraction of trained teachers, primary and JSS



Source: MoE data

14. The data cover all teachers other than 1991-2 which are for public schools only.

the proportion of teachers who are trained, which is clearly shown in the figure. Since the late 1990s the upward trend has reversed itself especially in primary schools, though this is partly the result of the rise in private schools.

47. The government's policy is to increase reliance on in-service training (INSET) to develop teaching skills. This has not happened. Only 3 percent of teachers receive such training on a regular basis.

Teaching Methods

48. Teachers were asked three questions to test their familiarity with improved teaching methods, and the extent to which they claim to use them in the classroom. The questions, described in the titles to Tables D.24-D.26, asked if children are encouraged to explore material by themselves, the use of simulations (role play), and the use of cues in explaining a word. In the second case, in which they were asked directly if they use simulations, those claiming to use them were asked to explain the approach. The results show that about a third of teachers use a student-centered learning approach and use simulations on a regular basis, though about a fifth of the latter could not explain them properly. And about one-fifth use cues to help explain difficult words. In summary, improved methods are far from unknown, but their use cannot be described as widespread, being used by a minority of teachers.

Table D.24: Which of the following describes your approach to teaching?

	Number	*Percent*
Allow children to explore material on their own	1,141	36
Present material to children which you have prepared in advance	1,988	64
Total	**3,129**	**100**

Table D.25: How often do you use simulations as an instructional approach?

	Number	*Percent*	*Of which percentage able to give a correct explanation*
Often	1,007	32	80
Sometimes	1,229	39	76
Rarely	357	11	44
Never	536	17	n.a.
Total	**3,129**	**100**	**73**

Table D.26: One of your pupils has difficulty in pronouncing a word in a group reading. How will you go about helping the other pupils to understand the word?

	Number	*Percent*
Would not do so	18	1
Tell the student to read the word again	661	21
Explain or define the word	1,286	41
Use cues in the story to explain the word	653	21
Other	511	16
Total	**3,129**	**100**

49. The data from these questions were used to construct a single composite variable on teaching methods (TMETHODS). This variable is a simple average of the three responses (multiplied by 100/4), each response re-scaled as necessary to range from 1 to 4. Teachers unable to correctly describe simulations were re-coded as 1 ('Never' use) for question two. The average value of this variable for all 3,129 teachers is 62.5 (Table D.27), but with a reasonable degree of variation (the coefficient of variation is equal to 0.28). Trained teachers are significantly more likely to use improved methods than untrained ones, although there is not a significant difference between teachers who have received university-level teacher training and those trained by TTCs. There is also significant variation across the country, with both the forest and savannah zones showing significantly less use of improved methods than the coastal region.

Table D.27: Bivariate tabulation of teaching methods against teacher training and geographical zone (percent)

	Teaching methods	*Standard deviation*	*Number of observations*	*t-stat**
Teacher training				
None	57.3	16.6	803	
Certificate	64.1	17.7	2247	9.84
Tertiary	66.3	18.5	80	4.16
Geographical zone				
Coastal	65.2	18.3	933	
Forest	61.2	17.6	1835	-5.49
Savannah	61.4	15.9	361	-3.71
Total	62.5	17.7	3129	

Note: *for teacher training the t-stat compares with the row above, for zone both t-stats compare with the coastal region.

50. These findings remain valid for multivariate analysis, shown in Table D.28. The table reports results both a full model (Model 1) and a more parsimonious one (Model 2) including only variables which are significant in the full model. Both teacher training and in-service training are significant, the former markedly so. Also significant are the teacher's level of schooling and his or her ability as measured by the Raven's test. However, neither of the teacher living and working conditions are significant and neither is morale. None of these three

variables are individually significant if the other two are dropped. Head teacher supervision of teachers has a significantly positive impact. Introducing the variables that make up this composite separately into the regression shows the strongest effect to come from the head teacher "sitting in" on the class (this question was interpreted as appearing in the class rather than necessarily sitting down for any length of time). The teacher having had direct contact with the circuit supervisor also has a positive effect, although the variables capturing the activities of the circuit supervisor are insignificant.

Table D.28: Regression analysis of determinants of teaching methods

	Model 1			*Model 2*			*Model 3*		
	Coeff.	*t-stat*		*Coeff.*	*t-stat*		*Coeff.*	*t-stat*	
Teacher training and ability									
Teacher training	6.31	8.77	***	6.31	8.93	***	5.24	6.31	***
In-service training	3.36	2.60	***	3.21	2.50	**	1.74	1.16	
Teacher schooling	2.58	3.37	***	2.67	3.81	***	2.59	3.70	***
Teacher Raven's score	0.10	2.10	**	0.11	2.24	**	0.10	2.15	**
Teaching conditions									
Teacher morale	0.90	0.94		..	..		..	..	
Teacher working conditions	-0.15	-0.31		..	..		..	..	
Teacher living conditions	0.03	0.11		..	..		..	..	
Supervision									
Head teacher supervision	2.76	2.19	**	2.33	1.88	*	2.33	1.89	*
Visit by circuit supervisor	4.32	5.19	***	3.60	5.51	***	3.53	5.40	***
Circuit supervisor supervision	-4.31	-1.41		..	..		..	..	
Other variables									
Teacher's discipline	1.18	3.30	***	1.15	3.23	***	1.15	3.23	***
Teacher's perception of materials	0.77	3.03	***	0.75	2.97	***	0.70	2.76	***
Primary teacher	-0.27	-0.38		..	..		..	..	
Combined school	1.37	1.79	*	1.41	1.85	•	1.44	1.90	*
Forest	-3.55	-4.73	***	-3.52	-4.75	***	-0.49	-0.37	
Savannah	-5.34	-4.50	***	-5.49	-4.69	***	-2.45	-1.54	
Constant	47.38	11.34	***	45.60	13.79	***	43.87	13.01	***
Interactive terms									
Teacher training in coastal region	..	..		..	..		3.49	2.46	***
In-service training in coastal region	..	..		..	..		5.55	1.92	**
N	2,939			2,953			2,953		
R^2	0.068			0.067			0.070		

Note: *** significant at 1%, ** significant at 5% and * significant at 10%.

51. Two teacher perception variables play a significant role. One is that teaching methods are better the worse the teacher perceives the supply of materials to be. There are two possible explanations for this finding. The first is that the teacher compensates for inadequate materials by using more innovative methods. A second explanation is that teachers wishing to use more innovative methods are more likely to perceive materials as being inadequate as

those teachers who invest less heavily in method. Support for the second explanation is given by the fact that teachers at the same school (i.e., with objectively the same materials available) are more likely to perceive materials as inadequate the higher their value of TMETHODS. Second, the variable DISCIPLINE, which captures the severity with which a teacher believes various offences committed by teachers should be punished, is significantly positive. This variable should probably not be interpreted as an explanatory variable but rather as the correlation in different aspects of professionalism among teachers.

52. The primary school dummy is not significant, so primary teachers are neither more nor less likely to use improved methods than those in JSS. However, the combined school dummy is significant at 10 percent. This finding may reflect a spillover effect, which is more likely in larger schools (although the number of teachers is not significant when included in the model), or may reflect the concentration of better teachers in those schools.

53. Finally, the zonal dummies are significant, implying that there are factors common to non-coastal areas that are not included in the model, which encourage the lesser use of improved teaching methods in these areas. One explanation may be that teacher training in the coastal region introduces teachers to these methods more successfully than does teacher training elsewhere. To test this hypothesis interactive terms were introduced of the coastal dummy multiplied by each of the teacher training variables.[15] The results (Model 3) strongly support the hypothesis: the two interactive terms are significantly positive (with the result that coefficients of the training variables and their significance is reduced, becoming insignificant in the case of in-service training),[16] and the zonal dummies become insignificant.

54. Dummies were not included in the regressions for the WSD and QUIPS projects since these projects are restricted to primary schools and so their inclusion would have reduced the sample size. When they were introduced into the regression neither variable was significant, suggesting the projects have no direct effect over and above the indirect effect through their influence on any of the variables already included in the model. However, bivariate analysis of the difference in means of teachers in project schools and other teachers showed no significant impact of either project on teaching methods as captured in our data, suggesting that they have no indirect effects.

55. Data were collected on the frequency with which teachers set homework, look at and assess students' work for both math and English. Table D.29 summarizes results for two of these. Homework is set at least once a week by over 95 percent of teachers for math and English, and work assessed with the same frequency by half. The most striking result is the lesser attention paid to local languages, for which homework is set infrequently by nearly 20 percent of teachers and work rarely assessed in over half the total number of cases.

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15. This test is problematic to the extent that teachers may have been trained in a different zone from that in which they are teaching, though this problem does not apply to in-service training.

16. This does not mean that in-service training is ineffective, but that it is only effective at improving teaching methods in the coastal zone.

Table D.29: Monitoring of student performance by teachers

	Homework			*Assess work*		
	English	*Math*	*Local language*	*English*	*Math*	*Local language*
Once a month or less	3.8	3.0	17.3	39.5	38.6	52.1
Once a week	78.8	76.7	79.2	50.2	51.2	44.9
Daily	17.4	20.2	3.5	10.3	10.2	2.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	2055	2041	1552	2054	2041	1561

56. These data were used to construct an index of student monitoring by teachers.[17] A regression model was used to examine the determinants of this behavior (Table D.30). Both in-service training and visits by the circuit supervisor were found to exert a significant positive impact on student monitoring. School quality variables appear not to matter, although the availability of materials has a positive effect, which may be picking up particularly good schools. Teachers who think that school management is a problem are more likely to undertake monitoring (perhaps because better teachers more readily perceive such problems), whereas teachers who think morale is a problem are less likely to monitor student performance (perhaps as bad teachers are more likely to complain about morale).

Table D.30: Determinants of student monitoring by teachers

	Full model			*Parsimonious model*		
	Coeff.	*t-stat*		*Coeff.*	*t-stat*	
Teacher training, ability and attitude						
Teacher training	-4.12	-0.75		-6.99	-1.38	
In-service training	15.61	2.01	**	15.58	2.03	**
Teacher schooling	3.24	0.65		..	..	
Teacher's Ravens score	0.04	0.11		..	..	
Teacher's English score	-0.14	-0.22		..	..	
Teacher's Math score	0.22	0.49		..	..	
Teaching method	0.56	4.52	***	0.56	4.72	***
Discipline	3.72	1.54		3.73	1.6	
Teaching conditions						
Teacher's morale	-6.28	-0.98		..	..	
Teacher working conditions	5.20	1.55		2.92	0.93	
Board quality: size	-1.80	-0.25		..	..	
Board quality: easy to clean	-0.65	-0.10		..	..	

17. For example, the frequency (number of times a week) with which a teacher set homework for the three subjects was calculated and averaged over the subjects taught by that teacher to get an average homework frequency. The same was done for looking at and assessing students' work. A simple average was taken of these three averages to arrive at the student monitoring composite variable. The variable can range from 0 (for a teacher who never does any of these things in any subject, there are 12 such teachers in our sample) to 5 (for one who does them all in all subjects they teach once a day, which 2 percent of our sample claim to do).

	Full model			Parsimonious model		
	Coeff.	t-stat		Coeff.	t-stat	
Materials to display	6.86	2.14	**	6.89	2.33	***
Shared classroom	11.56	1.52		10.41	1.42	
Full-sized internal walls	-8.63	-1.17		..	..	
Class disturbed by noise	-5.48	-1.19		..	..	
Living conditions	2.71	1.30		2.83	1.4	
Supervision						
Head teacher supervision	2.55	0.30		0.48	0.06	
Circuit supervisor supervision	6.42	0.31		3.64	0.18	
Visit by circuit supervisor	13.11	2.32	**	12.29	2.23	**
Teacher perceptions of						
Student discipline	0.28	0.14		..	..	
Student ability	-3.32	-1.63		-3.77	-1.98	**
Availability of materials	-0.24	-0.14		..	..	
Teacher morale	-4.04	-1.85	*	-3.51	-1.67	*
School management	4.09	1.76	*	4.26	1.9	*
Other variables						
Primary school	28.70	5.37	***	27.03	5.64	***
Combined School	-0.33	-0.06		..	..	
Urban/rural	-0.83	-0.18		..	..	
Forest	-7.19	-1.40		..	..	
Savannah	-8.40	-1.00		..	..	
Constant	57.42	1.58		50.04	1.83	*
N	2323			2381		
R^2	0.042			0.040		

Note: *** significant at 1%, ** significant at 5% and * significant at 10%.

Textbook Use

57. The data show a substantial rise in textbook availability. However, it is not the availability of textbooks that matters but whether they are used or not. The teacher questionnaire asked whether textbooks had been used in the last class taught on each subject. For math and English, nearly all teachers had textbooks available and over 90 percent used them (Table D.31). For local language nearly half did not have textbooks, and a lower percentage of those who have them used them. These findings are consistent with those of Okyere *et al.* (1997) who found that textbooks were used when there are sufficient of them.

Table D.31: Most teachers use textbooks when they are available

	English	*Math*	*Local language*
No textbooks available	1.9	2.4	44.2
Yes	94.5	90.7	47.6
No textbooks available	3.6	6.9	8.2
Total	**100.0**	**100.0**	**100.0**
Memo:			
% of those having textbooks who use them	96.3	93.0	85.3

Time on Task

58. The teacher questionnaire included questions about classroom activity, specifically the amount of time in a typical class spent:

- Preparing for class, handing out materials, writing on the board material for exercises or copying
- Disciplining students
- All students engaged in copying, reading, or other forms of exercise
- Dealing with students on a one-to-one basis
- Addressing the whole class

59. Enumerators reported difficulties in administering this question. The total implied class time from summing the answers to the above questions ranged from 5 minutes to four hours. However, these extremes were limited to a handful of observations. Of the 3,128 observations with complete data, 3,107 are retained in the sample if those with a total class time of less than 25 minutes or more than two hours are dropped. The results, shown in Table D.32, show that on average 28 percent of time is spent on getting ready for class or disciplining students. By a broad definition of time on task therefore 72 percent of class time is spent on task, though this varies from 29 to 100 percent. A narrow definition of time on task takes into account only the activities that actively engage all students, in which case the average is 33 percent, ranging from 0 to 73 percent.

Table D.32: Time on task: classroom activities

	Mean	*Minimum*	*Maximum*	*Coefficient of variation*
Total class time (minutes)	51	25	120	
Of which (percent)				
Preparing for class	21	0	68	0.55
Disciplining students	7	0	48	0.69
All students engaged copying etc	33	0	73	0.30
Dealing with student 1-to-1	13	0	68	0.62
Addressing whole class	26	0	80	0.51
Memo: time on task				
Broad definition	72	29	100	0.17
Narrow definition	33	0	73	0.30

Table D.33: Time on task: classroom activities (only those with class time of an hour or less)

	Mean	*Minimum*	*Maximum*	*Coefficient of variation*
Preparing for class	22	0	65	0.51
Disciplining students	7	0	33	0.65
All students engaged copying etc	34	0	73	0.30
Dealing with student 1-to-1	12	0	63	0.62
Addressing whole class	25	0	80	0.54

60. The robustness of these results was checked by considering the means only for those reporting a total class time of one hour or less, a sample of 2,215 teachers (Table D.33). The percentage distribution of activities is hardly changed.

61. Bivariate analysis shows no relationship between the sex or location of the teacher but a positive association with teacher training. These results are supported by multivariate analysis for the determinants of the broad definition of time on task (the narrow definition regression does not yield good results); see Table D.34. The regression shows also that teacher training matters, as does overall teacher morale at the school (the individual teacher's morale is significant if mean morale is not included). In-service training is not significant, but it should be recalled that less than 5 percent of teachers receive such training on a frequent basis.

Table D.34: Determinants of time on task

	Broad definition			*Narrow definition*		
	Coeff.	*t-stat*		*Coeff.*	*t-stat*	
Teacher characteristics						
Male	-0.34	-0.67		-0.23	-0.55	
Teacher training	2.96	4.63	***	-0.02	-0.03	
In-service training	-0.37	-0.40		0.31	0.41	
Old dummy	0.26	0.34		0.97	1.55	
Teaching methods	-1.04	-0.80		-1.31	-1.23	
School characteristics						
Primary	-0.29	-0.55		0.95	2.20	**
Private	0.42	0.52		-0.70	-1.06	
Board quality	1.41	0.33		2.31	0.65	
Class have internal walls	0.23	0.30		0.35	0.56	
Class disturbed by noise	-1.00	-2.08	**	0.27	0.69	
Display material available	1.83	5.36	***	0.29	1.05	
Head teacher supervision	3.70	4.11	***	0.92	1.25	
Circuit supervisor supervision	5.42	3.12	***	1.11	0.78	
Textbook availability	1.11	3.45	***	0.48	1.83	
Chalk availability	1.33	3.44	***	0.02	0.07	
School mean teacher morale	2.03	2.84	***	2.22	3.79	***
School mean discipline	1.84	4.02	***	0.51	1.35	
School mean teacher perception of management	-1.30	-3.40	***	-0.37	-1.19	
Community characteristics						
Savannah	-0.03	-0.04		-1.93	-2.58	***
Forest	2.76	5.23	***	0.38	0.88	
Rural	-0.06	-0.12		0.31	0.74	
Intercept	44.65	7.95	****	23.52	5.12	***
R squared	0.08			0.02		
No. of observations	2,919			2,919		

62. School quality matters to the time spent on task: materials matter (display material, textbooks, and chalk, and the average of teachers' perceptions of material availability), as does the quality of infrastructure (class disturbed by external noise). School management also matters: supervision of the teacher by both the head teacher and the circuit supervisor improve time on task, as does teachers' perception of school management (the worse is the perception then the less the time on task).

TEACHER CONDITIONS, MOTIVATION, AND MORALE

63. This section considers three related variables: teacher morale, teacher working conditions, and teacher living conditions. Few data were collected on these issues in 1988 — though those available mostly show a clear improvement — so the discussion is mostly restricted to an analysis of the 2003 data.

Descriptive Analysis of Teacher Morale and Conditions

64. The teacher morale variable is constructed as the simple sum to two questions: do you enjoy being a teacher (no=0, yes=1) and do you intend to remain as a teacher (no=0, yes=1)? The resulting variable, shown in Table D.35, is categorical from 0 to 2.[18] The variable suggests reasonably high morale, with two-thirds of teachers being in the top category.

65. Questions were also asked on teachers' subjective perceptions of living and working conditions, based on a 5- and 4-point scale, respectively. The former of these was combined with the results of a question regarding the cordiality of relations with the local community to make a subjective livings conditions index (Table D.36).

Table D.35: Measures of teacher morale

	Enjoy	*Remain*	*Morale*
0	13.3	31.0	10.2
1	86.7	69.0	24.0
2	..	..	65.9
Total	100.0	100.0	100.0
No. of observations	3,129	3,129	3,129

Table D.36: Subjective perceptions of working and living conditions

	How would you describe your working conditions?				*How would you describe the conditions of your accommodation?*		
	Urban	*Rural*	*Total*		*Urban*	*Rural*	*Total*
Very poor	8.0	4.9	7.0	Very poor	6.3	5.6	6.1
Poor	33.7	30.6	32.7	Poor	19.4	20.0	19.6
Good	54.2	59.2	55.8	Adequate	27.2	29.5	28.0
Very good	4.2	5.2	4.5	Good	38.5	38.4	38.5
Total	100.0	100.0	100.0	Very good	8.5	6.4	7.8
No. of obs.	2096	1033	3129	Total	100.0	100.0	100.0
Chi-squared (Prob.)	16.39	(0.001)		Chi-squared (Prob.)	6.05	(0.196)	

66. Teachers appear more satisfied with their working conditions (60 percent replying they are good or very good) compared to their living conditions (46 percent describing as good or very good). Urban teachers are less satisfied with their working conditions than those in rural areas, though there is no difference in the perception of living conditions (although the objective measures given below suggest they are worse in rural areas).

67. Teacher morale is related to all three of the subjective perception variables mentioned above, in particular working conditions (Table D.37)

18. The components of teacher morale are unsurprisingly correlated. Over three quarters of those who do not enjoy being a teacher plan to leave teaching, compared to under a third of those who do enjoy it. However, the creation of the composite gives a bit more variation in the dependent variable.

Table D.37: Relationship between teacher morale and teacher conditions

	Teacher morale				Chi-squared
	Low	Medium	High	Total	
Subjective living conditions					
Very poor	10.1	6.0	5.5	6.1	15.6
Poor	21.7	20.4	19.0	19.6	(0.049)
Adequate	27.4	26.4	28.7	28.0	
Good	32.4	39.2	39.2	38.5	
Very good	8.5	8.0	7.7	7.8	
Total	100.0	100.0	100.0	100.0	
Subjective living index					
Low	30.8	25.2	21.9	23.6	16.1
Medium	25.2	22.8	25.7	24.9	(0.003)
High	44.0	52.0	52.5	51.5	
Total	100.0	100.0	100.0	100.0	
Subjective working conditions					
Very poor	15.4	9.6	4.8	7.0	152.2
Poor	49.1	37.6	28.3	32.7	(0.000)
Good	33.3	48.7	61.9	55.8	
Very good	2.2	4.1	5.0	4.5	
Total	100.0	100.0	100.0	100.0	
No. of observations	318	750	2061	3129	

68. Objective data were also collected on teacher conditions. Regarding living conditions data are available on whether pay is received on time, if housing is provided for the teacher, the type of water supply at the teachers' housing, if teacher housing has electricity, and if the teacher is a member of a group within the community (e.g., church, cultural organization, or sports club). Data on the first of these were also collected in 1988, although at the school rather than teacher level and for a smaller number on water and electricity.[19] All variables that can be compared across time show an improvement in the living conditions of teachers.

69. In 1988, 95 percent of schools did not provide lodging for any of their teachers. By 2003 this figure fell to 70 percent. Today, 60 percent of teachers have access to pipe-borne water compared to only 20 percent 15 years ago. In only 13 percent of schools do no teachers have electricity in their home in 2003 compared to half in 1988. In 2003, 72 percent of teachers reported that they always or in most months received their salary on time, compared to the only 25 percent of schools for which it was reported that salaries were almost never late in 1988. The problem of late pay is greater for new teachers. Teachers with less than a year's experience are significantly more likely to say that they never receive their pay on time. But there remains a not insignificant group of older teachers who get their pay late, and this is found to be a critical factor in teacher morale (see below).

19. In 1988, data were only collected on whether teachers' lodgings had water and electricity if those lodging were provided by the school, which was a very low percentage.

70. Of the five objective living conditions four show a bias in favor of teachers living in urban areas, two strongly so (water and electricity). Just one indicator is more favorable in rural areas. That is having lodging provided, though this is not common anywhere (21 percent of teachers in rural areas and 6 percent in urban). In consequence, the objective index of living conditions, calculated as the average of the scaled values of these five variables, is better in urban areas than rural (Table D.38) — posing a puzzle as to why subjective perceptions of living conditions do not vary between rural and urban areas.

Table D.38: Objective index of living conditions

	Urban	Rural	Total
Low	22.9	53.1	32.9
Medium	42.9	31.9	39.3
High	34.2	14.9	27.8
Total	100.0	100.0	100.0
No. of observations	2096	1033	3129
Chi-squared (Prob.)	306.2	(0.000)	

71. Data on working conditions covered both teacher-level data on the various dimensions of school quality and school-level data. The analysis of material and physical inputs earlier (para. 5 ff) has already shown how these have improved in nearly all schools between 1988 and 2003.

Determinants of Teacher Morale and Conditions

72. Each of teacher morale, and teacher perceptions of living and working conditions was modeled as an ordered probit. In the first and most general equation, both subjective and objective measures were included. However, it seems likely that the three dependent variables are determined simultaneously so that there is a problem in including the subjective perceptions as regressors. Hence model 2 in each case drops these variables, which may be considered as reduced form estimate. Since a more parsimonious model is identified in each case with some differing regressors the model can be considered to be identified, with model structure determined by a data analytic approach.

73. Table D.39 summarizes the results, from which the following main points emerge:

- Teacher characteristics: young teachers and especially males, especially those in rural areas, are more generally dissatisfied. Better-qualified and -educated teachers also tend to be less satisfied. Living in the home district and with one's spouse both have a positive effect.
- Teacher living conditions: a resoundingly robust result is the importance of receiving pay on time, which has a significantly positive effect on all three measures. Having good social relations with the community are also important. Other aspects of living conditions affect the subjective perception of living conditions, but not the other two variables.
- Teacher-level school variables: several of these are significant, virtually all with the expected sign. Both board (easy to clean) and classroom (not disrupted by noise) quality affect teacher perceptions of both working and living conditions. While some aspects of school quality thus seem to spill over into perceptions of living conditions (but not vice

versa, see previous bullet), two perverse results appear with respect to in-service training and visits of the circuit supervisor. Also surprising is the negative impact of most variables measuring "quality" of other teachers at the school.

- School management and projects: the school management variables send mixed signals. This result partly follows from their inter-correlation. Both PTA variables have a positive effect on subjective working conditions, and PTA is positive in the subjective living conditions equation. Despite the small number of observations, the WSD dummy is significant in one case (living conditions).
- Community characteristics: taking into account all these factors, the indices are systematically higher in forest and savannah zones and in rural areas. However, there is a negative effect from community income and education (which are positively correlated with the objective measure of living conditions). The likely explanation (arising from field observation) is that teachers compare themselves with their peers in the neighboring community — they are much lower down the scale in well off communities than poor ones, and so will be less satisfied with their lot.

Table D.39: Determinants of morale and conditions (results from regression analysis)

	Subjective working conditions	*Subjective living conditions*	*Teacher morale*
Teacher characteristics			
Male	-ve (***)	-ve (***)	-ve (***)
Young (<30)	..	..	-ve (***)
Young in rural area	-ve (*)	..	-ve (*)
Young male in rural savannah	..	+ve (**)	
Old (>50)	..	..	+ve (***)
Living with spouse	..	..	+ve (***)
Living in home district	..	+ve (**)	..
Raven's score	..	+ve (**)	..
English score	-ve (**)	+ve (**)	..
Years of schooling	-ve (*)	..	-ve (***)
Level of teacher training	-ve (**)	..	..
Subjective indices		..	..
Morale	+ve (***)	..	n.a.
Subjective living conditions	+ve (***)	n.a.	..
Subjective working conditions	n.a.	+ve (***)	+ve (***)
Teacher living conditions	..	..	..
Pay received on time	+ve (***)	+ve (***)	+ve (***)
Water in residence	..	+ve (***)	..
Electricity in residence	..	+ve (***)	..
Lodging provided	..	+ve (***)	..
Member of social organization	..	..	+ve (***)
Perception of social relations	+ve (***)	..	+ve (*)
Teacher-level school data	..	..	..
Frequency of in-service training	..	-ve (*)	..

	Subjective working conditions	*Subjective living conditions*	*Teacher morale*
Teach extra classes	+ve (**)	+ve (**)	..
Have to share classroom	-ve (*)	..	..
Noise disrupts classes	-ve (***)	-ve (*)	..
Head teacher visits classes	..	+ve (*)	..
Display material available	+ve (***)	..	..
Board easy to clean	+ve (***)	+ve (***)	..
Teacher meets with circuit supervisor	+ve (**)	..	..
Circuit supervisor monitoring of teacher activities	+ve (*)	-ve (*)	..
School-level data	..	..	..
Own water supply	+ve (**)	..	..
Average level of teacher training	-ve (***)	+ve (*)	..
Average level of teacher schooling	-ve (*)	..	..
Average teacher test score	..	-ve (*)	..
School management	..	..	..
PTA	+ve (*)	+ve (*)	..
SMC	-ve (*)	..	..
PTA met in last month	+ve (***)	..	..
SMC helped in the school in past year	-ve (*)	..	..
Plan from SPAM being implemented	..	+ve (***)	..
Project dummies	..	..	..
Whole School Development	..	+ve (**)	..
QUIPS	..	..	..
Primary School Development	..	..	..
Community variables	..	..	..
Average income	..	..	-ve (***)
Average education of household heads	..	..	-ve (***)
Savannah	+ve (***)	..	+ve (***)
Forest	+ve (***)	..	+ve (***)
Rural	+ve (***)	+ve (***)	..

Absenteeism

74. In 1988, data were collected on absenteeism at the school level, asking how many teachers had been absent for reasons other than sickness during the last 12 months. In 2003, this question was included in the teacher roster of the school questionnaire, asking if the teacher had been absent in the past four weeks for reasons other than sickness. The results of the two surveys should not be comparable because the longer reference period used in 1988 will bias results toward finding a greater degree of absenteeism in that year.

75. However, despite this bias, the data clearly show that absenteeism has increased over the past 15 years. In 2003, nearly 13 percent of teachers had been absent in the past month, compared to just over 4 percent in 1988 (Table D.40).

Table D.40: Percent teachers absent by year and type of school

	Primary	*Middle/ JSS*	*Total*
1988	4.7	3.7	4.3
2003	12.8	12.8	12.8

76. Correspondingly, more schools are affected by absenteeism. In 1988, 85 percent of schools did not suffer at all; whereas this figure has now fallen to 61 percent, with 13 percent of schools have over one-third of the teachers being absent for reasons other than sickness in the past month (Table D.41).

77. Table D.42 reports bivariate analysis of school-level absenteeism rates using 2003 data. The strongest difference is between public and private schools: 80 percent of private schools have no problem with absenteeism, compared to not much more than half of public schools. There is also a significant relationship with rural versus urban schools, 7 percent of rural schools suffering absenteeism rates of over two-thirds. Likely reasons for greater absenteeism in rural areas are that: (1) teachers may live in town some distance from the school and suffer transport problems, (2) they have to travel to town once a month to collect their pay, which they may find is not yet there, and (3) rural teachers attend to their farming activities.[20] Finally, absenteeism is worst in the forest zone perhaps because of the greater scope for profitable farming in the zone.

Table D.41: Absenteeism rates by year (percent of schools in each category)

	1988	*2003*
None	85	61
Up to a third	11	26
Between one to two thirds	3	9
More than two thirds	1	4
Total	100	100
No. of observations	518	706

Table D.42: Cross-tabulations for absenteeism rates, 2003

	Coastal	*Forest*	*Savannah*	*Urban*	*Rural*	*Public*	*Private*
None	66	56	69	61	61	56	80
Up to a third	25	28	19	27	23	29	14
Between one to two thirds	5	12	10	9	10	11	4
More than two thirds	4	4	2	2	7	5	1
Total	100	100	100	100	100	100	100
No. of observations	205	404	97	451	255	568	138
Chi-squared		13.9**		9.9**		28.3***	

Note: ** significant at 5% level, *** significant at 1% level.

78. Multivariate analysis of teacher-level data also shows that private schools are less likely to suffer from absenteeism (Table D.43). It also shows that poor working conditions are associated with a greater likelihood of absenteeism. The subjective working condition index is significantly negative. The most important component of that index — receiving pay on time — is so important it is also significant in its own right when entered alongside the

20. A main source of income for urban teachers is extra classes, which necessarily do not take place during school hours. Rural communities, which are more cash constrained, offer fewer opportunities for extra classes.

index. There may be a direct effect of time taken by teachers in going to inquire about their pay. Low morale is also associated with absenteeism.

79. Some direct measures of school conditions also matter. A high pupil-teacher ratio encourages absenteeism, as does poor facilities as measured by lack of desks. The effect of the head teacher discussing lesson plans is a perverse result.

80. On the other hand there are a cluster of living condition variables, such as living with spouse, being in the home district and having good social relations, that appear conducive to absenteeism.[21] Presumably such circumstances provide distractions from work.

Table D.43: Determinants of teacher absenteeism

	Coefficient	*z-stat*	
Teacher characteristics			
Male	0.110	1.15	
Age	-0.006	-1.24	
In-service training	0.030	0.22	
Teacher training	0.189	1.28	
Teacher perception of morale	0.068	1.69	*
Teacher conditions			
Teacher morale	-0.133	-1.93	*
Subjective working conditions	-0.112	-1.69	*
Pay on time	-0.088	-2.05	**
Subjective living conditions	0.073	1.69	*
Social relations	0.124	1.52	
Home district	0.122	1.31	
Living with spouse	0.094	1.27	
Objective living conditions	-0.515	-1.73	*
School characteristics			
Primary	-1.505	-1.67	*
Private school	-0.299	-1.75	*
PTA helped in last month	-0.113	-1.21	
QUIPS	-0.359	-1.37	
Desks	-0.179	-2.10	**
Pupil teacher ratio	0.011	3.45	***
Head teacher discuss lesson plans	0.495	2.18	**
Community characteristics			
Per capita expenditure	0.130	1.00	
Forest	0.240	2.55	**
Intercept	0.725		
Number of obs	1606		
Pseudo R^2	0.074		

Note: *** significant at 1%, ** 5% and * 10%

21. These three variables are not individually significant but are so jointly.

Annex E: Tables Of School Quality Variables

RECURRENT INPUTS

(a) Full sample

Table E.1: Chalk (full sample)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Never enough	12.7	8.4	8.7	9.3	10.9	8.8
Occasional shortages	66.8	5.5	72.7	10.7	69.5	7.6
Always enough	20.5	86.1	18.6	79.9	19.6	83.6
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	283	417	231	289	514	706
Chi-squared (Prob)	388.9	(0.000)	220.6	(0.000)	553.2	(0.000)

Table E.2: English books (full sample)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Less than one book between two	58.4	11.3	42.1	22.1	51.1	15.7
At least one book between two	20.6	16.3	37.3	42.6	28.1	27.1
At least one book per student	21.0	72.4	20.6	35.3	20.8	57.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	286	417	233	289	519	706
Chi-squared (Prob)	214.13	(0.000)	27.4	(0.000)	218.1	(0.000)

Table E.3: Math books (full sample)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Less than one book between two	35.7	11.0	34.3	5.5	35.1	8.8
At least one book between two	32.9	35.7	52.4	23.2	41.6	30.6
At least one book per student	31.5	53.2	13.3	71.3	23.3	60.6
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	286	417	233	289	519	706
Chi-squared (Prob)	69.5	(0.000)	184.8	(0.000)	211.0	(0.000)

Table E.4: Desks (full sample)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
No desks or tables at all	18.2	1.2	9.0	1.0	14.1	1.1
Some, but not enough	70.3	31.4	77.7	31.1	73.6	31.3
Enough for everyone	11.5	67.4	13.3	67.8	12.3	67.6
Total	100	100	100	100	100	100
No. of observations	286	417	233	289	519	706
Chi-squared (Prob)	288.1	(0.000)	159.8	(0.000)	391.0	(0.000)

Table E.5: Recurrent input index (full sample)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Low (<0.5)	325.7	1.0	27.7	0.7	32.1	0.8
Medium (0.5-0.75)	49.8	19.2	60.2	28.4	54.5	22.9
High (>0.75)	14.5	79.9	12.1	70.9	13.4	76.2
Total	100	100	100	100	100	100
No. of observations	283	417	231	289	514	706
Chi-squared (Prob)	320.5	(0.000)	203.5	(0.000)	524.5	(0.000)

(b) Public schools only

Table E.6: Chalk (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Never enough	13.4	7.2	8.8	10.5	11.3	8.6
Occasional shortages	70.6	3.4	72.6	9.7	71.5	6.2
Always enough	16.0	89.4	18.6	79.8	17.2	85.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	262	320	226	248	488	568
Chi-squared (Prob)	336.7	(0.000)	205.9	(0.000)	536.7	(0.000)

Table E.7: English books (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Less than one book between two	61.0	13.1	42.1	21.8	52.2	16.9
At least one book between two	22.0	17.2	37.3	44.4	29.1	29.0
At least one book per student	17.0	69.7	20.6	33.9	18.7	54.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	264	320	228	248	492	568
Chi-squared (Prob)	185.6	(0.000)	24.8	(0.000)	187.3	(0.000)

Table E.8: Math books (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Less than one book between two	37.1	8.8	34.6	4.0	36.0	6.7
At least one book between two	34.8	40.6	52.2	23.0	42.9	32.9
At least one book per student	28.0	50.6	13.2	73.0	21.1	60.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	264	320	228	248	492	568
Chi-squared (Prob)	74.3	(0.000)	183.0	(0.000)	216.0	(0.000)

Table E.9: Desks (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
No desks or tables at all	18.9	1.6	9.2	0.8	14.4	1.2
Some, but not enough	73.1	35.3	78.5	34.3	75.6	34.9
Enough for everyone	8.0	63.1	12.3	64.9	10.0	63.9
Total	100	100	100	100	100	100
No. of observations	264	320	228	248	492	568
Chi-squared (Prob)	201.1	(0.000)	142.2	(0.000)	341.2	(0.000)

Table E.10: Recurrent input index (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Low (<0.5)	33.6	1.6	27.4	4.0	30.7	2.6
Medium (0.5-0.75)	51.1	17.8	55.3	25.0	53.1	21.0
High (>0.75)	15.3	80.6	17.3	71.0	16.2	76.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	262	320	226	248	488	568
Chi-squared (Prob)	261.4	(0.000)	145.4	(0.000)	404.2	(0.000)

(c) Panel data

Table E.11: Chalk

	1988	2003
Never enough	10.8	7.2
Occasional shortages	69.6	8.2
Always enough	19.6	84.5
Total	100	100
Observations	194	194

Table E.12: English books

	1988	*2003*
Less than one book between two	46.9	17.3
At least one book between two	30.6	28.1
At least one book per student	22.4	54.6
Total	100	100
Observations	196	196

Table E.13: Math books

	1988	*2003*
Less than one book between two	30.6	7.1
At least one book between two	40.3	30.1
At least one book per student	29.1	62.8
Total	100	100
Observations	196	196

Table E.14: Desks

	1988	*2003*
No desks or tables at all	15.8	1.5
Some, but not enough	76.5	34.7
Enough for everyone	7.7	63.8
Total	100	100
Observations	196	196

(d) Public versus private, 2003

Table E.15: Chalk

	Public	*Private*	*Total*
Never enough	8.6	9.4	8.8
Occasional shortages	6.2	13.8	7.6
Always enough	85.2	76.8	83.6
Total	100.0	100.0	100.0
Total	568	138	706
Chi-squared (Prob)	9.4	(0.009)	

Table E.16: English books

	Public	*Private*	*Total*
Less than one book between two	16.9	10.9	15.7
At least one book between two	29.0	18.8	27.1
At least one book per student	54.0	70.3	57.2
Total	100.0	100.0	100.0
Total	568	138	706
Chi-squared (Prob)	12.2	(0.007)	

Table E.17: Math books

	Public	*Private*	*Total*
Less than one book between two	6.7	17.4	8.8
At least one book between two	32.9	21.0	30.6
At least one book per student	60.4	61.6	60.6
Total	100.0	100.0	100.0
Total	568	138	706
Chi-squared (Prob)	20.6	(0.000)	

Table E.18: Desks

	Public	*Private*	*Total*
No desks or tables at all	1.2	0.7	1.1
Some, but not enough	34.9	16.7	31.3
Enough for everyone	63.9	82.6	67.6
Total	100.0	100.0	100.0
Total	568	138	706
Chi-squared (Prob)	17.7378	(0.000)	

Table E.19: Recurrent index

	Public	*Private*	*Total*
Low (<0.5)	2.6	3.6	2.8
Medium (0.5-0.75)	21.0	21.7	21.1
High (>0.75)	76.4	74.6	76.1
Total	100.0	100.0	100.0
Total	568	138	706
Chi-squared (Prob)	0.4567	(0.796)	

PHYSICAL INPUTS

(a) Full sample

Table E.20: Adequate classrooms (full sample)

	Primary		*Middle/JSS*		*Total*	
	1988	*2003*	*1988*	*2003*	*1988*	*2003*
Less then half necessary	0.0	0.0	0.0	0.0	0.0	0.0
More than half necessary	22.7	21.3	19.7	17.0	21.4	19.5
Required amount	77.3	78.7	80.3	83.0	78.6	80.5
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total	286	417	233	289	519	706
Chi-squared (prob)	0.2	(0.663)	0.7	(0.412)	0.6	(0.429)

Table E.21: Classrooms that cannot be used when raining (full sample)

	Primary		*Middle/JSS*		*Total*	
	1988	*2003*	*1988*	*2003*	*1988*	*2003*
More than half	28.7	19.9	20.2	19.7	24.9	19.8
Less than half	23.8	12.0	18.9	13.8	21.6	12.7
None	47.6	68.1	60.9	66.4	53.6	67.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	286	417	233	289	519	706
Chi-squared (prob)	31.6	(0.000)	2.7	(0.264)	26.9	(0.000)

Table E.22: Percentage of classrooms with a chalkboard (full sample)

	Primary		*Middle/JSS*		*Total*	
	1988	*2003*	*1988*	*2003*	*1988*	*2003*
None	3.1	0.5	2.1	0.7	2.7	0.6
Less than half	6.6	1.9	4.3	0.7	5.6	1.4
More than half	20.6	3.6	25.8	3.8	22.9	3.7
All	69.6	94.0	67.8	94.8	68.8	94.3
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	286	417	233	289	519	706
Chi-squared (prob)	76.4	(0.000)	66.3	(0.000)	142.6	(0.000)

Table E.23: Board quality (full sample)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Poor	9.6	8.2	5.3	9.3	7.7	8.7
Fair	33.0	17.4	38.5	10.7	35.4	14.7
Good	52.8	69.1	49.6	79.9	51.4	73.5
Excellent	4.6	5.3	6.6	0.0	5.5	3.1
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	282	414	226	289	508	703
Chi-squared (prob)	24.8	(0.000)	82.2	(0.000)	81.5	(0.000)

Table E.24: Own water supply (full sample)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Yes	16.1	28.3	17.2	31.1	16.6	29.5
No	83.9	71.7	82.8	68.9	83.4	70.5
Total	100	100	100	100	100	100
No. of observations	286	417	233	289	519	706
Chi-squared (prob)	14.1	(0.000)	13.5	(0.000)	26.4	(0.000)

Table E.25: Library (full sample)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Yes	7.7	9.8	9.9	16.6	8.7	12.6
No	92.3	90.2	90.1	83.4	91.3	87.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	286	417	233	289	519	706
Chi-squared (prob)	1.0	(0.329)	5.0	(0.026)	4.8	(0.029)

Table E.26: Physical index (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Low (<0.5)	44.7	26.3	35.4	27.0	40.6	26.6
Medium (0.5-0.75)	46.5	53.9	57.5	47.4	51.4	51.2
High (>0.75)	8.9	19.8	7.1	25.6	8.1	22.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total	282	414	226	289	508	703
Chi-squared (prob)	31.6	(0.000)	30.3	(0.000)	53.8	(0.000)

(b) Public schools only

Table E.27: Adequate classrooms (public schools only)

	Primary		*Middle/JSS*		*Total*	
	1988	*2003*	*1988*	*2003*	*1988*	*2003*
Less then half necessary	0.0	0.0	0.0	0.0	0.0	0.0
More than half necessary	22.7	21.6	19.7	18.5	21.3	20.2
Required amount	77.3	78.4	80.3	81.5	78.7	79.8
Total	100.0	100.0	100.0	100.0	100.0	0.0
No. of observations	264	320	228	248	492	568
Chi-squared (prob)	0.1	(0.736)	0.1	(0.742)	0.2	(0.661)

Table E.28: Classrooms that cannot be used when raining (public schools only)

	Primary		*Middle/JSS*		*Total*	
	1988	*2003*	*1988*	*2003*	*1988*	*2003*
More than half	29.9	22.5	20.2	21.0	25.4	21.8
Less than half	22.3	11.6	18.4	15.3	20.5	13.2
None	47.7	65.9	61.4	63.7	54.1	65.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	264	320	228	248	492	568
Chi-squared (prob)	21.6	(0.000)	0.8	(0.665)	15.2	(0.001)

Table E.29: Percentage of classrooms with a chalkboard (public schools only)

	Primary		*Middle/JSS*		*Total*	
	1988	*2003*	*1988*	*2003*	*1988*	*2003*
None	2.7	0.6	1.8	0.4	2.2	0.5
Less than half	7.2	2.2	4.4	0.4	5.9	1.4
More than half	20.8	3.4	26.3	4.0	23.4	3.7
All	69.3	93.8	67.5	95.2	68.5	94.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	264	320	228	248	492	568
Chi-squared (prob)	61.2	(0.000)	61.4	(0.000)	122.0	(0.000)

Table E.30: Board quality (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Poor	10.0	9.1	5.4	10.5	7.9	9.7
Fair	34.9	18.3	38.9	9.7	36.7	14.5
Good	51.3	67.8	49.3	79.8	50.4	73.1
Excellent	3.8	4.7	6.3	0.0	5.0	2.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	261	317	221	248	482	565
Chi-squared (prob)	22.1	(0.000)	78.6	(0.000)	78.0	(0.000)

Table E.31: Own water supply (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Yes	13.3	21.3	16.7	26.6	14.8	23.6
No	86.7	78.8	83.3	73.4	85.2	76.4
Total	100	100	100	100	100	100
No. of observations	264	320	228	248	492	568
Chi-squared (prob)	6.4	(0.012)	6.0	(0.009)	12.9	(0.000)

Table E.32: Library (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Yes	5.7	9.7	10.1	16.1	7.7	12.5
No	94.3	90.3	89.9	83.9	92.3	87.5
Total	100.0	100.0	100.0	100.0	100.0	100.0
No. of observations	264	320	228	248	492	568
Chi-squared (prob)	3.2	(0.074)	3.8	(0.052)	6.5	(0.011)

Table E.33: Physical index (public schools only)

	Primary		Middle/JSS		Total	
	1988	2003	1988	2003	1988	2003
Low (<0.5)	46.7	30.0	35.3	28.6	41.5	29.4
Medium (0.5-0.75)	46.4	53.9	58.4	50.0	51.9	52.2
High (>0.75)	6.9	16.1	6.3	21.4	6.6	18.4
Total	100	100	100	100	100	100
Total	261	317	221	248	482	565
Chi-squared (prob)	31.6	(0.000)	30.3	(0.000)	53.8	(0.000)

(c) Panel data

Table E.34: Adequate number of classrooms

	1988	*2003*
Less then half necessary	0.0	0.0
More than half necessary	14.8	18.4
Required amount	85.2	81.6
Total	100.0	100.0
No. of observations	196	196

Table E.35: Classrooms that cannot be used when raining

	1988	*2003*
More than half	29.6	22.4
Less than half	24.5	19.4
None	45.9	58.2
Total	100.0	100.0
No. of observations	196	196

Table E.36: Percentage of classrooms whit a chalkboard

	1988	*2003*
None	1.0	0.5
Less than half	4.1	2.0
More than half	23.5	3.6
All	71.4	93.9
Total	100.0	100.0
No. of observations	196	196

Table E.37: Chalkboard quality

	1988	*2003*
Poor	8.9	9.9
Fair	35.9	19.3
Good	47.9	66.7
Excellent	7.3	4.2
Total	100.0	100.0
No. of observations	192	192

Table E.38: Water

	1988	*2003*
No	85.7	81.1
Yes	14.3	18.9
Total	100.0	100.0
No. of observations	196	196

Table E.39: Library

	1988	*2003*
No	92.9	86.7
Yes	7.1	13.3
Total	100.0	100.0
No. of observations	196	196

(d) Public versus private, 2003

Table E.40: Adequate classrooms

	Public	*Private*	*Total*
Less then half necessary	0.0	0.0	0.0
More than half necessary	20.2	18.1	19.8
Required amount	79.8	81.9	80.2
Total	100.0	100.0	100.0
No. of observations	568	138	706
Chi-squared (prob)	0.3	(0.573)	

Table E.41: Classrooms that cannot be used when raining

	Public	*Private*	*Total*
More than half	21.8	11.6	19.8
Less than half	13.2	10.9	12.7
None	65.0	77.5	67.4
Total	100.0	100.0	100.0
No. of observations	568	138	706
Chi-squared (prob)	8.9	(0.011)	

Table E.42: Share of classrooms with a chalkboard

	Public	*Private*	*Total*
None	0.5	0.7	0.6
Less than half	1.4	1.4	1.4
More than half	3.7	3.6	3.7
All	94.4	94.2	94.3
Total	100.0	100.0	100.0
No. of observations	568	138	706
Chi-squared (prob)	0.1	(0.994)	

Table E.43: Board quality

	Public	*Private*	*Total*
Poor	9.7	4.3	8.7
Fair	14.5	15.2	14.7
Good	73.1	75.4	73.5
Excellent	2.7	5.1	3.1
Total	100.0	100.0	100.0
No. of observations	565	138	703
Chi-squared (prob)	5.9	(0.117)	

Table E.44: Own water supply

	Public	*Private*	*Total*
Yes	76.4	46.4	70.5
No	23.6	53.6	29.5
Total	100.0	100.0	100.0
No. of observations	568	138	706
Chi-squared (prob)	48.2	(0.000)	

Table E.45: Library

	Public	*Private*	*Total*
Yes	87.5	87.0	87.4
No	12.5	13.0	12.6
Total	100.0	100.0	100.0
No. of observations	568	138	706
Chi-squared (prob)	0.0298	(0.863)	

Table E.46: Physical index

	Public	*Private*	*Total*
Low (<0.5)	29.4	15.2	26.6
Medium (0.5-0.75)	52.2	47.1	51.2
High (>0.75)	18.4	37.7	22.2
Total	100.0	100.0	100.0
Total	565	138	703
Chi-squared (prob)	27.5	(0.000)	

Table E.47: Frequency of head-teacher and circuit supervisor activities

	Head-teacher				*Circuit supervisor*			
	QUIPS	*WSD*	*Other schools*	*Total*	*QUIPS*	*WSD*	*Other schools*	*Total*
Sits in on class								
Never	4	12	303	319	30	50	1749	1829
Less than once a week	25	20	802	847	40	65	1094	1199
At least once a week	35	65	1388	1488	4	5	70	79
Daily	8	18	333	359	0	0	13	13
Total	72	115	2826	3013	74	120	2926	3120
Looks at a sample of students' work								
Never	3	11	233	247	34	53	1673	1760
Less than once a week	37	33	1116	1186	38	62	1199	1299
At least once a week	31	62	1303	1396	2	4	47	53
Daily	1	8	171	180	0	0	7	7
Total	72	114	2823	3009	74	119	2926	3119
Looks at lesson plans								
Never	0	0	68	68	22	48	1449	1519
Less than weekly	0	0	72	72	47	69	1418	1534
At least once a week	72	115	2684	2871	5	3	60	68
Total	72	115	2824	3011	74	120	2927	3121
Discusses lesson plans								
Never	9	10	310	329	31	57	1717	1805
Less than weekly	36	54	1214	1304	38	60	1149	1247
At least once a week	27	51	1296	1374	0	3	42	45
Total	72	115	2820	3007	69	120	2908	3097
Discusses career development								
Never	26	52	1207	1285	48	78	2134	2260
Less than once a month	30	36	1089	1464	23	28	633	684
At least once a month	16	27	522	256	3	14	153	170
Total	72	115	2818	3005	74	120	2920	3114

Table E.48: Frequency of head-teacher and circuit supervisor activities (percent)

	Head-teacher				Circuit supervisor			
	QUIPS	WSD	Other schools	Total	QUIPS	WSD	Other schools	Total
Sits in on class								
Never	5.6	10.4	10.7	10.6	40.5	41.7	59.8	58.6
Less than once a week	34.7	17.4	28.4	28.1	54.1	54.2	37.4	38.4
At least once a week	48.6	56.5	49.1	49.4	5.4	4.2	2.4	2.5
Daily	11.1	15.7	11.8	11.9	0.0	0.0	0.4	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Memo: absolute total	72	115	2826	3013	74	120	2926	3120
Prob. value	0.251	0.147			0.090	0.020		
Looks at a sample of students' work								
Never	4.2	9.6	8.3	8.2	45.9	44.5	57.2	56.4
Less than once a week	51.4	28.9	39.5	39.4	51.4	52.1	41.0	41.6
At least once a week	43.1	54.4	46.2	46.4	2.7	3.4	1.6	1.7
Daily	1.4	7.0	6.1	6.0	0.0	0.0	0.2	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Memo: absolute total	72	114	2823	3009	74	119	2926	3119
Prob. value	0.029	0.255			0.214	0.038		
Looks at lesson plans								
Never	0.0	0.0	2.4	2.3	29.7	40.0	49.5	48.7
Less than weekly	0.0	0.0	2.5	2.4	63.5	57.5	48.4	49.2
At least once a week	100.0	100.0	95.0	95.4	6.8	2.5	2.0	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Memo: absolute total	72	115	2824	187	74	120	2927	3121
Prob value	0.113	0.036			0.000	0.109		
Discusses lesson plans								
Never	12.5	8.7	11.0	10.9	44.9	47.5	59.0	58.3
Less than weekly	50.0	47.0	43.0	43.4	55.1	50.0	39.5	40.3
At least once a week	37.5	44.3	46.0	45.7	0.0	2.5	1.4	1.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Memo: absolute total	72	115	2820	3007	69	120	2908	3097
Prob. value	0.114	0.376			0.014	0.039		
Discusses career development								
Never	36.1	45.2	42.8	42.8	64.9	65.0	73.1	72.6
Less than once a month	41.7	31.3	38.6	48.7	31.1	23.3	21.7	22.0
At least once a month	22.2	23.5	18.5	8.5	4.1	11.7	5.2	5.5
Total	100.1	100.4	100.0	100.0	100.0	100.0	100.0	100.0
Memo: absolute total	72	115	2818	3005	74	120	2920	3114
Prob. value	0.565	0.331			0.139	0.008		

Annex F: Variable Definition

Variable	*Name*	*Data and construction*
Physical: quantity		
Total number of classrooms	CROOMS	All classrooms at the school (including unusable)
Required classrooms	REQCROOM	Sum of number of classes in each grade, where the number is divided by 2 if that grade is split shift
Adequate number of classrooms	ADQCROOM	CROOMS (less those which cannot be used at any time) divided by REQCROOM
	ADQCROOMC	Categorical version of ADQCROOM: 1 (0-.49), 2 (0.50-.89), 3 (>= 0.9)
% of classrooms with chalkboard	BOARD	No. of classrooms with chalkboard/CROOMS
Own water supply	WATER	If the school has own water supply No=1, Yes=1
Library	LIB	If the school has a library No=1, Yes=1
Physical: quality		
% of classrooms that cannot be used when raining	RCROOMS	Classrooms that cannot be used at all plus those that cannot be used when raining divided by CROOMS
	RCROOMSC	Categorical version of RCROOM (reversed): 1 (>= 0.50), 2 (0.01-.049), 3 (0)
Classes held in shared classrooms*	CLASSSHA	School average (from teacher questionnaire) of if have to teach in a shared classroom
Size of internal walls*	CLASSWLA	School average (from teacher questionnaire) of if have fall size internal walls
Noise disruption*	CLASSNSA	School average (from teacher questionnaire) of if class is disturbed by external noise
Board quality	BOARDQUAL	School survey respondent assessment of overall chalkboard quality
School average of teacher assessment of board quality*	BQUALTA	Average of teacher responses as to quality of chalkboard in the class in which they teach
School average of teacher assessment of if adequate board size	BQUALSZA	Average of teacher responses as to the size of chalkboard in the class in which they teach
School average of teacher assessment of if board can be cleaned	BQUALCLA	Average of teacher responses as to how easily the chalkboard in the class in which they teach can be cleaned
Type of Water/Storage	WATTYPE	Type of water supply from piped water to reservoir/other.
Recurrent: quantity		
Chalk availability	CHALK	School survey assessment of chalk availability
English textbooks–pupil ratio	EBOOKR	Sum of English books available in each grade divided by total enrolments (ENR)
	EBOOKC	Categorical version of EBOOKR: 1 (0-0.49), 2 (0.50-0.99), 3 (>=1)
Mathematics textbooks–pupil ratio	MBOOKR	Sum of math books available in each grade divided by total enrolments (ENR)
	MBOOKC	Categorical version of MBOOKR: 1 (0-0.49), 2 (0.50-0.99), 3 (>=1)
Writing places–pupil ratio	DESKS	Total writing places (sum across ps6q12b1-b6) divided to adjusted enrolments (ENRA)

Variable	***Name***	***Data and construction***
	DESKSC	Categorical version of DESKS: 1 (0-.09), 2 (0.10-0.89), 3 (>= 0.90)
Seating places-pupil ratio*	SEATS	Total writing places (sum across ps6q11a1-b6) divided to adjusted enrolments (ENRA)
	SEATSC	Categorical version of SEATS: 1 (0-.09), 2 (0.10-0.89), 3 (>= 0.90)
Teachers and teaching methods		
Number of teachers	NOTEACH	This variable is problematic since we do not want to include detached heads. They should not be included in the roster, so the variable is calculated by summing the number of teachers in the roster. However, in some cases it appears the head was included though detached. These cases have been adjusted by inspection.
Required number of teachers	REQTEACH	Calculated in the same way as REQCROOMS but without the adjustment for split shift.
Adequate number of teachers	ADQTEACH	NOTEACH/REQTEACH
% trained teachers	TEATRAIN	Proportion of teachers who have teacher training.
Absenteeism	ABSENT	Proportion of teachers absent for reasons other than sickness (note reference period longer in 1988).
Teacher test scores	TSCORE	Simple average of teacher's scores on English, math and Raven's tests.
Head's assessment of if a good teacher*	GOODTEACH	Head's subjective assessment
	GOODTEACHA	School average of GOODTEACH
*Teaching methods**		
Teacher morale (subjective)*	TMORALE	If teacher enjoys being a teacher (No=1, Yes=1); ts6q5
	TMORALEA	School average of TMORALE
	TWCOND	Teacher assessment of working conditions (1 Very Poor, 2 Poor, 3 Good, 4 Very Good)
	TWCONDA	School average of TWCOND
Frequency of homework*	AVEHOME	How often homework is set per week, averaged over all three subjects (or number for which data available)
Frequency student work inspected*	AVEINSPECT	How often students' work is inspected per week, averaged over all three subjects (or number for which data available)
Frequency student work assessed*	AVEASSESS	How often students' work is assessed per week, averaged over all three subjects (or number for which data available)
Monitoring of student performance*	STMONITOR	Simple average of AVEHOME, AVEINSPECT and AVEASSESS
	STMONITOR	School average of STMONITOR
School management		
SMC*	SMC	If there is a SMC at the school
	SMCMEET	If the SMC has met in last month (No: 0; Yes: 1)
	SMCHELP	If the SMC has provided help to the school during the last year (No: 0; Yes: 1)

Variable	*Name*	*Data and construction*
PTA	PTA	If there is a PTA at the school
	PTAMEET	If the PTA has met in last month (No: 0; Yes: 1)
	SMCHELP	If the PTA has provided help to the school during the last year (No: 0; Yes: 1)
SPAM*	SPAM	If the school has had a SPAM in the previous year (No: 0; Yes: 1)
	SPAMPLAN	
Frequency of visits by circuit supervisor	CSVISIT	How often the circuit supervisor (school inspector in 1988) has visited the school in the last 12 months
	CSVISITC	Categorical version of CSVIST: 0 (Never), 1 (1-5 times); 2 (6-11 times); 3 (12 or more times)
Activities of head teacher and circuit supervisor*	HTCLASS CSCLASS HTCLASSA CSCLASSA	Frequency with which head teacher (circuit supervisor) sat in on class (per day). HTCLASSA and CSCLASSA are school averages.
	HTSMP, CSSMP HTSMPA, CSSMPA	Frequency with which head teacher (circuit supervisor) inspected students' work (per day). HTSMPA and CSAMPA are school averages.
	HTLLESS, CSLLESS HTLLESSA, CSLLESSA	Frequency with which head teacher (circuit supervisor) looked at lesson plans (per day). HTLLESSA and CSLLESSA are school averages.
	HTDLESS, CSDLESS HTDLESS, CSDLESS	Frequency with which head teacher (circuit supervisor) discussed lesson plans. HTDLESSA and CSDLESSA are school averages.
	HTDCD, CSDCD HTDCDA, CSDCDA	Frequency with which head teacher (circuit supervisor) discussed career development. HTDCDA and CSDCDA are school averages.
Pupil data		
Total enrolments	ENR	Total enrolments
Adjusted enrolments	ENRA	Enrolments adjusted for split shifts.
Note: * not available from 1988 data		

Annex G: Analysis of Test Scores

INTRODUCTION

1. In 1988/89 cognitive tests were administered to a sub-sample (1,594 households) of the 3,200 households interviewed by the second round of the Ghana Living Standard Survey (GLSS2).[1] The 2003 survey used exactly the same tests as those used in 1988/89, and included also a local language test. The second part of this annex describes the tests, discusses their limitations, and evaluates their reliability. The third part presents a descriptive analysis of the tests results and the fourth part builds an econometric model of the determinants test outcomes.

DESCRIPTION OF THE COGNITIVE TESTS USED

2. A total of seven tests were administered to members of the 1,740 households interviewed in 2003. These tests are:

- Raven's Colored Progressive Matrices test
- Short local language test
- Short English test
- Short math test
- Advanced local language test
- Advanced English test
- Advanced math test

3. The Raven's Progressive Matrices test is a measure intellectual ability intended to be independent of education and experience.[2] The test consists of a puzzle with a missing piece that the person taking the test has to find among a choice of 6 possible pieces. The test comprises 36 questions divided into three parts of 12 questions each. The short English and math test were originally designed as a screening device to prevent people with very low skills from attempting the more advanced tests (Glewwe 1999). In 1988, given the low performance in the advanced test, the short test results became part of the tests score analysis, and the same procedure was followed for this study. The short English reading test consists of a few English sentences that make a short story.[3] The person is required to read the sentences and then answer eight multiple-choice questions to measure the person's understanding of the story. The Short Mathematics test consists of eight arithmetic operations (addition, subtraction, multiplication, and division), of increasing difficulty. The advanced English and mathematics test are the same tests used by a study on educational achievements conducted in Kenya and Tanzania in 1980. These tests were designed by the Educational Testing Service, based in

1. Specifically, the tests were conducted in half of the 170 clusters covered by the survey.

2. In fact, Raven's test results are likely to be influenced by levels of schooling and household environment. In the second part of the annex we will show how we can isolate an innate ability component from individual scores using the same methodology used in Glewwe (1999).

3. The short English and mathematics test are reproduced in Annex A.

Princeton, New Jersey, based on school-leaving examinations of primary and secondary Kenyan and Tanzanian students (Knight and Sabot 1990). The advanced English test contains 29 multiple-choice questions. Some of the questions, as in the short English test, are based on the understanding of a short story. In other cases, the person taking the test has to select the correct word from a choice of four in a sequence of sentences.[4] The advanced mathematics test consists of 36 questions of increasing difficulty. The questions cover the knowledge of all basic mathematics, including arithmetic, fractions and proportions, decimal numbers, real problem solving, geometry, equations, and algebra. The local language tests, short and advanced, are a new feature of the 2003 survey. They were designed by the Department of Linguistics and Ghanaian Languages at the University of Ghana in association with the Department of Linguistics at the University College of Education at Winneba. They consist of a translation/adaptation of the English tests to the most commonly spoken Ghanaian languages.[5]

4. All household members aged between 9 and 55 were eligible to take the tests.[6] A maximum time for the completion of the tests, ranging from 10 minutes for the short English to 30 minutes for the advanced mathematics test, was applied. Despite the large number of tests and the length of time required for completion, the rate of reported refusal on the short tests was only 5 percent. On average, however, only 50 percent of individuals taking the short test were able to take the advanced ones, and many eligible individuals did not take the short tests because they found them too difficult. The 2003 survey screened eligible individuals with the use of flash cards, thus reducing the number of people taking the test.[7] This procedure has some implications for the measurement of mean test scores that are discussed below. Details of the procedure adopted for the administration of the tests can be found in the Test Administrator's Instruction Manual designed for the survey which is available on the study website.

Limitations and Reliability of the Tests

5. There are three limitations to the use of the set of tests used in this study. First, the use of numeracy and literacy tests focuses on a narrow range of child development, ignoring other aspects covered in the school curriculum.[8] A second limitation was the use of a language (English) for the literacy test, which is the first language for only a very small minority of Ghanaian children. This problem has been partially corrected by the introduction of a test in Ghanaian languages, that allowed children to be tested in both languages. This fact will

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4. A sample of the questions of the advanced English and mathematics tests can be found in Appendix A.

5. The English tests were translated into 12 Ghanaian languages, that together cover 80-90 percent of all languages presently spoken in Ghana. These languages are: Akuapem, Asante-Twi, Dagaare, Dangme, Ewe, Fante, Ga, Gonja, Kasem, Kusaal, Nzema, and Wale.

6. Teachers from the surveyed schools were also administered the tests, but only the advanced math and English tests, the Raven's test and the local language test using the local language officially designated for that school if they said they were competent in it.

7. The flash card for the language tests was a sentence taken from the text used in the test itself. The flash card for the math test was a simple addition or subtraction.

8. This fact may give an advantage to private schools which some say focus on these core skills to the detriment of other subjects.

particularly affect the test scores of younger children since until recently local language has been the medium of instruction until the end of third grade. A third problem is that the mathematics test was designed in English, thus giving an advantage to those individuals that are proficient in this language. Test administrators in the field were advised to translate the mathematics questions whenever necessary. However, we performed regression analysis, not reported here, which shows that mathematics test scores were to some extent dependent on English proficiency. The possibility of re-designing the math test in local languages was rejected for the same reason that a broader range of test instruments was not used. That is that comparability was needed with the 1988 tests. This comparability is central to the study design, and was preserved at the expense of using test instruments known to be imperfect.

6. In order to assess the reliability of the tests 'Cronbach's alpha' was calculated. Cronbach's alpha is a commonly used measure of the quality of test instruments, which captures their internal consistency. The statistic is calculated using the responses to individual questions (i) for different individuals (j). If a test is internally consistent, then the scores across questions of two individuals should be reasonably correlated. People doing well will do well on the same questions and badly on the same ones. People who do badly should get the same questions wrong as other people doing badly. Cronbach's alpha is based on the correlation coefficient between the test scores of all possible pairs of test takers. To calculate the statistic a random sample of 100 people was used for each test. A value of the alpha statistic of 0.7 and above is considered to be an indication of a reasonable degree of consistency. The Raven's test scores turned to be very high, and all other tests also have coefficients equal to or in excess of 0.7 other than the short local language test, which at 0.64 falls not far below the threshold (Table G.1).

Table G.1: Values of the Cronbach's alpha test

	Short	*Advanced*
English	0.72	0.79
Mathematics	0.75	0.82
Local language	0.64	0.70
Raven	0.94	n.a.

DESCRIPTIVE ANALYSIS OF THE TESTS

7. Before describing test performance and comparing scores of 1988 with those of 2003, the computation of test scores used for the analysis is discussed. Short tests were composed of eight questions, and only individuals scoring five or more were allowed to take the advanced tests of any type. Additionally, a screening mechanism was used, whereby the person was invited to take the short test only if able to read very short sentences or able to solve a simple arithmetic operation displayed on a flash card. As a result, not all individuals were administered the entire set of tests. This procedure results in a problem in the computation of the tests scores that is resolved in the following section.

Censoring and screening

8. As in 1988, the advanced tests proved to be very difficult, and the majority of the persons involved in the exercise did not score more than five on the short tests. On the other hand, for people with higher level of education, the short tests were very easy, and large number of persons scored eight, which is the maximum score. The latter can be seen as a problem of censoring from above. To clarify this point, assume that the English test scores are a measure of the latent variable English language ability. However, the test has eight questions so that there is a maximum score of eight. If the data had not been censored at

eight, then those with higher ability would have scored more than eight. But they could not do so, so that scores are bunched (censored) at eight. This bunching constitutes a problem when we want to compare mean scores of different groups or surveys, because simple means of test scores will under-estimate the real difference in ability between the groups. A formula can be applied that adjusts the simple means for censoring.[9]

9. As a result of applying the screening process described above, many individuals were reported as not having taken the test in 2003 because it was "too difficult." On the other hand, in 1988, when no screening was applied, few people said the test was too difficult, but many scored zero on the short tests (especially in English when 14 percent scored zero compared to only 1.3 percent in 2003; for math these figures are 2.5 and 0.3 percent, respectively) — these people would have been screened out using the 2003 procedure. Ignoring them will overestimate mean scores of 2003 respect to those of 1988, since those who were scoring zero in 1988 are likely to having been screened out of the sample in 2003. The data suggest that this problem is more serious for the short English scores than for the short math. In order not to lose information, the option of dropping all zero scores from the 1988 or both data sets was rejected (a solution that would have introduced other problems of sample selection). Instead, we assigned a score of zero to those individuals who did not take the English test because it was too difficult, and a random score between 0 and 4 to those who were not able to take the mathematics test.[10]

Combined test scores

10. In the next section a multivariate model is presented explaining test scores by individual, household, and school characteristics. The test scores used in the regressions are a combination of the short and the advanced tests scores. Since short and advanced data were missing for many people it was necessary to impute the missing test scores.

11. The short test scores, ranging from 0 to 8, show little variability across the sample, and an obvious solution is to add the short test scores to the advanced ones to get a combined

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9. If observation are normally distributed, the observed censored mean is (Greene, 2000):

$$E[x] = \Phi a + (1-\Phi)(\mu + \sigma\lambda(\alpha))$$

where x is the variable of interest, α is the truncation point (truncation is 'from above' in this case), μ is the uncensored mean and σ is the uncensored variance. $\lambda(\alpha)$ is the inverse Mill's ratio and (for the censoring from above case) is defined as:

$$\lambda(\alpha) = -\varphi(\alpha)/\Phi(\alpha)$$

where ϕ and Φ are the density and the cumulated density of the normal distribution and α is:

$$\alpha = (a-\mu)/\sigma$$

This set of equations can be solved for μ and σ, thus producing the uncensored mean and variance.

10. The data show that a score of zero was far more common for English than math. This make sense since people unable to read the text would simply give up and not answer any questions. In math, on the other hand, especially if the questions are read to them, people are likely to attempt all questions, at least guessing the more difficult ones.

test score. However, not all the children took the advanced test, because they scored less than 5 or found the test too difficult. Also, some people who took the advanced test skipped the short test as being too easy. Various options were examined in order to impute scores, and the following were adopted. To impute advanced test scores, the advanced scores were regressed on the short scores of reading, math, and the Raven's test. The resulting predicted values were used to calculate scores for who did not take the advanced test.[11] Similarly, regressions were estimated of short tests scores on the advanced test scores of reading and math and we calculated the predicted values in order to impute values for the missing short tests scores.[12] For the latter model a tobit specification was used correcting for both right and left censoring.

Overview of test score outcomes

12. Tables G.2 and G.3 show the average test scores for all sample individuals and for primary graduates of 2003 and 1988. Tests marked by a star have been corrected for right censoring as described above. The last columns of the table report t –statistics and p-values of the difference in the means between the two surveys. The data show a significant improvement in all test scores for both groups other than the Raven's test, which has increased for primary graduates only.

Table G.2: Average tests scores: whole sample

	1988	*2003*	*t-stat*	*p-value*
Raven's	19.4	19.4	0.11	0.914
Short English*	6.2	6.6	3.75	0.000
Short math*	5.5	5.9	8.16	0.000
Short local*	...	6.4		
Advanced English	12.3	13.2	4.16	0.000
Advanced math	8.7	10.1	6.93	0.000
Advanced local	...	15.5		
Combined English	17.7	19.2	5.28	0.000
Combined math	14.5	16.2	6.26	0.000
Combined local	...	21.1		

* Corrected for right censoring.

11. Negative predicted values were set to 0.

12. Predicted values larger than 8 were set to 8.

Table G.3: Average tests scores: primary graduates under 15

	1988	*2003*	*t-stat*	*p-value*
Raven's	20.2	22.3	2.87	0.004
Short English*	4.7	7.0	5.87	0.000
Short math*	5.2	6.3	3.42	0.000
Short local*	...	6.2		
Advanced English	10.2	14.5	6.88	0.000
Advanced math	7.2	9.7	5.04	0.000
Advanced local	...	14.1		
Combined English	14.5	20.8	7.72	0.000
Combined math	12.7	15.9	5.44	0.000
Combined local	...	19.8		

* Corrected for right censoring.

Test score improvement by income group

13. The improvement in test scores can be observed for children from all income groups (Table G.4). For primary students the improvement has leveled the performance between children from different backgrounds in English, but with the opposite effect for math. The latter is also true for JSS, whereas for English scores for JSS students the benefit has been uniform.

Table G.4: Test scores by schooling and income tercile

	1988			*2003*		
	I	*II*	*III*	*I*	*II*	*III*
Primary school students						
Raven's	15.7	15.8	16.9	15.9	15.6	17.4
Short English	0.8	1.7	3.7	4.3	4.8	5.5
Short math	3.4	3.7	4.0	4.0	3.8	4.5
Advanced English	3.4	8.6	10.2	12.3	12.3	14.0
Advanced math	5.2	4.9	6.0	14.0	11.7	15.3
JSS students						
Raven's	20.2	19.6	21.8	20.1	21.1	24.3
Short English	4.0	4.0	4.8	6.1	6.3	6.6
Short math	5.1	4.9	5.3	5.8	5.7	6.0
Advanced English	10.5	12.0	12.3	15.0	15.4	17.2
Advanced math	7.2	7.5	8.4	13.9	16.5	20.0

MODELING TEST SCORES

14. In this section a model is defined and estimated of children's test scores. Information from both surveys is used in order to detect determinants of changes in test scores over time. The interest is to assess the impact of school quality on students' achievements using household survey data, in order to control for the effects of individual and household

characteristics. The dependent variables used in the model are the combined results of the mathematics, English, and local language tests described in the previous section. The following section describes the sample and discusses the selectivity problem from the choice of the sample. A listing of variables determining test scores follows, and finally the regression results are presented.

Sample selection

15. The sample used in the regressions consists of all children aged between 9 and 15 who have recently attended or are currently attending school in the locality of residence. Only children with at least three years of schooling are included. This sample is not a random sample, because only children either with at least three years of schooling (1988) or able to read the flash cards (2003) took the tests. Other children did not take the test as a result of refusal or absence. Children that were purposely or incidentally excluded from the sample can be grouped into the following three categories.

16. **Eligible Children Not Tested.** Some 25 percent of the eligible children did not take the tests. About one-fifth of these did not do so because they found the test too difficult (mostly in 2003). This problem has been corrected by randomly assigning a low grade (math) or a zero grade (English) to those children with at least three years schooling. Another 20 percent of these children were in school at the time of the exercise, 20 percent were traveling, 5 percent were ill, 5 percent refused to take the test, and 30 percent did not take the test for other unspecified reasons. In general, the exclusion of eligible children from the exercise seems to have operated randomly. There might be some concern, however, that children "traveling" and those not taking the test for "other" reasons could share common and distinctive characteristics. For example, they could be workers, and thus have less education.

17. **Children Living Elsewhere.** Child fostering is very common in Western Africa. Nearly 50 percent of the sample children are "foster" children, in the sense they are not living in their household of origin. Parents can use fostering for reasons as different as sending children to better schools, reduce the burden on household resources, exploit opportunities in more developed areas, and strengthening kinship ties (Lloyd and Gage-Brandon 1994). Though households of origin of foster children may well be poorer on average than other households, foster children are not necessarily sharing common characteristics, precisely because the reasons at the origin of the "fostering" choice are so different. Additionally, while 25 percent of children could not be interviewed because they were "fostered out," another 25 percent were interviewed because they were "fostered in." Foster children are therefore largely represented in our sample.

18. A more serious problem is whether it is possible to relate foster children behavior to the characteristics of the fostering household. It could be argued that the household of origin makes choices for these children, rather than the household of residence (Glewwe 1999) so that the relevant household characteristics are missing for children who are fostered in. *A priori* this hypothesis appears most appropriate for the schooling decision, whereas for test scores the household of residence may be the most relevant. The hypothesis that it is true parental characteristics can be tested by interacting a dummy for foster children (F=1 if fostered in, 0 otherwise) with household characteristics (X). The coefficient on FX will be insignificant if

household characteristics affect fostered children in the same way as they do non-fostered children. If it is the characteristics of the "true household" that matter then the coefficient will be equal and opposite to that on X.

19. **Children Attending School.** The sample chosen for the estimation implies that children who never attended school, or who left school before completing primary (or the third year of primary depending on the sample), are not considered. In 2003, 11 percent of children aged between 10 and 20 had never attended schools, and 10 percent of children aged over 20 starting primary school never achieved grade six. The same percentages are considerably higher for the children surveyed in 1988. These children are likely to have common characteristics that prevented them form attending or completing school. However, the quality of the schools available and the job opportunities also matter. In Appendix I, using a complete set of household and locality explanatory variables, a model of school achievement is estimated whose results are used here to correct for the selectivity bias caused by the sample being dependent upon school attainment.

Selectivity Adjustments

20. The selection of a non-random sample can bias the regression results. The presence of this bias can be tested for when necessary by including a sample selection term in the test score regression. To clarify the problem, suppose that cognitive tests are administered to the sample of children graduated from primary school. In order to assess the importance of school quality, a regression is estimated of test scores using a school quality index as a regressor, resulting in a positive coefficient on this variable. But suppose that only wealthier families can afford for their children to complete primary school. Also suppose that children from wealthier families are better nourished, do not work, and that this improves their mental development and their performance at cognitive tests. As a result, we might erroneously attribute good test scores to school characteristics, while they are, at least in part, determined by factors related to household wealth.

21. Since selection bias in the description given above can be seen as an omitted variable problem, the presence of the bias should be detected by a test on omitted variables such as the Ramsey test. If a selectivity bias is found a correction can be made by modeling the selection of children to be in the sample.

22. Algebraically, the equation of interest is:

$$y_i = \beta x_i + \varepsilon_i \qquad (1)$$

where y_i is the test score for child i, x_i is the quality index of the school attended by the child and β is the parameter to be estimated. But only a selected number of children enter equation (1), since many children never go to school or drop out before reaching a given grade. We can use the entire sample of children and model school attendance based on a series of child and household characteristics. This is called the 'selection equation':

$$z_i^* = \gamma_j \sum_j w_{ji} + u_i \qquad (2)$$

where z_i^* is a variable defining whether the child is attending school or not and the w_{ji} are a set of explanatory variables. The variable y_i is observed only when z_i^* is larger than zero. Equation (1) corrected for selectivity is thus the expectations of y_i conditional on z_i^* being larger than zero:

$$E[y_i|z_i\rangle 0] = \beta X_i + \beta_\lambda \lambda_i(\alpha_u) + v_i \qquad (3)$$

where $\lambda_i(\alpha_u)$ is the inverse Mill's ratio obtained from the selection equation (Greene 2000). This ratio is usually derived after running a probit of the selection equation and takes the form:

$$\lambda = \frac{\varphi(X\beta)}{\Phi(X\beta)} \qquad (4)$$

where ϕ and Φ are the density and the cumulated density of the normal distribution, and the $X\beta$ are the predicted values of the selection equation. A significant β_λ is a test for the presence of selection bias, and at the same time a correction of the estimates of the equation (1) for that bias. In the case of the ordered probit achievement regression (used in Annex I) the inverse Mill's ratio for the children having attained at least a given grade is:

$$\lambda = \frac{1-\varphi(cutoff2 - X\beta)}{1-\Phi(cutoff2 - X\beta)} \qquad (5)$$

where the cutoff is the threshold used for the sample selection, for example the achievement of at least grade three.

Explanatory Variables

23. The explanatory variables used in the model are the characteristics of the child, of the household, and of the school attended. The variables are listed in Annex F with their description (variable with an * are not available for 1988).

Individual variables

Sex: (dummy) child sex
Age: (continuous) age of the child in completed years
Schooling: (continuous) number of completed years of schooling[13]
Order: (continuous) child's birth order
Siblings: (continuous) number of alive siblings
Ability: (continuous) estimated innate ability
Ability missing: (dummy) children whose innate ability is missing

13. Years of schooling are derived from the data on highest completed grade, as the number of years necessary to achieve a given grade. The transformation of grades into years followed the GLSS2 Basic Information Document.

24. The ability variable was estimated using the model formulated by Glewwe (1999). This model regresses Raven's test scores on the age, sex, and years of schooling of the child and of the parents. The model predicts Raven's scores for children and their parents at the same time, calculating household fixed effects. The ability variable is obtained as the sum of the estimated household fixed effect and the error term, thus assuming that children inherit their innate ability from their parents. Tables G.5 and G.6 present the results of the regression run on the 1988 and 2003 samples. The results are very similar, and the only differences are the significance of the age square term and the coefficient estimates of years of schooling and gender. It seems that gender and older age have become less important in explaining poor performance, while the effect of additional years of schooling has increased.

Table G.5: Innate ability regression (1988)

	Coefficient	*t-statistic*
Age	0.36	6.19***
Age squared	0.00	-4.81***
Education	0.69	5.19***
Education squared	0.01	2.19**
Father's education	-0.01	-1.21
Mother's education	-0.12	-0.98
Sex	0.09	0.78
Sex*age	0.31	0.44
Sex*education	-0.06	-2.49**
Constant	-0.29	-3.64***
Observations	1732	
F-statistic	58.41	
R square	0.32	

Table G.6: Innate ability regression (2003)

	Coefficient	*t-statistic*
Age	0.25	3.84***
Age squared	0.00	-2.52**
Education	1.14	7.54***
Education squared	-0.01	-1.06
Father's education	-0.01	-1.85*
Mother's education	-0.02	-0.14
Sex	-0.17	-1.22
Sex*age	0.21	0.28
Sex*education	-0.01	-0.49
Constant	-0.21	-2.23***
Observations	1716	
F-statistic	35.45	
R square	0.23	

Household variables

Coast Forest and Savannah: (dummies) three main agro-ecological zones of the country excluding Accra
Rural: (dummy) residence in rural areas as defined by the 1984 and 2000 demographic census respectively
Mother's education: (continuous) completed years of schooling of the mother
Father's education: (continuous) completed years of schooling of the father
Per capita expenditure: (continuous) logarithm of household per-capita expenditure. Expenditure values of 1988 were actualised to 2003 using the consumer price index
***Parents meeting the teacher:** (dummy) the parents are regularly meeting the child's teacher in order to discuss progress in school
***PTA:** (dummy) membership of any of the household member of local PTA (Parents and Teachers Association)

School variables

Index of recurrent inputs: this an index of recurrent inputs described in Annex D. It includes school availability of books, writing places and chalk.

Index of physical inputs: this an index of physical inputs described in Annex D. It includes quantity and quality of classrooms and blackboards, availability of water and library.
***Classrooms with internal walls:** (continuous) school average of classrooms with full size internal walls
***Noise disruption:** (continuous) school average of outside noise disturbing classes
***Private:** (dummy) whether the school attended is private
Teacher education: (continuous/categorical) average number of teacher s years of schooling

School management

***SPAM plan:** (dummy) school had a SPAM in the last year whose plan was actually carried out
Visits of circuit supervisor: (continuous/categorical) number of inspection visits by the circuit supervisor

Other

Lambda: (continuous) is the inverse Mill's ratio obtained form the attainment regression reported in Annex I.

25. The set of test score equations — English, math, and local language — might appear to comprise a system of seemingly unrelated regression equations (SURE), meaning that the error terms between each equation are correlated with one another. Using SUR estimation rather than OLS improves the efficiency of the estimates. However, SUR estimation requires the sample to be the same for each equation, so including the local language test reduces same size quite considerably. Moreover, there is no gain if the regressors are the same in each case. Whilst it might be thought that there could be some variation in the regressors (math books for math scores etc.), these distinctions did not prove good ones to keep. Results are first presented (Table G.7) for English and math. The local language estimates, which gave rather different results, are then discussed.

26. It proves quiet difficult to get good results from the pooled data. It is always the case that schooling is positively and significantly related with higher test scores — and this remains so even if just one or two years of schooling are included in the model. However, interacting school quality variables with years of schooling does not yield good results. A few of the school qualities have a "shift effect" on test score outcomes, notably math textbook availability is significant in some, but by no means all, model specifications.[14] A high pupil-teacher ratio is detrimental to English test scores (though appears good for maths scores in JSS), and being a beneficiary of the WSD program improves them.[15] Private school students perform significantly better in English though not in math, which is an unsurprising

14. The availability of math and English books is highly correlated. However, if English books are included and math books dropped the coefficient is not significant.

15. The pupil teacher ratio is entered as two dummy variables (low and high) rather than a continuous variable since evidence from other studies suggests that the ratio has no impact over a large range, but very small classes can be good and very large ones detrimental.

result as English is the medium of instruction in private schools. Having own water supply is robustly significant.

Table G.7 (a): Test score determinants: pooled data children in primary school (OLS)

	Math			*English*		
	Coefficient	***z-stat***		***Coefficient***	***z-stat***	
School variables						
Years schooling	0.92	2.39	**	1.21	2.67	***
Math books	0.46	1.22		0.11	0.24	
Classrooms can be used when raining	0.01	0.66		-0.01	-0.84	
Water supply	1.28	1.44		2.46	2.48	**
Board quality	0.59	1.30		-0.67	-1.28	
Teacher test score	-0.15	-1.26		-0.10	-0.78	
Private school	0.42	0.43		2.89	2.62	***
High PTR	-1.00	-0.95		-4.37	-3.68	***
PSD dummy	-0.62	-0.46		2.89	1.98	**
WSD dummy	0.83	0.50		3.14	1.67	*
QUIPS dummy	-2.17	-1.48		-0.98	-0.61	
Community variables						
Forest	-1.27	-1.90	*	-1.73	-2.21	**
Savannah	-0.29	-0.25		-2.30	-1.73	•
Rural	-0.21	-0.34		-1.00	-1.39	
Child characteristics						
Age	0.29	1.44		0.26	1.10	
Sex	-0.29	-0.52		-0.20	-0.30	
Ability	0.35	5.95	***	0.49	7.34	***
Ability missing	4.09	4.45	***	7.96	7.50	***
Household variables						
Mother's education	0.13	2.00	**	0.23	3.26	***
Income	0.07	0.12		1.41	2.11	**
Other						
Survey dummy	3.56	4.12	***	8.32	8.08	***
Selectivity correction	-1.25	-1.02		0.41	0.28	
Number of obs.	331			298		
R^2	0.29			0.57		

Table G.7 (b): Test score determinants: pooled data children in middle/JS school (OLS)

	Math			*English*		
	Coefficient	*z-stat*		*Coefficient*	*z-stat*	
School variables						
Years schooling	2.13	5.29	***	3.25	5.95	***
English books	0.16	0.32		0.29	0.43	
Math books	0.55	1.06		-0.47	-0.67	
Classrooms can be used when raining	-0.01	-0.91		-0.01	-0.61	
Water supply	0.39	0.48		1.03	0.97	
Board quality	-0.21	-0.44		0.51	0.81	
Teacher test score	0.10	0.82		0.08	0.48	
Private school	-0.83	-0.60		1.29	0.69	
High PTR	2.99	1.90	*	-0.33	-0.16	
WSD dummy	-1.81	-0.99		3.57	1.50	
QUIPS dummy	2.41	1.06		2.86	0.97	
Community variables						
Forest	-1.26	-1.83	*	-0.54	-0.59	
Savannah	-0.28	-0.23		-0.32	-0.20	
Rural	-1.41	-2.07	**	-2.17	-2.32	**
Child characteristics						
Age	-0.99	-3.46	***	-1.16	-3.02	***
Sex	-2.39	-4.08	***	-1.31	-1.64	*
Ability	0.24	4.20	***	0.42	5.55	***
Ability missing	2.39	2.62	***	4.21	3.36	***
Household variables						
Mother's education	0.17	2.73	***	0.16	1.95	**
Income	-0.72	-1.23		-0.18	-0.22	
Other						
Survey dummy	3.82	4.29	***	8.44	6.99	***
Selectivity correction	1.30	0.60		0.68	0.19	
Number of obs.	272			250		
R^2	0.45			0.58		

Table G.8 (a): Test score determinants, primary schools 2003 (OLS)

	Math score			*English score*		
	Coeff	*z*		*Coeff*	*z*	
School characteristics						
English books	-0.35	-0.72		-0.67	-1.04	
Math books	1.04	1.81	*	1.27	1.78	*
Physical Index	4.96	1.92	*	4.79	1.61	
Low PTR	2.22	2.05	*	-0.57	-0.39	
High PTR	-0.51	-0.45		-4.15	-3.05	***
Teachers speak local language	2.65	1.90	*	-0.21	-0.13	
Teachers' discipline	1.27	2.11	**	0.56	0.91	
Teaching methods	-5.77	-1.73	*	-4.54	-1.13	
Time on task	0.07	1.66	*	0.03	0.60	
Board easy to clean	-0.14	-0.09		-2.34	-0.93	
Classrooms have internal walls	1.94	1.45		1.22	0.61	
Class disrupted by noise	-1.22	-0.77		-1.60	-1.00	
Private school	0.53	0.33		4.05	1.90	*
PSD dummy	-1.23	-1.11		2.95	2.52	**
WSD dummy	0.61	0.38		3.51	1.95	*
Circuit supervisor discuss lesson plans	-3.17	-0.17		15.16	0.68	
Head teacher sits in on lessons	3.29	1.87	*	3.92	1.69	*
Student monitoring	0.41	0.58		-0.89	-1.20	
School had a SPAM	0.00	0.00		0.52	0.78	
Teachers morale	1.26	1.10		0.38	0.25	
Students indiscipline	-0.80	-1.55		-0.91	-1.85	*
Community characteristics						
Forest	-2.49	-2.78	***	-1.64	-1.45	
Savannah	-0.70	-0.59		-1.97	-1.50	
Rural	-1.96	-2.52	**	-2.70	-2.79	***
Child characteristics						
Age	0.52	1.87	*	0.26	0.77	
Sex	0.05	0.08		0.10	0.12	
Years of schooling	1.19	2.56	**	1.58	2.78	***
Ability	0.38	4.40	***	0.50	6.95	***
Ability missing	5.97	3.34	***	7.22	3.34	***
Fostered in	14.89	0.49		23.30	0.73	
Fostered*income	-1.12	-0.56		-1.50	-0.70	
Household characteristics						
Mother's education	0.17	1.94	*	0.31	2.67	**
Income	0.29	0.36		2.03	2.24	**
Parent in PTA	1.33	1.13		-0.88	-0.64	
Parent met with teacher	-1.80	-2.40	**	-0.72	-0.64	
Other variables						
Selectivity correction	0.97	0.54		3.48	1.74	*
Constant	-18.33	-1.27		-37.97	-2.24	**
No. of obs.		206			204	
R^2		0.38			0.45	

Table G.8 (b): Test score determinants, 2003 JSS (OLS)

	Math score			*English score*		
	Coeff.	*z*		*Coeff.*	*z*	
School characteristics						
English books	1.44	2.34	**	0.04	0.05	
Math books	2.38	3.52	***	2.20	3.20	***
Physical Index	0.19	0.08		4.48	1.57	
Low PTR	-2.62	-3.18	***	-0.81	-0.73	
High PTR	3.19	1.84	*	2.65	1.56	
Teachers speak local language	2.26	1.96	*	0.34	0.17	
Display material available	0.86	1.01		1.44	1.03	
Teachers' discipline	0.85	1.29		-0.11	-0.12	
Teaching methods	14.25	2.93	**	9.24	1.37	
Time on task	-0.03	-0.38		0.19	3.13	***
Board easy to clean	3.44	1.67	•	1.72	0.50	
Classrooms have internal walls	3.42	1.90	*	3.77	1.76	*
Class disrupted by noise	-3.95	-3.61	***	-3.69	-2.36	**
Private school	1.14	0.69		8.45	4.18	***
WSD dummy	3.55	2.48	**	3.67	1.67	•
QUIPS dummy	1.69	0.89		2.94	2.34	**
Circuit supervisor discuss lesson plans	22.43	1.66	*	63.34	2.55	**
Head teacher sits in on lessons	-3.58	-2.09	**	-5.35	-1.97	•
Student monitoring	0.11	0.21		-0.11	-0.19	
Community characteristics						
Forest	0.51	0.53		2.90	2.23	**
Savannah	4.83	3.49	***	4.16	2.61	**
Rural	-3.12	-4.30	***	-3.05	-2.88	***
Child characteristics						
Age	-1.22	-2.91	***	-1.61	-3.65	***
Sex	-2.32	-2.81	***	-0.06	-0.06	
Years of schooling	2.93	5.25	***	3.39	4.63	***
Ability	0.13	1.82	*	0.23	2.11	**
Ability missing	-0.02	-0.01		1.45	0.42	
Fostered in	53.25	2.80	***	62.79	2.00	**
Fostered*income	-3.42	-2.68	***	-4.15	-2.00	**
Total hours worked	0.01	2.17	**	0.02	2.11	**
Household characteristics						
Father's education	0.25	3.67	***	-0.02	-0.18	
Mother's education	0.04	0.47		0.23	1.88	*
Income	1.92	2.01	**	1.73	1.17	
Parent in PTA	3.01	1.89	*	4.07	2.24	**
Parent met with teacher	2.75	3.28	***	0.47	0.49	
Other variables						
Selectivity correction	-19.30	-3.77	***	-12.63	-1.47	
Constant	-35.36	-1.91	*	-31.89	-1.24	
No. of observations	137			137		
R^2	0.67			0.59		

27. The data for 2003 allow the inclusion of rather more school characteristics and doing so leads to more satisfactory results, especially for JSS, as shown in Table G.8. Years of schooling are significant and the coefficient rather higher. Textbook availability has the right sign in all four cases for JSS and is always significant. This is the case only for math books at primary level (English books are negative but insignificant). Teaching methods significantly improve test scores for math in JSS but have a perverse effect in primary. Time on task is always positive and significantly so in two cases. And there is substantial evidence that the quality of infrastructure matters: test scores are significantly higher in schools in which classrooms have full-sized internal walls and lower in ones where noise disrupts teaching. Participation in WSD positively affects both English and math scores in JSS, and having been a PSD beneficiary is good for math scores. As before, English test scores are significantly better in private schools, but this is not so for math (primary schools only, there is no difference in either for JSS). For both primary and JSS teachers being able to speak the local language improves student math scores.[16] Finally, teachers' perceptions of student discipline show that indiscipline significantly worsens English scores.

28. Turning to other characteristics: rural children perform worse, as do girls in math. The dummy for fostered-in children has a staggeringly large coefficient. The parental education interactive dummies are not significant, suggesting that it is the actual residence that matters — but in the case of income the term is significant, more than offsetting the beneficial impact of household income on test scores. Variables measuring parental involvement also matter: having met with the student's teacher improves math scores and being in the PTA improves English scores.

29. Finally, when local language test scores are included the most striking result is the lower explanatory power of most the variables (results not shown). Schooling still matters, as does parental education. But virtually none of the school variables contribute: none of the project dummies are significant, nor are any of the school input variables. However, a variable measuring if teachers took the local language test *is* significant.

Interpretation

30. Interpretation of the results is made by analysing the change in test scores attributable to the change in each of the determinants. The more complete model estimated using the 2003 data is used for this purpose. For variables collected in each of the two rounds the comparison is made using the change in sample means (Table G.9a). For other variables (which are mostly 0-1 dummies) the minimum and maximum values are used (Table G.9b). The exception is schooling, which saw a small drop in the sample, but the sample is known not to be representative.

31. Schooling improves test scores, each additional year increasing the combined English score by 3.6 points and math by 4.9 points. Enrolments have risen and dropout rates are low: in 2003, 95 percent of those beginning primary complete it and 86 of them complete JSS

16. This variable is measured as the percentage of teachers taking the test for the designated Ghanaian language for that school. Even though English is officially the medium of instruction (though only recently so for the first three grades) teachers may resort to local language to get ideas across. Their being able to do so helps in math.

(Annex H). The 10 percent of the age group attending school who would not have done so 15 years group can expect to have an increase in their English score of 20 if they complete primary and 27 if they go on to complete JSS. For math these figures are 16 and 21, respectively.

Table G.9 (a): Change in test scores attributable to between sample changes in explanatory variables

	Sample mean		*Coefficient*		*Change*	
	1988	*2003*	*English*	*Math*	*English*	*Math*
Forest	0.60	0.40	3.51	0.86	-0.70	-0.17
Savannah	0.11	0.17	4.76	4.95	0.27	0.29
Rural	0.44	0.56	-3.45	-2.81	-0.40	-0.33
Age	12.48	12.54	-1.70	-1.30	-0.09	-0.07
Sex	0.45	0.47	0.13	-1.60	0.00	-0.04
Years of schooling	5.04	4.90	3.59	2.76	-0.51	-0.39
Ability	5.93	7.74	0.17	0.12	0.31	0.22
Missing ability	0.48	0.33	-0.91	-3.20	0.13	0.46
Father's education	6.24	7.81	-0.04	0.12	-0.06	0.19
Mother's education	3.81	5.14	0.16	0.02	0.21	0.03
Household expenditure	13.96	14.78	2.70	1.43	2.23	1.18
Fostered in	0.23	0.20	74.64	49.92	-2.23	-1.49
Fostered*expenditure	3.27	3.00	-4.82	-3.02	1.33	0.83
Hours worked	136.86	30.58	0.01	0.01	-1.06	-1.06
English books	1.69	2.47	0.17	1.70	0.13	1.32
Math books	2.00	2.44	1.86	1.53	0.80	0.66
Physical index	0.50	0.59	4.03	0.60	0.38	0.06
Low PTR	0.30	0.18	-1.83	-2.16	0.23	0.28
High PTR	0.03	0.11	0.88	1.04	0.08	0.09

Table G.9 (b): Change in test scores attributable to maximum possible changes in explanatory variables

	Assumed values		*Coefficient*		*Change*	
	Low	*High*	*English*	*Math*	*English*	*Math*
Display material available	0.00	1.00	1.32	1.03	1.32	1.03
Discipline	0.00	6.00	0.70	1.14	4.20	6.84
Teaching methods	0.00	1.00	6.20	8.80	6.20	8.80
Board easy to clean	0.00	1.00	1.94	2.38	1.94	2.38
Internal class walls	0.00	1.00	5.08	3.87	5.08	3.87
Class not disrupted by noise	0.00	1.00	4.28	3.81	4.28	3.81
Private	0.00	1.00	7.61	0.67	7.61	0.67
PSD	0.00	0.07	3.11	5.40	0.22	0.38
WSD	0.00	0.05	6.62	3.80	0.36	0.21
QUIPS	0.00	0.06	3.40	2.42	0.21	0.15
Circuit supervisor discuss lesson plan	0.00	1.00	22.40	-1.12	22.40	-1.12
Student monitoring (homework etc)	0.00	5.00	0.36	0.50	1.80	2.50

32. The increase in recurrent and physical items between the two rounds increased math scores by 1.6 and English by 2.0 points. This understates the gains in the most deprived areas. Ensuring that a school has one math and English book per child compared to the

situation in the mid-1980s of one text per classroom will increase average English scores in children from that school by 6 points and math scores by close to 10 points.

33. Turning to the variables collected only in 2003, it is shown that both process and infrastructure matter. The most important single variable is teaching methods. If all teachers in the school used modern methods then, compared to a situation in which none do so, children's English scores would be 6.2 higher and their math score 8.8. The three infrastructure variables combined can improve English scores by 11.3 points and math by 10.1.

34. Home factors also matters to student performance. The two measures of parental involvement in a child's education (membership of PTA and meeting with a teacher) give a combined impact of 3.5 and 3.9 on math and English scores respectively. Income also matters; economic growth (the between sample rise in incomes) has increased average English scores by 2.2 and math scores by 1.2 points.

Annex H: Data on Educational Performance

WHAT HAS HAPPENED TO ENROLMENTS?

1. Table H.1 is reproduced from the 2002 Education Sector Strategy. It shows primary enrolments in 2000 down slightly from those in 1990, having behaved erratically during the course of the decade. However, the report of the Ghana Statistical Service (GSS) on the Ghana Living Standards Survey reported a school attendance rate for 6-11 year olds of 73.2 percent for GLSS2 (1988/89), rising a full 10 percent to 83.1 percent for GLSS4 (1998/99), see Table H.2.

Table H.1: Official data on primary enrolments

Year	*School-age Population*	*Primary school enrolment (Public& private)*	*Gross Enrolment Ratio*	*Proportion enrolled in private schools*	*Gender parity*
1986	2,173,089	1,679,072	77.3	4.1	0.81
1990	2,453,146	1,945,422	79.3	7.3	0.82
1991	2,544,676	2,011,062	79.0	10.2	0.84
1992	2,638,831	2,047,293	77.6	9.7	0.85
1993	2,736,919	2,138,635	78.1	10.7	0.85
1994	2,838,678	2,154,676	75.9	10.9	0.87
1995	2,944,253	2,197,172	74.6	11.0	0.87
1996	3,048,161	2,333,347	76.5	13.1	0.88
1997	3,155,758	2,445,353	77.5	13.1	0.89
1998	3,267,002	2,562,229	78.4	13.1	0.90
1999	3,382,649	2,684,689	79.4	13.1	0.91
2000	3,154,152**	2,477,990	78.6**		

Note: ** Data from the 2000/2001 MOEYS annual school census and population data from the 2000 national population census conducted by the Ghana Statistical Service. All other population figures are based on projections from the 1984 Population Census.

Source: SRIMPR Division MOEYS.

2. To understand what is going on here and get an accurate picture of what is happening to enrolments it is helpful to first clarify definitions.

Table H.2: Attendance rates reported from Ghana Living Standards Survey

Age range	*GLSS2 (1988/89)*	*GLSS4 (1998/99)*
6-11	73.2	83.1
12-15	71.8	80.4
16-18	54.1	47.0
19-25	14.1	13.5

Source: GSS (1996 and 2000)

Some Definitions

3. Enrolment data may be either net or gross, for which the definitions are as follows, given here for the case of primary education:

$$\textit{Net enrolment rate, NER} = \frac{\textit{No. of children of primary school age in primary school}}{\textit{No. of children of primary school age}}$$

$$\textit{Gross enrolment rate, GER} = \frac{\textit{No. of children in primary school}}{\textit{No. of children of primary school age}}$$

However, using household survey data that ask for the age of each of each household member and whether they are currently in school or not, it is most straightforward to work out an attendance rate (this is the term used by GSS, it does not refer to the proportion of children enrolled actually attending school, which is another meaning of the term), given here for children aged 7-12:

$$\textit{Attendance rate, AR} = \frac{\textit{No. of children aged } 7-12 \textit{ in school}}{\textit{No. of children aged } 7-12}$$

4. While it must always be the case that NER<GER (and that NER $\leq$100, which is not the case for GER), no such statement can be made regarding AR since the indicator refers to an age cohort, not to a level of schooling. However, suppose that the age at which children are meant to be in primary school is 7-12 (there is a complication in this regard which is discussed below), then a relationship can be established between the three measures: NER<AR<GER. To see this, note first that the denominator is the same in all three cases (assuming primary school age to be 7-12), so that differences between the three are accounted for by differences in the numerator. Hence NER<AR since some of the children aged 7-12 who are in school may not be in primary school but in kindergarten or a Koranic school and so would be counted in AR but not in NER. But AR<GER as, given the frequent occurrence of late enrolment, there are many children in primary school who are aged 13 or above, so appearing in the numerator for GER but not the AR. They will be offset by those 7-12 year olds in school other than primary, but the quantitative significance of this category is slight compared to over-age children still in primary school. Hence the NER will be close to the AR, but the gap between these two and GER may be quite substantial.

5. Similar reasoning suggests a different ordering for children in secondary school. Consider the case of SSS, for which the expected age is 16-18. In this case NER<GER<AR. The attendance rate now exceeds the GER since there are many children age 16-18 who are in JSS (or even primary) rather than SSS, so that they appear in the denominator of AR but not GER. The case of JSS (13-15 years) is more ambiguous, since 13-15 in primary are in AR but not GER, but the latter includes the many children aged 16 and above attending JSS.

Where Do the Data Come From?

6. Calculation of all three measures requires data on the total number of children in a given age cohort and the number of children at school (either by age group or level of schooling, or both of these in the case of NER).

7. In the case of enrolment rates administrative data (i.e., those collected from schools by district officials) may be used for the numerator. At the very least, administrative data should be available on how many children are enrolled in each level of schooling. In Ghana, in place of such administrative data, there is an annual school census, captured in the Education Management Information System (EMIS), which includes these numbers. Indeed, it goes further since the census questionnaire asks about enrolments in each grade by the year of birth

of the pupils. While this is a cumbersome question to respond to it allows the calculation of net enrolment.[1] However, as for many social indicators, the denominator is problematic. Ghana has had population censuses in 1970, 1984, and 2000. Any estimate of enrolment rates using total national enrolments from administrative or school census data must be based on an estimate for the denominator. This is the case for all the data shown in Table H.1, other than 2000 for which the new census data were available. It can be seen that total population of primary school age *dropped* by over 200,000 from 1999 to 2000, clearly indicating that population growth had been over-estimated, exerting a downward pressure on the trend in the reported enrollment rate.

8. A second problem is that the school census covers only pubic schools, so that the same data are not available for the rapidly growing private sector. It is not clear if the MOEYSYS data in Table H.1 exclude private schools, or if they do in some years but not others, which may explain the substantial drop in enrolments in 2000. Given that there is a column reporting the percentage of pupils in private schools, which is blank for 2000, it seems most likely that these children are included in all years but 2000.[2] The drop may also be explained by the incomplete coverage of the census. Coverage is not reported, only the statement that returns are not 100 percent. Failure to correct for differential coverage rates will make data incomparable from year to year.

9. The alternative data source is household surveys, in the case of Ghana either GLSS or the Demographic Health Survey (DHS). From GLSS it is possible to know the age of a person and the highest grade they have achieved. Attendance rates are the most straightforward indicator to calculate, since data are only required on age and whether the child is currently in school or not.[3] To calculate the enrolment rate, data are also required on what level of schooling the child is in. The GER is calculated as those in primary school divided by all those in the sample of primary school age. The NER is calculated as those in primary school and who are of primary school age divided by all those in the sample of primary school age. The advantages of survey data are that the problem of denominator does not arise, and that both public and all private schools are covered.

10. A problem was encountered in constructing enrolment rates arises from design of the GLSS questionnaire, which is based on the Living Standards Measurement Survey supported by the World Bank. The problem is for young children currently in school. If the highest grade completed for these children is preschool they are currently in P1. But if the highest grade completed is "none," there is no way of telling if these children are in P1 or in preschool. It can be assumed that children aged 7 and above are in primary. But the problem remains for those children aged 6. They were excluded from the numerator for the GER

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1. The enrolment calculations from these data will be subject to two sources of error. First are possible inaccuracies in the reporting of year of birth. Second, even if the year of birth is correct the current age depends on the actual birth date.

2. But this percentage is constant at 13.1 for 1996-99, suggesting the data are based on a 1996 estimate for the number in private schools, while the true share has probably continued to rise.

3. Currently in school is interpreted as having attended school in the past 12 months, so may include people who have subsequently dropped out. However, the school census suffers the same problem in that enrolment data are based on beginning of year admissions. A second issue is the frequency with which enrolled children attend school. Both surveys contain data on attendance, which are discussed below.

calculation, which may therefore be slightly under-estimated (children aged six and currently in P1 who did not attend preschool are missed out). This problem can only be solved by changing the questionnaire. There are two possible amendments to the questionnaire that would handle the problem. The first is to ask if the child has attended or is attending preschool. The second is, for children currently in school, to ask the grade they are currently in rather than the highest grade completed.

Why Is the Attendance Rate Higher Than the Gross Enrolment Rate?

11. It was shown above that it must be the case for primary school that AR<GER. Yet GLSS4 reports an AR of 83.1, whereas the MOEYSYS GER for comparable years is around 79. How is the discrepancy to be explained? The preceding discussion on data sources has identified two possible reasons:

- The denominator for 1986-99 is progressively over-estimated in the MOEYSYS figures, thus reducing the GER
- The MOEYSYS enrolment figures may exclude or under-estimate the number of children in private schools.

12. A final factor may be the choice of primary school age. The legal minimum age for staring primary school is 6. Hence both MOEYS and GSS use the age range 6-11 (six years to cover the six grades of primary) to correspond to primary. But 6 is the minimum age at which children may start. Table H.3 shows data on the age at which children start primary school.[4] This analysis is problematic for children who have not completed P1, since they may be in either P1 or preschool. Six year olds in preschool (less than six should definitely be in preschool not P1) will over-state the extent to which people begin primary at age 6. To check the extent of this problem data are also shown for those who have completed preschool only (and those completing preschool are who are 7 or above so may be assumed to be in primary not preschool). When all children are considered then most appear to start at 6, though many begin at 7 or 8. Looking only at those without P1 who have completed preschool then there are more beginning at age 6 in 1988 but not 2003. These children are probably not a representative sample. The middle column excludes those aged six who did not complete preschool and so probably biases the starting age upwards — indeed more children now start school at 7 rather than 6 using this sample.

4. The starting age is calculated as age in months less months of schooling. There is a problem here if a child has repeated, since this will appear as a late start. For example suppose a child is age 12 and has completed P4 (four years of schooling). It thus appears that they began at age 8 (12-4). But suppose they repeated P3, they have in fact had five years of schooling, and so begun at 7. Fortunately data presented below suggest that repetition is not common (well less than 10 percent). The problem could be avoided in the household module asked if any grades had been repeated and, if so, how many.

Table H.3: Starting age, 1988 and 2003

Age	1988			2003		
	All children	Completed preschool or age 7 or above	Completed preschool	All children	Completed preschool or age 7 or above	Completed preschool
4	122	130	122	34	35	34
5	544	494	479	151	127	127
6	1121	925	877	448	334	302
7	890	942	766	438	445	336
8	539	599	457	352	356	276
9	260	306	232	227	233	187
10	114	147	109	101	107	83
12	39	67	45	44	53	34

13. The analysis is inconclusive given the data limitation of not knowing if children with highest grade "None" are in P1 or preschool. It can be said that there are at least as many children starting primary at 7 or 8 as there are at 6, and possibly more start at 7 than 6. So the question is whether to designate the 7s as late-starters and stick to the range 6-11 or adjust the range to 7-12 to reflect reality. The choice of range does matter since using a different age range (7-12 not 6-11) for the calculation affects the estimated enrolment rates (Table H.4), as does a third alternative of extending the age range to 6-12. Since this latter period is seven years, compared to the six years of primary education it is not recommended. It will deflate enrolment rates, and increase the AR relative to the 6-11 category (but decrease it relative to 7-12).

Table H.4: Enrolment rates for different age ranges, 2003

	6-11	7-12	6-12
GER	133.0	127.0	111.0
AR	85.1	86.3	85.7
NER	84.1	81.8	81.8

14. Surprisingly, in these results the GER for 6-11 is more than that for 7-12. The numerator is identical in both cases (the number of children in primary). The difference lies in the denominator, which in both cases includes children aged 7-11. The denominator of the former also has those aged 6 and the latter those aged 12. With a population pyramid of the expected shape there should be more 6 year olds than 12 year olds (for reasons of both population growth and mortality). However, in our data there are more 12 year olds than 6 year olds. This fact may be partly explained by small sample size (only around 200 per year in each category) in the 2003 data, but it is also observed in the larger GLSS4 sample. The finding is therefore a result of bunching, a problem whereby respondents prefer certain ages to others. This problem is common at older ages with bunching around 60 and 70. Table H.5 illustrates this problem using GLSS4 data for middle-aged people. The right of the table gives the number of people from 29-46 showing 30, 35, 40, and 45 and the years either side. Of the 1,670 people shown, 16 percent reported they are aged 30 compared to only 7 and 8 percent claiming to be 29 or 31 respectively, a clear case of bunching. The same can be seen for 35, 40, and 45. For children (the left-hand side of Table H.5) bunching appears to affect even numbers, each of which has a higher percentage of the sample than the odd ages to either side. If bunching is worse at older ages, which seems to be the case, then this fact will explain why there are more 12 year olds in the sample than 6 year olds.

15. Bunching is the likely reason why the GER is less when the age range 6-11 is used rather than when the age range 7-12 is used, which is the opposite to what is to be expected. All survey data will suffer from this problem — but so will the population census, so the issue is not one of sample size. The school census is, if anything, less reliable, since it relies on the head teacher for information on year of birth (and collects only year not month).

Table H.5: Bunching of reported ages in GLSS4

Age	Number	Percent	Age	Number	Percent
5	717	6.89	29	121	7.25
6	824	7.92	30	270	16.17
7	776	7.46	31	137	8.20
8	870	8.37	34	142	8.50
9	775	7.45	35	215	12.87
10	893	8.59	36	126	7.54
11	670	6.44	39	82	4.91
12	870	8.37	40	188	11.26
13	704	6.77	41	78	4.67
14	639	6.14	44	61	3.65
15	699	6.72	45	163	9.76
16	531	5.11	46	87	5.21
17	442	4.25			
18	583	5.61			
19	407	3.91			
Total	10,400			1,670	

So What Has Happened to Enrolments?

16. The preceding arguments leads to two conclusions:

- Analysis of enrolment trends is best based on survey, rather than school census, data
- The appropriate age range for calculating primary enrolments is 7-12, rather than 6-11

17. These conclusions should not be taken to mean that the school census data should be disregarded. They are an invaluable tool in educational planning. The weakness of not covering the private sector could be addressed. But the problem of the denominator will remain. It is thus better to work with data from nationally representative samples.[5] This is not to say that survey data are not without problems, which have been noted above. In part, but not entirely, these problems are overcome by large sample size, such as is available from CWIQ.

18. Table H.6 presents all three indicators calculated from GLSS2, 3, and 4 and the 2003 GSS/OED survey. These data show a clear rise in all three of NER, AR, and GER at both primary and JSS level. The rise is also present including data on children living elsewhere, which is only possible with GLSS2 and the GSS/OED survey.

5. This statement is at least so to capture national trends. Sample data may not be representative at sub-national levels. For example, GLSS data are representative for the country's three ecological zones, but not regional level. However, the 2003 CWIQ has a sufficiently large sample to be representative at district level.

Table H.6 (a): NER, AR, and GER, 1988-2003 (children living with parents)

	Gross enrolment rate (GER)	*Attendance rate (AR)**	*Net enrolment rate (NER)*
1988			
Primary	103.5	73.1	72.1
Middle	54.8	72.1	33.6
Secondary	25.3	44.1	18.1
1992/93			
Primary	106.6	74.4	72.6
Junior Secondary	66.1	78.5	28.6
Secondary	28.0	62.1	13.1
1998/99			
Primary	119.0	83.1	80.8
Junior Secondary	68.5	84.9	33.3
Secondary	32.5	61.3	14.6
2003			
Primary	133.0	85.1	84.1
Junior Secondary	70.6	86.9	30.7
Secondary	38.7	71.0	19.5

* Attendance rates are age, not school, specific. The age ranges used here correspond to the relevant school age ranges (see text for further discussion).

Source: Calculated from GLSS2, 3 and 4, and GSS/OED survey.

Table H.6 (b): NER, AR, and GER, 1988-2003 (including children living elsewhere)

	Gross attendance ratio	*Attendance ratio*	*Net attendance ratio*
1988			
Primary	102.9	71.9	71.0
Middle	55.5	71.1	33.9
Secondary	22.9	36.1	14.1
2003			
Primary	129.9	85.9	81.4
Junior Secondary	77.1	82.2	39.7
Secondary	40.8	56.6	21.0

19. This increase is not inconsistent with the MOEYS data. Table H.7 re-presents the MOEYS numbers modified in two ways: (1) the school age population is re-estimated to interpolate with a constant growth rate from 1986-2000, thus eliminating the population drop in 2000; and (2) 2000 enrolments are adjusted assuming a further 13.1 percent of children enrolled in private schools. The data now show the same upward trend as reported in Table H.5. However the gross enrolment rate is lower, resulting from incomplete coverage of the school census and the fact that MOEYS data may under-estimate private enrolments.

Enrolments Among the Poor

20. Has enrolment growth benefited all population groups? Table H.8 presents attendance rates by expenditure tercile. The expected pattern of higher enrolments with higher income is observed in all years. However, enrolments have risen in all groups. For primary the increase in the enrolment rate has been faster among lower income groups (17 percentage points for the bottom tercile and 13 for the other two), so that the enrolment gap has been narrowed. For middle/JSS and secondary enrolments have grown more rapidly among the less poor, resulting in a widening gap.

Table H.7: Recalculated MOEYS gross enrolment rate

	Children of school age	*No. enrolled*	*GER*
1986	2,173,089	1,679,072	77.3
1990	2,417,172	1,945,422	80.5
1991	2,482,362	2,011,062	81.0
1992	2,549,309	2,047,293	80.3
1993	2,618,063	2,138,635	81.7
1994	2,688,670	2,154,676	80.1
1995	2,761,182	2,197,172	79.6
1996	2,835,650	2,333,347	82.3
1997	2,912,126	2,445,353	84.0
1998	2,990,664	2,562,229	85.7
1999	3,071,320	2,684,689	87.4
2000	3,154,152	2,800129	88.8

Table H.8: Attendance rates by expenditure tercile

	Tercile I	*Tercile II*	*Tercile III*
1988			
Primary	62.6	75.2	79.8
Middle	64.1	71.6	79.0
Secondary	31.9	37.1	40.1
1992/93			
Primary	65.5	76.1	85.6
Junior Secondary	71.1	79.9	86.7
Secondary	57.2	62.1	65.1
1998/99			
Primary	74.9	85.9	90.5
Junior Secondary	79.3	87.5	88.2
Secondary	55.7	61.4	67.9
2003			
Primary	79.5	88.4	93.0
Junior Secondary	72.7	84.3	92.1
Secondary	48.2	60.4	61.8

REPETITION, DROPOUTS, AND ATTENDANCE

21. The Education Sector Review states that "Primary Schools experience very low repetition rates ranging from 3 to 10 percent… A [recent] study estimated drop out rates of

29.5% for girls and 20.2 % for boys whereas EMIS data estimates national rates of 10% for boys and 12% for girls. [The] study indicated that in two districts of the North, out of a cohort of 1000 girls as many as 740 dropped out in primary school. However, at an average transition rate of 95% it would appear the majority of pupils who reach Primary 6 continue to JSS" (MOEYS, 2002: 12-13). These statements are supported by the table reproduced here as Table H.9.

Table H.9: ESR data on completion and transition rates in basic education

Year	*Completion Rate for P6 (%)*	*Completion Rate for JSS 3 (%)*	*Completion Rate for Basic Education (%)*	*Transition (pass) from P6 to JSS1*	*Transition (pass) rate from JSS to SSS (%)*
1991	70.0	82.8	50.5	96.8	35.3
1992	70.1	82.8	51.0	93.9	33.8
1993	72.1	82.6	54.3	95.0	34.8
1994	75.4	82.4	56.8	94.5	N/A

Source: From MOEYS (2002)

Repetition

22. Repetition rates are expected to be low in Ghana since there is automatic progression through the first nine grades. Pupils need only satisfy a minimal attendance requirement to pass from one grade to the next. Only on completing JSS3 is the Basic Education exam taken which serves as a qualifying exam for senior secondary. So there may be repetition of JSS 3, although that turns out not to be the case.

23. Data on repetition are available from the school census, which asks for the number of repeat students in each grade. However, these data are not reported in the annual census report.

24. The school survey in GLSS2 and the GSS/OED survey asked the same question, the results from which are shown in Table H.10. These data confirm the low rates suggested by the Education Sector Review, averaging just under 6 percent in primary and 3 percent in JSS in 2003, both of which are increases compared to 1988.

Table H.10: Repetition rates from GLSS school survey data

Primary			*Middle/JSS*		
	1988	*2003*		*1988*	*2003*
Grade 1	6.5	8.3	Middle 3	0.7	..
Grade 2	4.0	5.7	Middle 4	0.8	..
Grade 3	3.3	4.4	JSS 1	1.8	3.2
Grade 4	2.6	4.6	JSS 2	1.0	4.3
Grade 5	2.4	3.7	JSS 3	..	0.5
Grade 6	2.0	3.6			
Primary	**3.3**	**5.8**	**Middle/JSS**	**1.1**	**2.7**

DROP OUT, TRANSITION AND RETENTION

25. The transition rate is the proportion of children completing one grade who pass onto the next. However, data nearly always refer to the proportion of children entering a grade compared to the number who entered the previous grade in the preceding year, which is more appropriately called the retention rate. These data conflate those who drop out during the course of the year and those who complete the year but do not begin the next. This distinction matters most when looking at transition between levels of schooling, such as from primary to JSS and JSS to SSS.

26. In principle the school census data could be used to calculate drop-out\transition rates. Data are collected on the number enrolled in each class, including the number transferring in and out from other schools. By combining data from consecutive years the dropout rate can be calculated as enrolments in grade X less net transfers minus enrolments in grade (X-1) in the previous year all divided by enrolments in grade (X-1) in the previous year. This quite complicated piece of analysis appears not to have been undertaken so that no data on dropouts are in fact available from the school census.

27. A cruder method of analysis is to perform the calculation using national aggregates. Such analysis has been reported in MOEYS education statistics publications in the past, though not at present (but are presumably the basis for the statement that there is a 95 percent transition rate from primary to JSS). An example is given in Table H.11 using annual enrolment data by grade from 1988-90. The retention rate is simply the percentage enrolled in grade X as a percentage of the number enrolled in the grade X-1 in the preceding year. The dropout rate is 100 minus the retention rate. The final column of the bottom part of the table shows the percentage of those entering primary school who reach grade 6 (though may not complete it), using the retention rates observed for that year.[6] Using a longer time series it would be possible to calculate the actual percentage of a cohort entering in year X entering P6 five years later.

6. This calculation is analogous to the way in which life expectancy is calculated, i.e., expected life span given the current probability of death of each age cohort, which may well differ from the probabilities a newborn will in fact face during the course of their life.

Table H.11: Total enrolments by grade and retention rate

	P1	*P2*	*P3*	*P4*	*P5*	*P6*
1988	363,557	299,878	283,741	262,344	235,602	214,738
1989	377,663	327,276	299,329	279,261	253,720	231,263
1990	420,772	362,061	332,565	302,513	275,640	251,871
Retention rate						
	P2	*P3*	*P4*	*P5*	*P6*	*P1-P6*
1989	90.0	99.8	98.4	96.7	98.2	84.0
1990	95.9	101.6	101.1	98.7	99.3	96.5

28. There appears to be an anomaly in the retention rate for 1989, which is far below the other rates. In addition, rates in excess of 100 should not be observed. There may be two sources of these problems. First, incomplete coverage of the data, with the proportion covered varying from year to year. Second, the treatment of private schools. In this case actual data were available for private enrolments in 1990 but for 1988 and 1989 public enrolments were increased by 3.7 percent to include children at private schools. If, as is more likely, this percentage were increasing over time, including parents switching children out of public school and into private (most likely from first grade) then both the apparent anomalies may disappear. The growth in private enrolments undermines the validity of retention and transition calculations made using national data unless these data have comprehensive coverage of the private sector.

29. Retention rates may also be calculated from survey data using a technique called survival analysis. The requisite calculation, using an example from GLSS2 is shown in Table H.12. The procedure is as follows. The sample is defined as children of a given age. Although in principle the whole sample could be used, the data would not refer to any particular year as they would include the education experiences of people educated 50 years ago or more. In the example given here the sample for primary school is all children aged 15 or under, so who will have begun primary education at most nine years previously. The questionnaire for GLSS asks "the highest grade attained." It can be safely assumed that a child whose highest grade attained is, for example, P3 has completed P1-2. The data show that there are 2,333 children in the sample who have completed P3 or higher, and these are shown as entering P4.[7] Some may not have in fact entered P4 but left on completing P3 — their departure is picked up by the calculation. The number "entering P4" is shown to explain this calculation. The figure of 2,333 compares with the 3,012 who entered P3 (completed P2 or higher). So in the sample, 679 more children completed grade 3 than completed grade 2. Of those 679, 592 are still in school. These 592 have not dropped out. The remaining 87 (=679-592) completed P2 but are no longer in school, so either left school on completing P2

7. A complication arises with Grade 1, which children currently in school who have not completed any grade may be either in preschool or first grade. This problem and its solution were discussed earlier in this annex. Here children less than six are excluded since they will not be in primary and those aged 7 and above can be assumed to be in primary. Of children aged six only those who have completed preschool are included. Since these may be less likely to drop-out there is an undoubted bias in our data. This bias affects the drop-out rate for P1 only, but, through that, affects the survival function. The overall bias will not be that great, and the clear reduction in drop-out rates between 1988 and 2003 unaffected.

or at sometime during the third grade. The P3 dropout rate is thus 87/3012 = 2.9 percent, and the retention rate 97.1 percent.

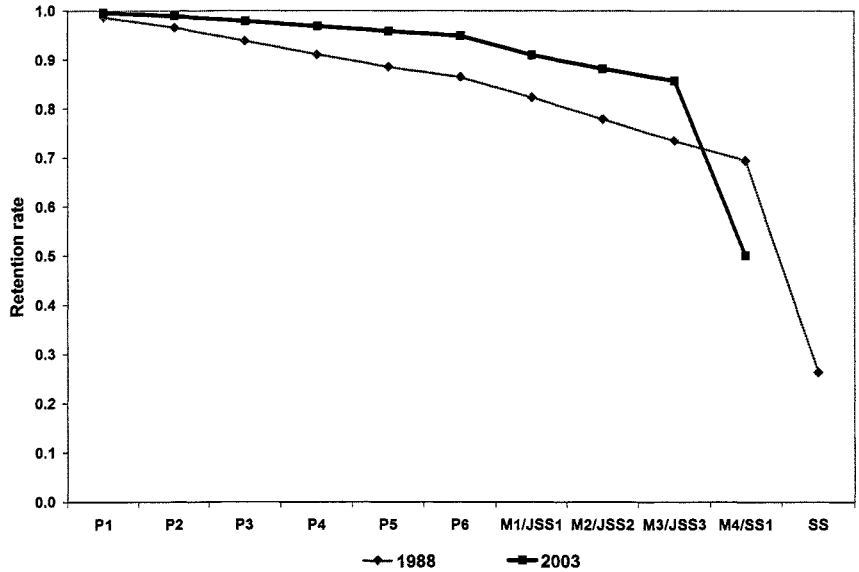
30. Separate samples were used for the primary and middle/JSS age ranges. The sample for primary was for children aged 15 or under at the time of the survey, so who started primary at most nine years earlier. For middle/JSS it was those aged 23 or under at the time of the survey so they would have started middle/JSS nine years earlier at most.

Table H.12: Survival function analysis of dropout rates

	Number	*Still in school*	*Drop out*		*Survival function*
			Number	*Percent*	
P1	4514	702	60	1.3	0.987
P2	3752	661	79	2.1	0.966
P3	3012	592	87	2.9	0.938
P4	2333	473	68	2.9	0.911
P5	1792	420	51	2.8	0.885
P6	1321	368	31	2.3	0.864
M1	922	310	33	3.6	0.833
M2	579	240	21	3.6	0.803

31. The survival function shows the cumulative effects of dropout on the initial cohort. In 1988, 86 percent of those who began primary completed the final year. And 83 percent completed at least the first year of middle school, indicating a transition rate in excess of 95 percent. These data may be summarized graphically by plotting the survival function (Figure H.1).

Figure H.1: Retention rates (survival function)

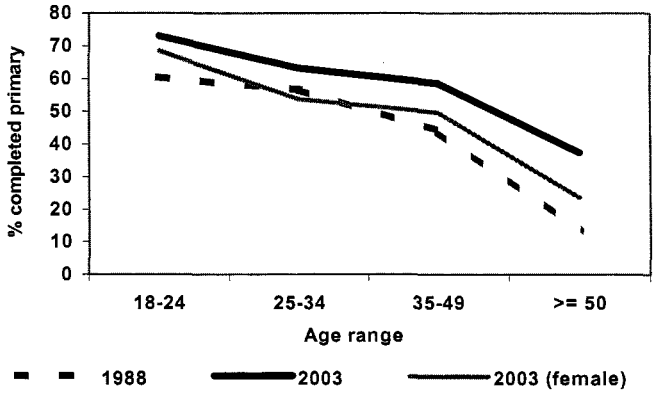


Source: GLSS2 and GSS/OED household survey

32. The results shown in Figure H.1 indicate that dropout rates are relatively low and have decreased. In 1988, 86 percent of those entering primary made it to sixth grade, and 69 percent to the final year of middle school. There was a substantial drop-off between middle school and secondary, with only 26 percent of the sample starting secondary. The comparable figures for 2003 are higher still at 95 and 86 for primary and JSS, respectively.

33. The analysis of the GSS data does not support the idea of the high dropout levels indicated in the Education Sector Review. On the other hand, the GLSS data do agree with the completion rate of 75 percent of students.[8] The primary completion rate is the percentage of the reference population having completed primary (highest grade is P6 or higher). This statistic can be calculated from GLSS data. It makes sense to break the population down into age ranges, since younger age cohorts (who have benefited from higher enrolment rates) are more likely to have completed primary. Figure H.2, which presents data from GLSS2 and the GSS/OED survey thus confirms a rising completion rate in two ways. First, the line drawn from each survey is downward sloping — within each survey the data show that older age cohorts are less likely to have completed than younger ones. Second, the line for 2003 lies above that for 1988. People aged 18-24 today are more likely to have completed primary than the same age group 15 years earlier, both as enrolments have risen and drop-outs fallen. The primary completion rate for this age group in 2003 is 73 percent, very close to the 75 percent reported by MOEYS. The figure also shows completion rates for females from the 2003 data. The female completion rate has converged on that for male over time, although a gap remains.

Figure H.2: More children finish school (primary completion rates)



Source: **GLSS2 and GSS/OED household survey**

34. Completion is correlated with income. Children from poorer households are less likely to complete their education than the children of the better off (Table H.13). However, completion rates have improved for all income groups, so that the poorest third today are more likely to complete primary than were the richest third 15 years ago (Table H.13).

8. UNESCO data give a survival rate of 75 per for Grade 4 and 66 percent to Grade 5. However, it seems that these figures are completion rates, not survival rates (and even then seem rather low).

Table H.13: Retention rate by expenditure tercile

	1988				2003		
	Tercile I	*Tercile II*	*Tercile III*		*Tercile I*	*Tercile II*	*Tercile III*
P1	0.98	0.99	0.99	P1	0.99	1	1
P2	0.96	0.97	0.98	P2	0.99	0.99	1
P3	0.93	0.93	0.96	P3	0.97	0.98	0.99
P4	0.9	0.91	0.93	P4	0.96	0.97	0.98
P5	0.86	0.88	0.92	P5	0.93	0.94	0.97
P6	0.83	0.86	0.89	P6	0.9	0.93	0.96
M1	0.79	0.81	0.86	JSS1	0.84	0.89	0.93
M2	0.74	0.77	0.82	JSS2	0.8	0.88	0.91
M3	0.69	0.72	0.78	JSS3	0.76	0.86	0.88
M4	0.65	0.68	0.74	SS1	0.35	0.52	0.58
SS1	0.18	0.26	0.33				

Attendance

35. The school census collects data on attendance, asking the average attendance for each grade for a month preceding the census. However, these data are not reported in the MOEYS publication *Education Indicators at a Glance* or in the Education Sector Review. The 2003 GSS/OED survey asked how many pupils were in school on the day of the survey. The responses indicated attendance rates of around 80 percent (Table H.14). Since non-attendance may be seasonal, at least in rural areas, only detailed data collection, possibly of administrative sources, can really get at this issue.

36. In addition, the GLSS household questionnaire asks how many hours a child spent in school the previous week. These data, shown in Table H.15, mainly capture the rise in school hours resulting from the official policy of lengthening the school day from 4 to 5 hours, the rise of extra classes and the longer hours in the increasingly important private school sector.

Table H.14: Attendance by grade

Primary		*JSS*	
Grade 1	82.0	JSS1	79.7
Grade 2	83.8	JSS2	79.9
Grade 3	81.9	JSS3	76.5
Grade 4	81.5		
Grade 5	83.2		
Grade 6	82.4		
Primary	82.5	JSS	78.7

Table H.15: Hours spent in school in past 7 days by primary and middle/JSS students

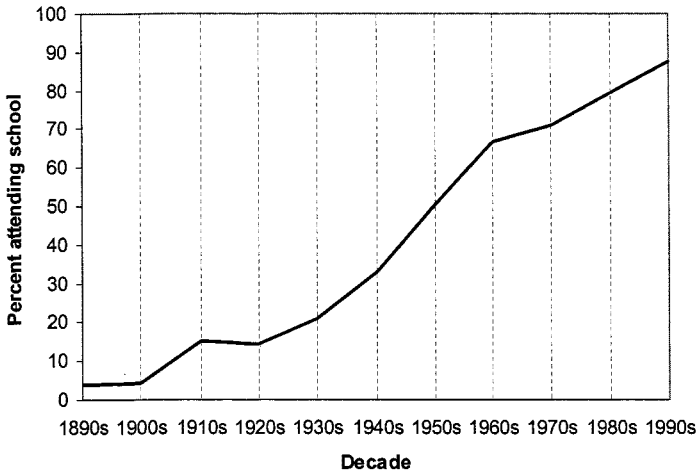
	1988	*2003*	
		Public	*Private*
20 or less	58.7	16.3	23.1
20-30	39.1	55.3	30.1
More than 30	2.2	28.4	46.9
Total	100.0	100.0	100.0
No. of observations	3464	1158	286

STOCK INDICATORS OF EDUCATION

The Stock of Schooling: Education Participation

37. It is useful to distinguish between stocks and flows. The enrolment rate is a flow, and the percentage of the population who have ever been to school is a stock. Data on the latter may be calculated from population census or survey data. Figure H.3 shows the results from combining the data from GLSS1-4 and the GSS/OED survey. The sample is all those aged 10 and over, which is more than 56,000 people.[9] The participation rate (percentage having attended school) was calculated on an annual basis for age cohorts based on the year of birth. Seven years were added to the year of birth to give the age at initial enrolment and decade averages calculated from these figures (sample sizes are too small for annual data until the 1980s).

Figure H.3: School participation rates (percent ever attended school) by decade of initial enrolment



38. The figure shows a continual rise in the percentage of the Ghanaian population aged 10 and above who have attended school (the participation rate). This does not mean that the enrolment rate was always rising. There have been periods in which it fell, such as the late 1970s. But the participation rate continued to rise, albeit more slowly. This happens because there is both an inflow to the stock of new enrollees and an outflow from those who die. If those dying are less educated than the average, which is expected to be the case in Ghana (since they are old and so were of school age when the enrolment rate was far lower than today), then this fact will exert an upward pressure on the participation rate. For this reason stock data are not a good measure of current educational performance.

Literacy

39. The most commonly used stock measure is literacy, usually taken as literacy among those aged 15 and above. Literacy is most commonly measured indirectly. That is, the actual indicator is based on the percentage of the population who have received at least five years of primary education, i.e., completed P5 in the case of Ghana. Alternatively, literacy may be self-assessed. The GLSS questionnaire asks if each household member can "read a newspaper in English."

9. Including younger children will downward bias the result for years near to the survey as young children have probably not yet started school.

40. Data from test scores cast doubt on the validity of both these measures. Data from the Criterion Reference Test show that only 60 percent of P6 students achieve mastery level in English, the other 40 percent should not really be considered literate but are according to the indirect definition. The 1988 and 2003 GSS surveys administered a simple eight-question, multiple-choice test to all those aged 9-55. In 1988, children who had reached P5 scored an average of 2.2 — little better than guessing. By 2003 this had improved to 4.7, but a large percentage (42 percent) were still scoring 4 or less, which means that they can barely read.

41. The GSS data also allow us to analyze the reading ability of those claiming to be literate on the self-assessed question. Table H.16 shows the percentage who replied they could read a newspaper in English according to their test score. In 1988, over 80 percent of those scoring between one and three marks out of eight replied that they could read. Although the situation is not so bad in 2003, more than a third of those scoring 4 or less claimed to be able to read.

Table H.16: Percent replying they can read a newspaper in English tabulated against test score on simple English test

	1988	*2003*
0	48.5	29.2
1	78.2	44.0
2	86.8	50.5
3	82.7	57.1
4	82.3	53.6
5	86.5	67.2
6	97.4	78.6
7	97.5	88.2
8	96.6	90.1

42. Taking these factors into account, it is interesting to compare different literacy estimates (Table H.17). The highest estimates are those reported in *World Development Indicators,* followed by the indirect method based on those having at least five years of schooling, with self-reported literacy some way behind. Lowest of all are the test-based estimates, but even these are over-estimates since those aged 55 and above (approximately 10 percent of the sample population) did not take the tests, and their literacy may be assumed to be lower than that of those aged 15-55.

Table H.17: Literacy estimates by different approaches (those aged 15 and above)

	1988/89	*2003*
Reported literacy rate	68[1]	71[2]
Population completing P5 or higher	48.5	62.2
Self-reported literacy	43.2	51.1
Scoring 5 or more on simple English test	36.7	44.8

Note: 1/ 1990; 2/ 2000. Source for reported literacy rate is World Development Indicators, other data calculated from GLSS2 and GSS/OED survey.

43. As it is a stock indicator, the literacy rate is likely to only change slowly. It can continue to rise even when enrolments are falling so long as the percentage of those attaining five years of education remains above the percentage among those leaving the denominator (i.e., dying). A more sensitive measure, which is among the MDG indicators for education, is literacy among those aged 15-24. Table H.18 shows that this measure has risen by 20 percentage points in Ghana between the two surveys, equivalent to a 40 percent increase in literacy. This improvement can be attributed to school quantity and quality through an accounting decomposition:

$$Literacy = \frac{No.\,literate}{Total\ no.} = \frac{No.literate}{No.\,in\ school} \times \frac{No.\,in\ school}{Total\ no.}$$

44. The percentage change in literacy is the sum of the percentage change in school quality (measured as the proportion of school attendees who are literate) and the percentage change in enrolments (given as an age-specific attendance rate). The results of this calculation, given in Table H.18, show that school quality accounted for a bit more than half (57 percent) of the increase in literacy.

Table H.18: Sources of literacy growth among 15-24 year olds

	1988	*2003*	*Percentage change*	*Share*[1]
Absolute numbers				
1. Literate	475	931		
2. Attended school	695	1124		
3. Total	979	1363		
Ratios and decomposition				
Literacy rate (1/3)	48.5	68.3	40.8	
School quantity (2/3)	71.0	82.5	16.2	43.3
School quality (1/2)	68.3	82.8	21.2	56.7

Note: calculated as share of the sum of the two terms, which implicitly imputes a pro-rata share of the interactive residual term.

Mean Years of Schooling

45. The United Nations Development Program (UNDP) used mean years of schooling as a component of the Human Development Index for several years, although it has now been dropped (literacy is still part of the index). The World Bank's *World Development Indicators* reports mean years of schooling, as calculated by Barro and Lee (2000). Table H.19 shows the Barro and Lee data for Ghana, and Table H.20 compares Ghana's performance with that of the rest of sub-Saharan Africa. In interpreting the results three points should be noted: (1) most of the data are constructed, (2) there is a problem of censoring, and (3) data for a particular year are describing the education system some years before.

Table H.19: Percentage of population at different levels of education 1960-2000

Year	None	Primary		Secondary		Post-Secondary		Mean years of schooling
		Total	Complete	Total	Complete	Total	Complete	
Aged 25 and over								
1960	86.2	12.1	2.8	1.1	0.3	0.7	0.5	0.69
1965	82.7	14.7	3.4	2.0	0.4	0.6	0.5	0.87
1970	77.7	5.8	1.3	16.1	3.3	0.4	0.3	2.03
1975	74.7	9.6	2.2	15.2	2.6	0.5	0.4	2.07
1980	66.1	18.7	4.3	14.6	2.2	0.6	0.5	2.35
1985	60.2	20.1	4.7	19.0	2.5	0.8	0.6	2.87
1990	54.0	22.8	5.3	22.4	2.6	0.9	0.7	3.34
1995	48.8	24.8	5.8	25.4	3.0	1.0	0.8	3.75
2000	46.2	25.1	5.8	27.6	3.3	1.1	0.9	4.01
Aged 15 and over								
1960	79.5	18.2	4.2	1.6	0.3	0.7	0.5	0.97
1965	77.2	19.3	4.5	2.9	0.3	0.7	0.4	1.12
1970	65.1	7.4	1.7	27.3	4.9	0.3	0.2	3.25
1975	61.1	11.9	2.8	26.6	3.7	0.4	0.2	3.32
1980	56.7	16.7	3.9	26.0	3.1	0.6	0.3	3.44
1985	52.9	20.6	4.8	25.8	2.7	0.7	0.4	3.57
1990	51.0	22.8	5.3	25.5	2.4	0.8	0.4	3.62
1995	47.7	26.0	6.1	25.4	2.4	0.9	0.5	3.75
2000	44.8	28.6	6.6	25.7	2.5	1.0	0.5	3.89

Source: http://www2.cid.harvard.edu/ciddate

Table H.20: Mean years of schooling in Ghana and sub-Saharan Africa

	Mean years of schooling				Annual growth rate			
	Aged 15 and over		Aged 25 and over		Aged 15 and over		Aged 25 and over	
	Ghana	SSA	Ghana	SSA	Ghana	SSA	Ghana	SSA
1960	0.97	1.74	0.69	1.39	..	..	..	..
1970	3.25	2.07	2.03	1.63	12.9	1.8	11.4	1.6
1980	3.44	2.39	2.35	2.14	0.6	1.4	1.5	2.8
1990	3.62	3.14	3.34	2.79	0.5	2.8	3.6	2.7
2000	3.89	3.52	4.01	3.78	0.7	1.1	1.8	3.1

Source: http://www2.cid.harvard.edu/ciddate and Barro and Lee (2000).

46. Barro and Lee estimate the mean years of schooling using a perpetual inventory method. The data requirements are fairly demanding and are often based on data that are themselves estimates, such as the population structure data provided by the UN, which is only actual data for census years. Other than population structure, Barro and Lee rely on UNESCO data. The method is to calculate, at five-year intervals, the number of people with different levels of education (incomplete primary, primary, incomplete secondary, etc.). For example, the stock of those with no education is equal to the stock of those with no education five years ago, "depreciated" by the mortality rate plus the number of people currently aged

15-19 who did not go to primary school. This latter figure is calculated as the number of people aged 15-19 multiplied by one, less the primary gross enrolment rate (adjusted for repetition). Dividing this figure by the total number of people aged 15 and over gives the proportion with no schooling.

47. These data should not be interpreted as giving the mean years of schooling in the year to which the data refer for two reasons. First there is a problem of censoring. If enrolment rates are rising then a child currently in primary is more likely to go onto secondary and tertiary than are children currently at that level. The data provide the current years of schooling of that child, but not the years they are expected to get. The way around this problem is to pick an age at which all (or as good as all) people will have completed their education, such as 25. Barro and Lee also report mean years of schooling for those aged 25 and over, thus avoiding the problem of censoring. However, if mean years of education is around 4 and children start school at 6 or 7, then the data refer to children who left school at least 15 years ago. So the figure for 2000 is describing the situation in the education sector mid-1980s and before. Barro and Lee's purpose in constructing the data set was a measure of the human capital stock. For this purpose the time lag discussed here does not matter: the overall mean years of schooling (MYS) is a measure of the capital stock. The lag only matters if the variable is being interpreted as describing changes in the education sector

48. Table H.21 shows mean years of schooling calculated from GLSS2 and GSS/OED data. The figures show the expected rise both across age ranges within each survey and for each age range between surveys. The figures are rather higher than those reported by Barro and Lee, but similar to the UNESCO expected years of schooling figures discussed below — though, as explained below — these two measures are quite different.

Table H.21: Mean years of schooling by age range, 1988 and 2003

	1988			*2003*		
	Male	*Female*	*Total*	*Male*	*Female*	*Total*
25-34	7.8	4.9	6.2	8.5	6.0	7.1
35-49	6.8	3.2	4.9	8.4	5.8	6.9
50 and above	2.6	0.6	1.5	6.5	2.6	4.4

49. An alternative is to construct a measure of the expected years of schooling based on current enrolment rates in a manner analogous to the calculation of life expectancy. In this case, current enrolment rates are used although it is known that they will probably not be the actual relevant probabilities facing a child as he grows. This measure is reported in the World Bank's *World Development Indicators* and by UNESCO, which call it school life expectancy. For example, if the school system consists of primary, secondary and tertiary with are 6, 6, and 3 years long respectively with enrolment rates of 90, 60, and 10 percent, then the expected years of schooling is 0.9 x 6 + 0.6 x 6 + 0.1 x 3 = 9.3 years.[10] Table H.22 reports the figures given by the World Bank and UNESCO. Although for the former claims

10. The calculation as stated here assumes all students complete. The formula can be adjusted for drop outs. It can also be adjusted for repetition if desired. Repeaters have more years of schooling, though whether they should be considered as having so depends on the purposes for which the indicator is required.

the latter as their data source, there is a marked, unexplained, discrepancy between the two sources.

50. The expected years of schooling is not a stock measure as is mean years of schooling (MYS). Expected years of schooling is based on current enrolment rates, whereas the mean years of schooling embodies all past enrolment rates and changes in the structure of schooling, as occurred in Ghana.

Table H.22: Expected years of schooling from different sources

	1998		*2000*
	UNESCO	*World Bank*	*UNESCO*
Males	7	3	8
Females	6	2	7
Total	7	..	7

51. A difficulty in constructing the variable is the choice of enrolment rate: NER, AR, or GER? The net enrollment rate is clearly inappropriate since it excludes children attending school at the "wrong age" and so under-estimates schooling. The attendance rate refers to age ranges not levels of schooling. We know that 71 percent of 13-15 year olds were in school in 2003, but the AR does not say if they were in primary (6 years) or JSS (3 years). The GER, therefore, seems to be the appropriate rate to use. Using the GERs given in Table H.5, Table H.23 reports the expected years of schooling from GLSS data. Tertiary is excluded here, but the tertiary enrolment rate is low enough to not worry about that. Expected years of schooling fell from 1988 to 1992 as a result of the reduction of pre-university education from 17 to 12 years, but had reached the 1988 level by 1998 and has now passed it.

Table H.23: Expected years of schooling

1988	10.2
1992	9.2
1998	10.2
2003	11.3

SUMMARY

52. This Annex reports data on educational attainment based on the information contained in the various rounds of the GLSS. These surveys are argued to be an accurate source of education data, covering areas such as enrolments, dropouts and, with the education tests in GLSS2 and the GSS/OED survey, literacy. The main finding is that, contrary to official data, there has been a rise in educational attainment in Ghana over the past 15 years. Enrolments have risen, and the drop out rate has declined so that completion has increased. The gender gap at primary level has been eliminated. The literacy rate has increased as a consequence of both higher enrolments and the improved quality of schooling, as shown by higher test scores.

Annex I: School Attainment

INTRODUCTION

1. Basic education in Ghana is free and compulsory. However, the law is not enforced and parents are free to decide whether to enroll their children or not. Once enrolled in grade one, the child can go through to JSS 3 without examinations, and repetition rates are generally low (see Annex H). This makes school attainment largely dependent on the parents' decision regarding the child's education. In this appendix, a model is used to explain children school attainments (i.e., highest grade achieved). The next section briefly presents reasons given by parents and teachers as to why children do not attend school, setting the scene for the econometric model in the section that follows. The concluding section makes some observations regarding schooling and child labor.

Reasons Given by Parents and Teachers for Children Not Attending School

2. A first look at the reason why parents are not enrolling children in school is provided by the survey interviews. Head-teachers were asked to list the main reason why some children in their area are not attending school. Similarly, parents were asked why their child was not attending school, or why had he or she left school at some point. Answers where grouped in three main categories. The results are unequivocal. The large majority of head-teachers and parents agree that children do not attend school because it is too costly (Table I.1-I.3). In other cases, though school is affordable, parents do not believe in the value of education. A small fraction of head-teachers and parents blame the poor condition of schools or the excessive distance.

Table I.1: Primary school head-teachers: reason for children not attending school

	Number	*Percent*
Parents cannot afford/children need to work at home	326	78.2
Parents do not value education	47	11.3
School too far/low quality	9	2.1
Other	35	8.4
Total	417	100.0

Table I.2: Household interviews: reason for their children not attending school*

	Number	*Percent*
Parents cannot afford/children need to work at home	129	45.9
Parents do not value education	63	22.4
School too far/low quality	20	7.1
Other	69	24.5
Total	289	100.0

*Only children aged between 6 and 21

Table I.3: Household interviews: reason for children stopping attending school

	Number	*Percent*
Parents cannot afford/children need to work at home	34	35.0
Parents do not value education	4	4.1
School too far/low quality	3	3.1
Not doing well at school	36	37.1
Other	20	20.6
Total	97	100.0

*Only children aged between 6 and 21

3. The responses show that some of the factors influencing the decision whether to enroll children in school are less relevant for the decision to stop school. Children do not leave school because of poor school quality, since this is generally known beforehand, and parents do not change their mind about the importance of schooling while their children are attending school. On the other hand, child performance at school becomes the most important factor for the completion of studies once the child has been enrolled. This fact suggests estimation of two models, one explaining child enrolment, and the other explaining dropouts. However, dropout rates are relatively low in contemporary Ghana, and this would make the second model hard to estimate for lack of observations. Hence, enrolment and dropouts are explained at the same time in a single model.

Determinants of School Attainment

4. The sample used consists of all children aged between 9 and 15. Even considering delayed entry, the large majority of children have started school by the age of 9,[1] and completed primary by age 15. Considering children older than 15 might be problematic, since the model uses explanatory variables measuring current characteristics of localities and schools that would not be relevant to children having left school some years ago. The sample does not include "foster" children living outside the household. In 2003, 30 percent of these children lived in a different region than the household of origin, and the use of locality variables as explanatory variables for these children would be inappropriate. Exclusion of these children does not bias the sample since "foster" children are well represented (20 percent) among the households interviewed. A different problem arises here (Glewwe 1999), that the schooling decisions concerning these children are made by the household of origin rather than the household of residence (the household actually interviewed). A test is performed to see whether this is the case or not.

5. The variables included in the model measure the effects of school costs, household background, school quality, and child performance on educational attainment:

- *Household characteristics* include parents' education, per capita expenditure, and demographic composition. Education of the father and of the mother of the child is

1. Glewwe (1999) estimates a model for late start. However, as discussed in Annex H, the identification of late starts conflates late starts with repetition, thus over-stating the frequency of late starts.

measured in number of completed years of schooling. Per capita expenditure measures household welfare. Demographic structure includes the birth order of the child, and the number of siblings.[2] It has been shown that in Ghana larger households (in terms of number of siblings) have lower educational levels, and that children of higher order achieve higher educational attainment (Lloyd and Gage-Brandon 1994).

- *Child characteristics* include age, which captures cohort effects, and sex to test for the presence of gender discrimination. Child ability is measured by the innate ability factor estimated in Appendix G.[3]

- *School characteristics* include the household distance to the nearest primary school, which some parents have claimed to be responsible for leaving school. To enable comparisons between 1988 and 2003 a model is estimated using only the 10 school quality variables included in the school quality indices (see Annex D): availability of books, chalk, and writing desks, quantity and quality of classrooms, the presence of a library, the availability of water, and the quantity and quality of the blackboards used. These variables are measured for the school attended by the child. When the school attended is not known (as is always the case for children who never attended school), the locality mean is used. Another indicator of the quality of teaching received at the school is pupil teacher ratio. This ratio was disaggregated into two indicators, representing very low (less than 20) and very high (above 40) ratios. School costs are measured in terms of average school fees in each locality.

- *Community characteristics*: A dummy variable is included taking the value one if there is a private school in the locality. The model also includes location variables, namely the subdivision in three ecological zones and a dummy for rural areas.

6. The estimation method used is an ordered probit, where the outcome variables represents increasing years of completed schooling achieved by the child from zero (children who never attended school) to six (children who completed primary and beyond).[4] A problem that arises in estimating this model is the fact that many observations are censored. A large fraction of the children surveyed have not achieved a given schooling level, simply because they have not had time to do so. For example, a child of age 9 at the time of the interview cannot have achieved grade 6, but he might well be do so in the future. If we do not correct the estimation for censoring, results will be biased, since children of older age will have reached, on average, higher levels of schooling. One way of correcting for censoring is through the modification of the likelihood function used for the estimation of the standard ordered probit. See King and Lillard (1987) for a discussion of this method, Holmes (2003)

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2. Note that the birth order and the number of siblings of foster children is not known. For these children we used the sample means of order and siblings.

3. As in Appendix G, ability missing factors are set to the sample mean, and a dummy variable is created for these observations. Children with missing ability values are the foster children, whose parents live in the household of origin.

4. Years of schooling is based on grade completed. Repeaters will have in fact had more years of schooling to reach a given grade, but there is no way of detecting these children (see Annex H for more discussion).

for a recent application to household survey data, and Glewwe (1999) for an application to the same 1988 Ghanaian data as used here.[5]

7. Tables I.4 and I.5 present the regression results for 1988 and 2003 separately and for the pooled data. These results are presented here as these regressions are the basis for the selectivity terms used in the test score regressions in Annex G. However, there are two problems with the econometric model used for the estimation of educational achievements (ordered probit corrected for censored observations). The first problem is common to all ordered probit models. Coefficient estimates are not to be confused with the predicted probabilities. Predicted probabilities should be calculated for each of the seven possible outcomes, and discussed separately. It can be shown that predicted probabilities depend on the value of the thresholds, among other things, and that coefficient signs can be misleading (Johnston and DiNardo 1997). A second problem is that the correction for censoring used assumes that a child currently in school will achieve *at least* the grade level the child is presently attending. This seems too restrictive an assumption if there is non-negligible dropout. An alternative approach is a Cox regression of educational attainment that overcomes both these problems. Interpretation of the coefficients of a Cox model is unequivocal and the probability of dropping out for each observation is calculated conditionally on this observation being in the risk set (which leaves out censored observations for the time they are not longer observed). Thus, no assumption is made on the school grades obtained by the children in the sample.

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5. If the dependent variable consist of three outcomes corresponding to 3 increasing levels of schooling, the probabilities for a child of reaching a given outcome are (see Maddala for derivation and discussion of the standard ordered probit model):

$$P_1 = \Phi(c_1 - X\beta)$$

$$P_2 = \Phi(c_2 - X\beta) - \Phi(c_1 - X\beta)$$

$$P_3 = 1 - \Phi(c_2 - X\beta)$$

where $c1$ and $c2$ are the thresholds and $X\beta$ is the product of variables and coefficients to be estimated. The model can be estimated in this way for the uncensored observations, but these probabilities are not correct in the case of censored observations. For a censored child who has achieved level 1, the correct probability is not P2, as it would be for an uncensored child, but 1- $P2 - P3$, since we assume the child would achieve at least level 2, and possibly level 3. In general, for a censored child having achieved the schooling level j, the probability to be estimated is:

$$P_j = 1 - \Phi(c_{j-1} - X\beta)$$

The likelihood function for the censored ordered probit is therefore the sum of the likelihood function for the censored and uncensored observations, where the probabilities for the censored and the uncensored children are estimated differently in the way described above.

Table I.4: School attainment (censored ordered probit)

	1988			*2003*			*Pooled*		
	Coeff.	z-stat		Coeff.	z-stat		Coeff.	z-stat	
Community characteristics									
Forest	0.03	0.08		-0.02	-0.06		0.17	0.70	
Savannah	-1.33	-4.74	***	-0.07	-0.22		-0.76	-2.69	***
Rural	0.19	1.80	*	-0.09	-0.63		0.08	0.66	
Female	-0.39	-2.39	**	-0.26	-1.15		-0.34	-3.62	***
Female in Savannah	-0.03	0.10		0.30	0.26		0.24	1.75	*
Female in Forest	-0.17	-0.84		0.45	0.27		0.09	0.71	
Private school in locality	-0.03	-0.25		0.80	2.67	***	0.10	0.79	
Average school fee	-0.00	-2.15	**	-0.00	-0.39		-0.00	-0.34	
Household characteristics									
No. of siblings	-0.03	-1.61	*	-0.09	-3.42	***	-0.05	-2.23	***
Father's education	0.07	5.60	***	0.04	4.62	***	0.06	7.00	***
Mother's education	0.05	3.42	***	0.03	1.19		0.03	3.13	***
Ability	0.02	1.69	*	0.02	1.44		0.02	2.20	**
Missing ability	-0.26	-2.56	***	-0.27	-1.02	*	-0.23	-2.95	***
Log per capita expenditure	-0.05	-0.59		0.32	3.86	***	0.11	1.47	
Child characteristics									
Age	0.08	2.37	***	0.04	1.13		0.05	2.42	**
Birth order	0.13	2.87	***	0.12	3.27	***	0.10	3.00	***
School characteristics									
Distance (minutes)	-0.01	-2.24	***	-0.01	-1.04		-0.01	-2.21	***
English books	0.01	0.12		-0.07	-0.71		-0.01	-0.24	
Math books	0.06	0.62		-0.31	-2.39		0.02	0.12	
Chalk	0.00	0.01		0.19	1.43		0.09	1.00	*
Desks	-0.04	-0.37		0.94	2.62	***	0.09	0.86	
Adequate classrooms	0.00	0.05		0.01	2.09	**	0.00	0.81	
Classrooms can be used when raining	-0.12	-1.12		0.00	1.91	*	0.00	1.40	
Library	0.27	0.88		0.51	2.25	**	0.54	2.00	**
Water	-0.28	-1.20		0.10	0.57		-0.08	-0.45	
Classrooms with chalkboard	0.39	1.50		-0.31	-0.83		0.06	0.19	
Board quality	0.21	2.50	**	0.17	1.46		0.11	1.29	
Low pupil teacher ratio	0.11	0.66		1.00	2.88	**	0.14	0.76	
High pupil teacher ratio	-0.13	-0.59		-0.41	-1.73	*	-0.13	-0.59	
Number of observations	1399			1334			2733		
Log likelihood	-741			-489			-1342		

Table I.5: School attainment: Cox regression

	1988			2003			Pooled		
	Hazard ratio	z-statistic		Hazard ratio	z-statistic		Hazard ratio	z-statistic	
Community characteristics									
Forest	0.86	-0.31		1.35	0.70		0.73	-0.83	
Savannah	3.92	2.81	***	1.22	0.46		2.14	1.91	*
Rural	0.79	-1.21		0.97	-0.14		0.88	-0.79	
Female	1.79	2.92	***	1.68	1.26		1.63	3.00	***
Female in Savannah	0.77	-1.03		0.53	-1.43		0.71	-1.87	*
Female in Forest	1.17	0.56		0.46	-1.65	*	0.89	-0.57	
Private school in locality	0.89	-0.62		0.19	-2.69	***	0.83	-1.21	
Average school fee	1.00	2.88	***	1.00	0.28		1.00	0.19	
Household characteristics									
No. of sibling	1.04	1.82	*	1.09	3.07	***	1.05	2.24	**
Father's education	0.90	-5.20	***	0.91	-3.36	***	0.91	-5.26	***
Mother's education	0.98	-1.01		0.96	-0.96		0.97	-1.58	
Ability	0.98	-1.29		0.96	-2.59	**	0.98	-2.24	**
Missing ability	1.25	1.62		1.19	0.68		1.24	1.92	*
Log per capita expenditure	1.11	0.77		0.60	-2.62	***	0.85	-1.44	
Child characteristics									
Age	1.01	0.19		1.03	0.65		1.01	0.45	
Birth order	0.87	-2.60	***	0.89	-2.18	**	0.89	-2.73	***
Fostered in	7.61	0.75		0.00	-1.51		0.67	-0.21	
Fostered * father's ed.	1.05	1.64	*	1.00	0.03		0.97	-1.13	
Fostered * mother's ed.	0.97	-1.07		0.91	-1.72	*	1.03	1.03	
Fostered * income	0.86	-0.74		1.52	1.51		1.03	0.24	
School characteristics									
Distance (minutes)	1.01	2.86	***	1.01	1.34		1.01	2.65	***
English books	1.00	0.01		1.04	0.30		1.01	0.07	
Math books	0.89	-0.89		1.59	2.80	***	0.96	-0.46	
Chalk	0.96	-0.28		0.79	-1.44		0.84	-1.41	
Desks	0.87	-0.65		0.33	-2.50	**	0.79	-1.92	*
Adequate classrooms	1.00	-0.61		0.99	-2.32	**	1.00	-0.95	
Classrooms can be used when raining	1.18	1.20		0.99	-1.88	•	1.00	-1.46	
Library	0.67	-1.05		0.48	-2.33	**	0.48	-2.32	**
Water	1.35	1.04		0.88	-0.52		1.13	0.54	
Classrooms with chalkboard	0.74	-0.88		0.97	-0.05		0.91	-0.32	
Board quality	0.80	-2.21	**	0.85	-1.31		0.91	-1.07	
Low pupil teacher ratio	0.87	-0.74		0.23	-2.90	***	0.81	-1.24	
High pupil teacher ratio	0.39	-1.92	*	1.94	2.37	**	1.30	1.02	
Number of observations	1399			1334			2733		
Log likelihood	-2274			-1187			-3879		

8. The Cox regression results are shown in Table I.5.[6] Of the 10 school quality variables four are significant with the expected sign: having an adequate number of classrooms matters, as does having enough desks, good quality chalkboards, and a library.[7] In addition, the distance to the nearest school has a significant impact on the probability of school attending and staying in school. There is one perverse result, which is that having more classrooms that can be used when it is raining reduces school attainment.[8] It is possible that this result is explained by the nature of the school pavilions erected using World Bank financing. These metal, concrete-based, structures were undoubted improvements on the mud-walled classrooms they frequently replaced. But unless clad, which many are not, they cannot be used when it rains heavily.[9] Hence, these schools are improved but suffer this problem. Teacher numbers also have the expected effect: schools with high pupil-teacher ratios deter students, whereas those with low numbers encourage them.[10]

9. Turning to household and child characteristics, education of the parents also has the expected sign; though in 2003 mothers' education appear to have lost significance. The innate ability coefficient has the expected sign, but is not significant in 2003. Possibly this is a consequence of the reduction in the number of dropouts for which ability is more relevant. Household income has become an important determinant of a child's education. Virtually all of the fostering terms are insignificant, suggesting that the characteristics of the household in which the child is resident do matter for the educational choices relating to that child.

10. The presence of a private school in the locality increase attendance, though the coefficient is significant only in 2003, since in 1988 private schools were not very common. The average locality school fee has the expected negative effect in 1988, but none in 2003.

11. The Cox regression was also estimated up to attendance in senior secondary school. No data were collected on SSS quality. However, it is likely there is less variation in this than there is between basic schools, so that variation will not be a major determinant. But costs are considerably higher for senior secondary, so income may be expected to play a larger role. Table I.6 bears this out. The odds ratio for household expenditure is (a bit) lower and its significance rather higher. Basic school variables also matter to whether a child makes it through to secondary: two of the school quality indices are significant, as is the distance to school. High pupil-teacher ratios also discourage attendance.

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6. They are not greatly different from those in Table I.4 in terms of which variables are significant or not.

7. Few schools have a library. This variable may be acting as a dummy for "very good" schools.

8. Math book availability has a perverse result in one case.

9. During field work the study team got stuck in one of these pavilions in heavy rain. Staying dry requires huddling in the middle of the "room" (joined by neighboring livestock also trying to stay dry), none of which is conducive to study. The Primary School Development (PSD) project significantly improved the percentage of schools with classrooms that can be used when raining (Annex D). But the majority of PSD pavilions have been clad (PSD ICR). It is possible that more recent structures have not.

10. 1988 is an exception with respect to high PTR.

Table I.6: School attainment up to senior secondary school (Cox regression)

	Coefficient	*z-statistic*
Coast	1.02	0.14
Forest	0.93	-0.45
Savannah	1.57	2.62***
Rural	1.06	0.78
Sex	1.58	4.17***
Female savannah	0.80	-1.44
Female forest	0.95	-0.35
Age	1.03	2.26**
Birth order	0.92	-3.47***
Number of siblings	1.03	2.25**
Father's education	0.95	-8.41***
Mother's education	0.96	-4.85***
Innate ability	0.99	-1.42
Innate ability missing	1.03	0.50
Per capita expenditure	0.84	-3.62***
Distance to nearest primary	1.00	-0.98
Distance to nearest JS/middle school	1.01	7.31***
Index recurrent inputs (primary)	0.40	-4.30***
Index physical inputs (primary)	1.08	0.28
Index recurrent inputs (middle/JSS)	0.77	-0.95
Index physical inputs (middle/JSS)	0.45	-3.31***
Private	0.98	-0.18
School fee	1.00	-1.14
Low pupil/teacher ratio	0.96	-0.28
High pupil teacher ratio	2.31	6.98***
Observations	4002	
Chi square	978.7	
Log likelihood	-9093.0	

Interpretation

12. To interpret the relative importance of the different factors affecting school attainment it is necessary to combine the level and range of the explanatory variables with their coefficients. For ease of exposition, this analysis is presented using the results from a probit model of enrolments, which yields similar results to those in the other attainment regressions. The sample used here is children aged 10-15. If the sample 9-15 is used, the results are similar except that the age term is significant, showing that some children aged nine have not yet started school but are likely to do so.

13. The results are shown as the marginal effects of the probit model (Table I.7), together with the sample means of the explanatory variables for 1988 and 2003. It is therefore

possible to calculate the impact on enrolments of the observed changes in the different independent variables.

Table I.7: Marginal effects from probit model of enrolments and implied change in enrolments from different factors

Variable	*Whole sample Mean*	*1988*	*2003*	*Marginal impact (*100)*	*Accountable change*
Forest	0.492	0.523	0.460	3.43	-0.22
Savannah	0.220	0.201	0.238	-21.11	-0.78
Rural	0.468	0.451	0.485	1.63	0.06
Sex	0.465	0.449	0.481	-20.78	-0.66
Sex*survey	0.701	0.449	0.962	8.35	4.28
Female*savannah	0.093	0.077	0.110	3.78	0.12
Female*forest	0.238	0.247	0.229	-12.33	0.22
Age	13.008	13.013	13.003	-0.13	0.00
Birth order	3.176	2.892	3.470	1.29	0.75
Father's schooling	6.487	5.744	7.255	1.08	1.63
Mother's schooling	3.657	2.894	4.447	0.31	0.48
Ability	9.663	11.553	7.708	-0.07	0.27
Missing ability	0.422	0.493	0.349	-5.87	0.85
Household expenditure	14.329	13.967	14.704	3.48	2.56
Fostered in	0.240	0.248	0.232	24.38	-0.38
Foster*income	3.451	3.469	3.433	-2.99	0.11
Distance to school	12.475	13.696	11.211	-0.10	0.26
Chalk	2.405	2.092	2.730	2.70	1.72
Adequate classrooms	94.742	96.116	93.327	0.05	-0.14
Rain rooms	0.202	0.259	0.144	10.22	-1.18
Board quality	2.581	2.494	2.672	3.25	0.58
Library	0.092	0.067	0.117	6.31	0.32
High PTR	0.203	0.268	0.135	-1.75	0.23
Survey	1.491	1.000	2.000	-6.00	-6.00

14. In the sample, enrolments (the attendance rate) grew by 5.5 percent, from 81.6 to 87.1 percent. Some factors acted to lower enrolments, so that the cumulative effect of all the positive factors exceeds 5.5. The negative factors are mostly demographic shifts and the largest is a pure "survey round" effect (which is not significant).[11] The results are as follows:

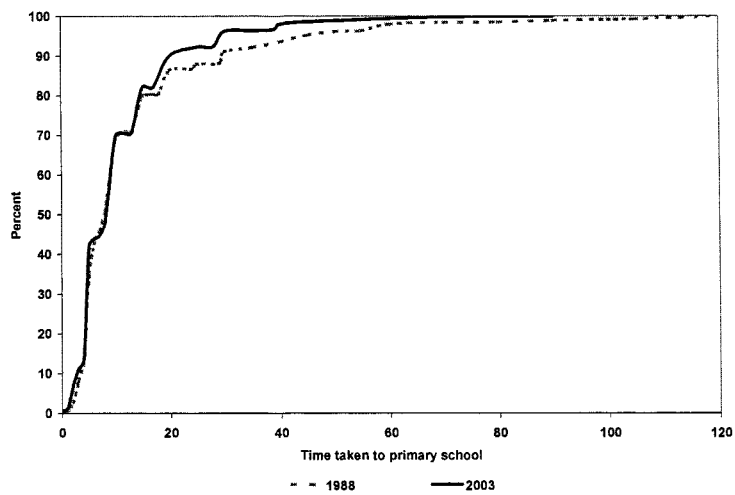
- The largest single effect comes from the reduction of gender bias in enrolments, which raised enrolments by over 4 percent.

11. In line with standard modeling procedure, all variables are entered into the analysis whether or not they were significant.

- The improvements in the school quality variables accounted for an increase in enrolments of over 3 percent, the largest single impact coming from the chalk variable, though this is probably picking up the general availability of resources in the school. This effect is partially offset by the perverse impact of classrooms that cannot be used when raining and the fact that, in this sample, the percentage of schools with adequate classrooms fell slightly.
- There is also a substantial impact (of 2.5 percent) from the increase in household expenditure between 1988 and 2003.

15. As presented here, it is difficult to see the impact of school building and rehabilitation. But it can be seen in three ways. First, the reduction in travel time to school is a result of school building. While the mean travel time has not fallen very much, those who were furthest from school (more remote, and typically more disadvantaged, groups) have benefited most. Figure I.1 shows the distribution of the sample over travel time. For 80 percent of the sample this number has not changed. But for those furthest from schools travel time has been reduced considerably. The maximum travel time has fallen from 2 hours to 90 minutes, and the average travel time for those more than 20 minutes away fallen from 48 to 36 minutes. By 2003, only 4 percent of the sample was more than 30 minutes from a school compared to nearly 10 percent in 1988.

Figure I.1 Travel time has been reduced considerably for those farthest from school



16. Imagine a community with the nearest school one hour away. Building a school in that community, giving an average travel time of 10 minutes, will increase enrolments in that community by 5.2 percent. Table I.8 shows the 10 clusters (out of 79 for which the calculation can be made) with the largest change in average reported travel time to the nearest primary school, and the change in enrolments expected from that change implied by the regression coefficient. In the cluster with the largest change, of a 45-minute reduction, enrolments were expected to rise by 4.7 percent. On average enrolments are expected to have risen by about 2.2 percent in these cluster as a result of schools being closer. The fact that schools are closer will depend in part on changing settlement patters, but the largest effects will result from school building.

Table I.8: Changes in travel time to nearest primary school in 10 clusters with largest change between surveys

Cluster no.	*Year of survey*		*Rural (Yes=1)*	*Change in*	
	1988	*2003*		*Travel time*	*Attributable enrolments*
81	72	26	1	-45	4.7
1	43	13	1	-30	3.1
68	31	6	0	-25	2.6
45	33	12	1	-21	2.2
54	24	6	0	-18	1.9
69	36	19	1	-18	1.8
74	23	5	1	-17	1.8
66	20	7	0	-13	1.3
20	16	6	1	-11	1.1
46	16	6	1	-10	1.0

17. The impact of school building on travel times can be seen by looking in more detail are the data from those clusters with the largest reductions in travel time to the nearest primary school. Table I.9 reports the distance to school reported by each household for four of the clusters shown in Table I.8. In the first cluster shown, which is that with a reduction in travel time of 45 minutes, in 1988, 19 of 20 households reported that the nearest primary school was over 30 minutes away, but in 2003, nearly 80 percent said it was less than 30 minutes. The data seem clear that a school was established in the community closer to the majority of the population.[12] Enrolments in this community in fact increased from only 10 percent to 80 percent.[13] A similar pattern can be seen for the second cluster shown, where enrolments increased by over 20 percent.

Table I.9: Distribution of travel time to nearest primary school in clusters with substantial reductions in travel time

	Rural		*Rural*		*Rural*		*Urban*	
	1988	*2003*	*1988*	*2003*	*1988*	*2003*	*1988*	*2003*
10 minutes or less	0	5	0	9	14	16	0	32
11-30 minutes	1	10	2	9	11	13	14	1
31-45 minutes	2	2	8	0	10	0	0	0
Over 45 minutes	17	2	4	0	13	0	0	0
Total	20	19	14	18	48	29	14	33

12. The school survey contains data for four schools in this cluster, two of which were established in the mid-1990s. In 1988, enumerators surveyed schools outside the cluster if there were none inside.

13. Sample sizes are rather small to rely on community-level enrolment data. Nonetheless, the substantial rise in enrolments in the three communities with the largest reduction in school distance is notable (the increase being over 20 percent in the other two clusters).

18. In the third cluster shown, close to half the children were already less than 30 minutes from school in 1988. But in 2003 they all were, suggesting that another school was built in the cluster. The school survey shows that a new school was built in this community in 2001. Finally, the table shows data for an urban cluster where another school appears to have been built: while all households were less than 30 minutes from a school in 1988 (but more than 10 minutes), in 2003 all but one are 10 minutes or less from the nearest school. A new school was built in this cluster in 1991.

19. In summary, new school building can have a substantial impact on enrolments in the community in which the school is built, particularly if it suffered from being a great distance to the existing school before the new construction. While these effects are great at the local level, the fact that the vast majority of the population was already within 20 minutes of a school in 1988 means that the aggregate effect of school building at national level is not that great, adding only about one quarter of a percent to enrolments.

20. The second channel through which school building can have an effect on enrolments is that having an adequate number of classrooms can have a substantial impact. Although the large majority of schools do have sufficient rooms, some do not — nearly 10 percent of schools have only half the required number or fewer. Suppose a primary school teaching all six grades has two classroom blocks but one is unusable, so that it only has half the required number of classrooms. Rehabilitating (or replacing) the unusable block will raise enrolments in the school's catchment area by 2.4 percent.

21. Analysis of the data from the five clusters with the largest increase in having sufficient classrooms in a school (dealing only with clusters which had far less than necessary in 1988). The increased availability of classrooms appears to have increased enrolments in these clusters by, on average, around 2 percent. However, these figures understate the impact of classroom building through this channel since, with growing population, new classrooms have to be built just to maintain having sufficient classrooms.

22. The final issue is classrooms that cannot be used when it is raining. Considering the sample as a whole, this variable has a robustly significant positive impact on enrolments (the more classrooms that cannot be used when raining then the higher are enrolments). However, analysis of the data shows that this result comes from the fact that schools with 100 percent of classrooms that cannot be used when it is raining have high levels of enrolment. In bivariate analysis, there is a highly significant negative relationship between the two variables if individuals linked to schools with 100 percent of classes that cannot be used are dropped. In the multivariate analysis, this is so for 85 percent of the sample (using a cut-off of 50 percent of classrooms). For the large majority of the sample the coefficient is robust giving a marginal impact in the region of –0.33, implying that rehabilitating a school so that all rather than none of the classrooms can be used when raining increases the probability of enrolment by one-third. The actual improvement in the percentage of classrooms that can be used when raining accounts for a 3.5 percent increase in enrolments across the country.

23. Finally, there is an "enrolment multiplier effect" since educated parents are more likely to send their children to school than are less educated ones. The increase in parental

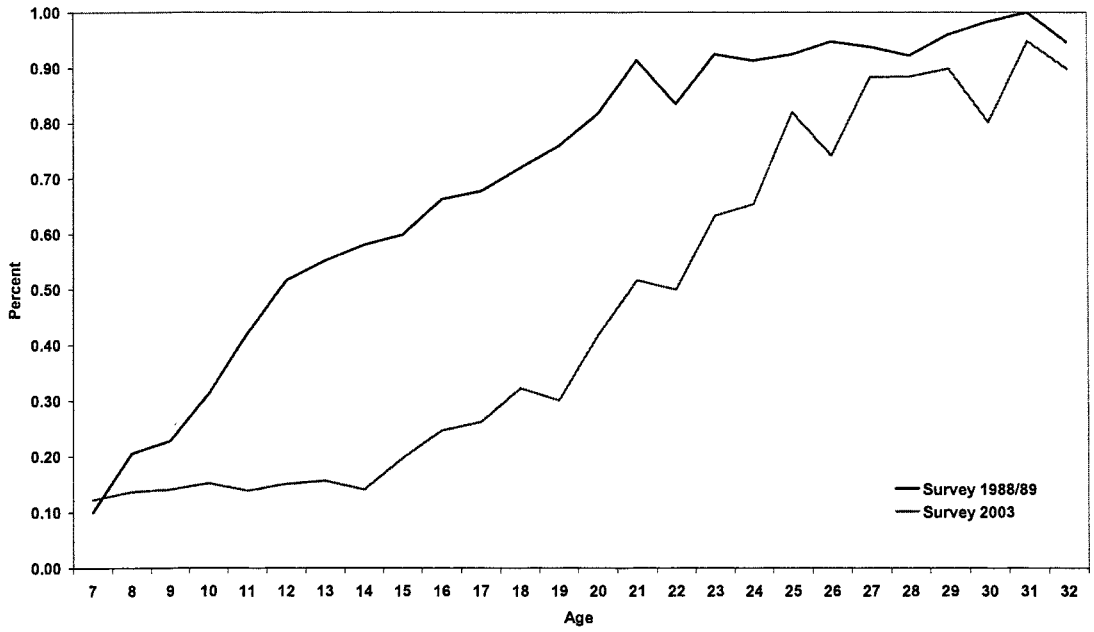
education between the two rounds of the survey contributed another 2 percent to enrolments over the 15 years.

Schooling and Child Labor

24. Schooling and child labor are inter-linked as the household decides on the allocation of the child's time between one or the other. Bhalotra and Heady (2003) found that the most important determinants of child labor for Ghanaian farm households are, besides the usual region, religion, and ethnicity dummies, the number of farms operated (but not farm size), the absence of the father (but only for girls work), the education of the mother (reflecting preferences), the availability of public transport in the community (reflecting distance to school effect), rainfall (negative effect), electricity (positive effect) and "the dynamism of the region as reflected in subjective assessments of life and work opportunities having got better in the last ten years." No relationship was found between child labor and household expenditure after instrumenting for expenditure in order to circumvent endogeneity (since child work may increase household consumption). Similarly, Canagarajah and Coulombe (1997) find that child labor is poorly correlated with poverty. Father's education has a negative influence on child work (especially for girls), and child labor is more common among family enterprises (farming or otherwise). School participation, on the other hand, is found negatively correlated with school costs (official and unofficial fees).

25. The opposite side of the coin to rising enrolments should be reduced child labor. Figure I.2, which shows the proportions of children working out of the samples of 1988 and 2003, demonstrates that this has been the case. The number of children working has

Figure I.2 Proportions of working children in 1988 and 2003 by age



Source: GLSS2 and GSS/OED household survey

decreased dramatically between the two survey periods. Similar factors seem to drive both trends: in particular more educated parents are more likely to send their children to school and less likely to require them to work. An additional factor may be the lengthening of the school day, giving children less time for work, and (though we have no evidence of this) the increase in homework now that textbooks are available.

26. Note on Figure I.2: The sample includes all children surveyed, thus some children are full-time workers while others are working and studying at the same time. The definition of working is obtained from the household questionnaires. Children are considered workers if they have worked for some time during the past 12 months. A large number of workers results from this definition since it includes people working only occasionally, but it seems relevant for this study because the working time is potentially lost studying or school time. The definition of work is broad, including wage work, family farm and family enterprise work.

Annex J: Conditions Attached to Bank Credits

EDSAC I

Actions taken before First Tranche	*Second Tranche Conditions*	*Status: Tranche review March 1988*	*Third Tranche Conditions*	*Status: Tranche Review – September 1989*
Plans for the completion/rehabilitation of facilities so that teacher training enrollments can be increased by 600 to 18,500 have been prepared. A study on task analyses of teachers, and alternative methods for their training has been designed and is ready to start.	Agreement between borrower and IDA on (a) borrower's draft budget for FY88 for public expenditures on education and (b) the use of the proceeds of credit to finance part of this expenditure.	Agreement reached.	1. Agreement (a) on borrower's draft budget for FY89 for public education expenditures and (b) on the use of the proceeds of the credit to finance it.	Agreement reached.
Public announcement made by the PNDC that the new structure will be introduced nationwide starting with Grade 1 in 1987.	Replacement of first class of Middle School by Class 1 of the JSS.	All first-year classes of Middle Schools phased out and replaced by JSS1 where numbers are adequate. Thus, 4,418 JSSs came into operation in September 1987.	2. All second-year Middle School classes to have been phased out and replaced by JSS-2. Termination of intake into old secondary schools from Grades 6 and 7.	Second-year Middle School phased out 4,798 JSSs in existence, and intake into old Secondary Schools from Classes 6 and 7 stopped.
An audit of all staff on the payroll of MOEDC, its educational institutions and the universities to check whether they actually exist has started and is already completed for second-cycle institutions. Total teacher posts by level have been frozen at their 1986 level, and the recruitment of untrained teachers banned.	Completion of audit of staff on the payroll of the ministry.	Audit of staff in second-cycle institutions completed in June 1986. Information also collected on all first-cycle staff during school mapping exercise.	Announcement that all untrained teachers will need to have completed formal training by 1995 to remain employed.	Formal announcement made on September 14, 1999, and plans being made to provide such training.

Actions taken before First Tranche	*Second Tranche Conditions*	*Status: Tranche review March 1988*	*Third Tranche Conditions*	*Status: Tranche Review – September 1989*
Existing freeze in GES and the universities continued on any new recruitment or replacement of staff retirement apart from those being redeployed. Categories of staff that should be (a) retired, (b) redeployed are being identified as a part of the audit.	Continuation of freeze on the number of teacher posts and on the recruitment of untrained teachers.	Freeze in effect and being enforced by adhering to a one in-one out policy.	Continued freeze on teacher posts and on recruitment of untrained teachers.	The freeze was breached and GES employment rose by 6,457 between February and December 1988. However, draconian measures were taken to ensure compliance so that, through 1991, GES staffing fluctuated around 146,000, well below the upper limit of 153,000 agreed upon between IDA and government.
All exercise books and writing materials provided by the Bank through Credit 1653-GH will be sold at cost, and the proceeds deposited in a special account. Tertiary students charged the full cost of books, and loans provided to needy students (guaranteed by guardians) by banks.	Increase of the level of book user fees for secondary students.	Not implemented at time of tranche review because of delay in procurement of books. Later enforced in September 1987.	Increase in level of book user fees for secondary students sufficient for cost recovery. Increase in level of book user fees for JSS students.	Book user fee increased from 2, 4 to 1,500 cedis. This is total price of books. This was done in September 1987. Current cost covers all but cost of paper, which is provided through grant aid.
The feeding and boarding fee at secondary level institutions has been increased by 50%. The level of the full costs of feeding and boarding students at secondary and tertiary institutions including food, cooks, cleaning, and other staff has been announced. The phasing out of all subsidies from secondary and tertiary institutions has also been announced.	Reduction of food and boarding subsidies at all secondary and tertiary level institutions by 50%.	Boarding fees were increased from 45 cedis to 100 cedis per day effective January 1988 with no change in the boarding subsidy of 10 cedis, thus effecting an increase in parent-borne costs by 50%. At university level, feeding subsidies have been kept constant, reducing their real value since 1987 by 40%.	Elimination of remaining half of boarding and feeding subsidies at all secondary and tertiary level institutions.	All feeding subsidies removed.

Actions taken before First Tranche	*Second Tranche Conditions*	*Status: Tranche review March 1988*	*Third Tranche Conditions*	*Status: Tranche Review – September 1989*
The higher education rationalization and cost study has started.	Agreement between borrower and IDA on the recommendations for the rationalization of university education.	Draft study submitted and under discussion. However, judgment made to allow more time for report to be considered in detail. Appropriate amendments were made to the Development Credit Agreement.	Government to submit a study on university rationalization with recommendations on how to cut costs and, soon after, agreement with IDA is reached; implement those recommendations acceptable to IDA.	Study completed March 1989. Agreed-upon plan of action was completed in December 1989.
A revised JSS syllabus with a much simplified and inexpensive structure has been completed according to mutually agreed guidelines. Equipment lists for simple hand tools to be provided for JSS students has been prepared.				

EDSAC II
*** denotes special condition for tranche release**

Objective	*Actions taken before effectiveness*	*Second tranche conditions*	*Status (Tranche review Sept./Oct 1991)*	*Third tranche conditions*	*Status (Tranche Review Sept/Oct 1992)*
1. Continued implementation of new structure of the school system: reducing pre-university education from 17 to 12 years.	September 1989. All Middle School third-year classes replaced by JSS3	September 1990. All secondary school Form 1 classes replaced by the new SSS1	The academic year for SSS was changed to January-December. All Form 1 classes were replaced by SSS1 in January 1991	September 1991: All secondary school Form 1l classes replaced by the new SSS2	All Form 2 classes were replaced by SSS2 in January 1992
2. Reform of senior secondary education					
(a) Curriculum design	Syllabi for all subjects in the new curriculum completed	Design study to evaluate SSS curriculum over first three years of implementation.	Preliminary statement of objectives for the study was drawn up.	Begin evaluation of SSS curriculum based on experience during first year of implementation.	Completed process evaluation of the SSS curriculum.
(b) Pattern of operation in schools	Government completed matrix of senior secondary schools (existing secondary schools and proposed new or converted schools, grouped by Region) against programs and program options, to indicate the number of schools offering each option, the number of option in each school, and the total annual intake of students.	*No program option being run by any school unless at least 20 students from each grade are enrolled in the option, and unless there are suitably qualified teachers or National Service staff to teach all of the courses in that option.	Condition considered to be met, 88% of program options had adequate student numbers. Government initiated action to close program options with fewer than 10 students enrolled. Teacher's qualifications by program options were not available.	*No program option being run by any school unless at least 20 students from each grade are enrolled in that option, and unless there are suitably qualified teachers or National Service staff to teach all of the courses in that option.	It was expected that less than 10% of program options in SSS1 would have inadequate enrollment. The qualifications of SSS teachers were considered to have reached satisfactory levels.
(c) Textbooks	Determination of quantities of SSS textbooks needed by subject. Tendering for publishing and printing of textbooks underway.	See Objective 3(d).		See Objective 3(d)	

Objective	*Actions taken before effectiveness*	*Second tranche conditions*	*Status (Tranche review Sept./Oct 1991)*	*Third tranche conditions*	*Status (Tranche Review Sept/Oct 1992)*
(d) Program costs	Government provided indicative figures of unit costs for each program, using examples of existing acceptable-quality program as models.	Design study to monitor actual unit costs of various programs and program options over time.	Preliminary statement of objectives of the study was prepared.	Initiate study.	MOE completed in August 1992 a study of the unit costs of the five SSS programs in 34 SSSs. But annual monitoring is not being done
(e) Staffing		*Achieve a minimum SSS student-teacher ratio of 20:1, including national service staff.	Condition met. In June 1991, the ratio was 22:1 (total enrollments 194,000 and total teaching staff 8,711).	*Maintain student-teacher ratio at or above 20:1, including national service staff.	Condition met. In July 1992, the ratio was 22:5 (total enrollments 221,250 and total teaching staff 9,823).
(f) Student performance assessment		Continuous assessment guidelines prepared and all SSS teachers trained in their application.	Guidelines were under preparation.	West African Examination Council to complete preparation of SSS exams to reflect new emphasis on practical competencies and work orientation.	WAEC in the process of preparing final examination for SSS3. Continuous assessment guidelines were issued. All basic through SSS teachers were trained in their application.
3. Improving the teaching/learning process					
(a) In-service teacher training.	Government presented acceptable plan for regular in-service training of all serving basic and senior secondary education teachers during 1990 and 1991.	Implementation of plan proceeding on schedule, and plan to cover 1992 and 1993 presented to IDA.	All existing secondary school teachers and National Service personnel posted to SSS were trained during January 1991. Training plans were prepared covering 1992 and 1993 for SSS and JSS and 1992-1996 for primary.	Implementation of plan proceeding on schedule.	New and exiting SSS teachers and JSS teacher for Life Skills and Vocationa Skills received training during Oct. 1992. USAID provided in-service training to primary school teachers.

Objective	Actions taken before effectiveness	Second tranche conditions	Status (Tranche review Sept./Oct 1991)	Third tranche conditions	Status (Tranche Review Sept/Oct 1992)
(b) Inspection/ supervision					
(i) Basic education	Government finalized plans for new circuit-based supervision, including announcement of job descriptions and performance norms	Implementation of plan proceeding on schedule.	Implementation plan for monitoring was nearly completed. Permanent Circuit Monitoring Assistants had been appointed 1 to 3 Circuits. The appointment of circuit supervisors to oversee the professional aspect of reforms was behind schedule. The appointment District Education Officers with the rank of Directors had greatly enhanced supervision of schools.	Implementation of plan proceeding on schedule.	All Circuit Supervisors selected had been trained and posted 1 per 3 circuits. They were to be provided with motor bikes. Circuit Monitoring Assistants in the field and continued to monitor all aspects of the reform
(ii) Senior secondary education		Present plan satisfactory to IDA for supervision of the SSS progress including job description and performance norms.	Plans were finalized and advertisements prepared to invite qualified Assistant Directors of Education to apply for the positions of Assistant director in charge of supervision at the District level. The director appointed would identify and organize staff within the District to form Inspection teams for SSS, in the District. The appointments, training and assumption of duty were planned for completion by end of 1991.	Implementation of plan proceeding on schedule.	GES had accepted implementation of the decentralized plan for the district education offices. Most districts had appointed an Assistant Director in charge of coordinating supervision of the districts and ensuring that action was taken on reports submitted by Circuit Supervisors, The overall coordination of supervision at the national level, however, was weak.

Objective	*Actions taken before effectiveness*	*Second tranche conditions*	*Status (Tranche review Sept./Oct 1991)*	*Third tranche conditions*	*Status (Tranche Review Sept/Oct 1992)*
(c) School accountability	Government agreed that from the end of 1990/91 school year, a standardized achievement test will be administered to a random sample of Grade 6 pupils in all schools to evaluate the effectiveness of primary school teaching. School averages will be publicized for purpose of bringing GES attention and community pressure to bear on low-achieving schools.	Develop and pilot standardized achievement test.	A pilot criterion reference test was developed for mathematics, science, and English, and administered to a sample of Primary 6 pupils in mid-September 1991, with assistance from USAID.	Administer test and publicize results. Develop plan for improving achievement in perennially low-achieving schools and districts.	USAID assisted in the preparation of criterion reference tests in mathematics and English, to be administered to a 5% sample of Primary 6 pupils in June 1993.
(d) Textbooks	All basic education pupils have access to full complement of textbooks.	All pupils in JSS were supplied with free complement of books.	Large quantities of books were delivered to JSS.	All basic education pupils have access to full complement of textbooks.	Ratio of textbooks to pupils close to 1:1 in the key subjects in primary; and reached 1:1 in JSSs.
		All SSSI students have access to full complement of textbooks.	Most of the core textbooks for SSS1 were delivered to schools.	All SSS1 and SSS2 students have access to full complement of textbooks.	In SSS, 60% of the required books had reached almost all schools. The remaining to be sent to school by Dec. 1992.
(e) Technical Institutes		Government completed plan for re-direction of Technical Institutes.	Government was considering a reform plan for technical vocational training that included reform of the 19 technical institutions.	Implementation of plan begun.	Government Initiated a program to reform the vocational education subsector.

Objective	*Actions taken before effectiveness*	*Second tranche conditions*	*Status (Tranche review Sept./Oct 1991)*	*Third tranche conditions*	*Status (Tranche Review Sept/Oct 1992)*
4. Reducing and sharing of recurrent costs.					
(a) Staffing norms.		*GES staff of all kinds (including teachers, teaching assistants, non-teaching and administrative staff, nursery school attendants, and all other categories except students in teacher training colleges and national service staff) not to exceed 153,000.	Condition met. Throughout 1991 GES staffing levels were around 148,000.	*GES staff of all kinds (including teachers, teaching assistants, non-teaching and administrative staff, nursery school attendants, and all other categories except students in teacher training colleges and national service staff) not to exceed 153,000.	Condition considered met. In August 1992, total GES staffing was 153,513, a negligible excess over the agreed ceiling.
(b) Book user fees		*Book fees in primary and junior secondary schools maintained at no less than 1987/88 proportions of full costs.	Condition met. Primary and JSS textbook user fees were increased from C150 to C250 per student per year in October 1990.	*Book fees in primary and junior secondary schools maintained at no less than 1987/88 proportions of full costs.	Condition met. Annual textbook fee of 250 cedis remained sufficient to cover costs (excluding of paper) of textbooks. This was equivalent to the proportion of full costs covered in 1987/88 procured in 1992.
		*At SSS level, maintain level of book user fees sufficient for government to cover full cost over the books' life span.	Fees raised in June 1991 to 4,500 cedis/student/year as recommended by IDA. Condition considered technically met, but implementation needed to be monitored.	*At SSS level, maintain level of book user fees sufficient for government to cover full cost over the book's life span.	Review mission recommended raising fees to 600 cedis for the school year 1993. Government complied and made such an increase effective January 1993.
(c) Food subsidies.		*At SSS level, maintain level of fees for student feeding sufficient to cover full costs of food.	Condition met. Fees at 90 cedis per day was adequate to meet the full cost of food obtained at low cost with World Food Program assistance.	*At SSS level, maintain level of fees for student feeding sufficient to cover full costs of food.	Condition met. All school charged up to 200 cedis/day, which seemed adequate to cover the full costs of food.

5. More effective planning and management.					
(a) Controlling the public investment program (PIP).		All projects and subprojects fully elaborated and listed in priority order before submission to Ministry of Finance and Economic Planning to be considered for inclusion in PIP.	Some progress was made in streamlining PIP. However, the number of subprojects was still too large.	All projects and sub-projects fully elaborated and listed in priority order before submission to Ministry of Finance and Economic Planning to be considered for inclusion in PIP.	The 1992 PIP gave priority to improving classroom facilities and ensuring support for educational reforms. However, the number of subprojects further increased.
(b) Education budgets.	Agreement between IDA and the government on the 1990 educational budgets, both capital and recurrent.	*Agreement between IDA and the government on the 1991 educational budgets, both capital and recurrent.	Condition met. The proposed 1991 recurrent and capital budgets were found acceptable to IDA.	*Agreement between IDA and the government on the 1992 educational budgets, both capital and recurrent.	Condition met. The proposed recurrent budget was fully satisfactory. The proposed 1992 capital budget was considered less satisfactory because of the large number of subprojects and the high share of tertiary education.
		*Actual expenditures for preceding financial year in line with agreed budgets.	Actual expenditures in 1990 exceeded the budget by 6.3% and diverged significantly from budgeted amounts for higher education and vocational education. Government and IDA agreed to a more regular system of expenditure monitoring.	*Actual expenditures for preceding financial year in line with agreed budgets.	MOE introduced semi-annual monitoring of actual expenditures, which were only 3% above agreed recurrent budget in 1991. Spending on non-wage items was satisfactory with supplementary funding from donor and textbook revolving funds.
		*Basic education's share of recurrent education budget maintained at lest at 1989 level.	Condition met. The 1990 and 1991 recurrent basic education budgets maintained at 1989 level of 62%	*Basic education's share of recurrent education budget maintained at least at 1989 level.	Condition met. The 1992 and 1993 recurrent budgets for basic education remained at the 1989 level.

Objective	*Actions taken before effectiveness*	*Second tranche conditions*	*Status (Tranche review Sept./Oct 1991)*	*Third tranche conditions*	*Status (Tranche Review Sept/Oct 1992)*
(c) Reform of education procurement functions within MOE.		All procurement organized centrally for school education in MOE in accordance with competitive tendering procedures.		All procurement organized centrally for school education in MOE in accordance with competitive tendering procedure.	All procurement for schools financed from the government budget was organized centrally in GES. All procurement under foreign-aided projects was handled directly by MOE.
(d) Maintenance					
(i) Basic education		Announce an incentive scheme for rewarding schools that have good maintenance records.	Incentives scheme being devised.	Implement incentive scheme	IDA supported MOE's view that the majority of basic education schools in Ghana need to be upgraded or rehabilitated before implementation of incentive schemes for maintenance.
(ii) Secondary education	Explicit provision included in the budget for maintenance and repair of equipment and facilities in SSSs, this item to be not fungible.	Continued provision in the budget for maintenance and repair of equipment and facilities in SSS.	Provision was made in 1991 budget.	Continued provision in the budget for maintenance and repair of equipment and facilities in SSS.	Provision was made in 1992 budget.

POLICY-RELATED LEGAL COVENANTS FOR PRIMARY SCHOOL DEVELOPMENT PROJECT

Description	*Status*	*Comments*
Implement a program to monitor instructional time, intakes, enrollments, dropouts, attendance, and learning time of primary school students.	CD/CP	Although standard statistics are being gathered through EMIS, instructional time is not monitored.
Implement information campaign regarding impact of student fees and levies on primary school enrollments.	CP	Periodic public announcements were made and information campaigns were carried out, but fees and levies have continued to proliferate.
Implement recruitment procedures for primary school head-teachers; require applicants to meet minimum criteria and serve for four years, and establish selection panels that include local community leaders.	CP	Procedures were followed in most of the schools, but the role of communities often handled by a district official residing outside the community.
Prepare and implement training programs for primary school head-teachers	C	Training was not put to use
Prepare and implement orientation programs for district-level officials and community leaders	C	None
Prepare and implement training programs for circuit officers to increase capacity to support and monitor classroom construction activities and effective primary school management	C	Training has not been put to use.
Conduct a detailed school mapping of approximately 1,500 schools to help identify school amalgamation options and need for rehabilitation of school facilities.	NC	To be included for future work as part of EMIS.
Borrower to implement program for increasing actual instructional time of primary school students.	CP	Directives were sent but were not monitored and thus not enforced.
Borrower to take action to ensure that no new fees or levies are imposed on primary school students.	CP	MOE directives were issued but not monitored or implemented.
Borrower to implement program to eliminate fees and levies imposed on primary school students other than those approved by Ministry of Education.	CP	MOE formally announced that all unapproved fees and levies were to be abolished. This was not well monitored or enforced.

Source: World Bank documents

Annex K: Education and Welfare Outcomes

EARNINGS FUNCTIONS

1. Rather than estimate income, which is difficult for the predominant self-employed sector, this report examines the impact of education on per capita household expenditure. These data are expressed in 2003 prices and adjusted for household size and composition (i.e., economies of scale in household consumption and adult equivalence). Table K.1 presents the earnings data, tabulated against education level of the household head. Average earnings rise with the education of the household head, although these increases are less marked, other than for higher education, in 2003 than 1988.

Table K.1: Mean earnings by education level of household head

	Mean earnings		*As percent lower level*	
	1988	*2003*	*1988*	*2003*
None	2.05	4.45		
Primary	2.54	4.99	23.9	11.9
Middle/JSS	2.93	5.09	15.3	2.1
SS	3.96	5.65	35.1	11.0
Higher	5.46	8.25	38.0	45.9

2. Table K.2 reports the results from the OLS regression of logged per capita expenditure. These are augmented earnings functions, since other variables thought important to average expenditure (sex of household head, dependency ratio, and location) are also included. As is to be expected, years of schooling has a positive impact on household expenditure. This result is found whether just the education of the household head is used or the average education level of all household members. The data suggest that an extra year of schooling increases per capita household expenditure by about 4 percent, so that completing basic education (nine years) increases it by 42 percent.[1]

Table K.2 (a): Earnings functions using school years (pooled data): education of household head

	Model 1			*Model 2*			*Model 3*		
	Coeff.	*t-stat*		*Coeff.*	*t-stat*		*Coeff.*	*t-stat*	
Age of head (logged)	-0.16	-2.44	•	0.02	0.63	..	-0.12	-1.83	**
School years	0.04	6.58	***	0.03	16.00	***			
Combined test score (logged)	0.13	3.58	***				0.25	7.7	***
Female	-0.24	-6.01	***	-0.15	-7.97	***	-0.23	-5.66	***
Dependency ratio	-0.99	-16.38	***	-0.80	-26.06	***	-1.00	-16.23	***
Rural	-0.19	-5.20	***	-0.19	-10.35	***	-0.21	-5.79	***
Forest	-0.18	-4.90	***	-0.09	-4.77	***	-0.19	-5.1	***
Savannah	-0.25	-4.79	***	-0.27	-10.72	***	-0.25	-4.72	***
Survey dummy	0.67	19.92	***	0.68	38.10	***	0.68	19.89	***
Intercept	15.21	60.74	***	14.99	148.71	***	15.09	59.29	***
R2	0.49			0.43			0.47		
No. of observations	1113			4922			1113		

1. The return here is based on expenditure per capita and so under-stated to the extent that a single person is earning an income spread over several people.

Table K.2 (b): Earnings functions using school years (pooled data): average education of those aged 16 and over

	Model 1			Model 2			Model 3		
	Coeff.	t-stat		Coeff.	t-stat		Coeff.	t-stat	
Average age (16 and over)	0.15	2.59	**	0.33	11.49	***	0.05	0.87	..
School years	0.05	12.16	***	0.04	18.55	***			
Combined test score (logged)	0.07	3.01	***				0.19	7.79	***
Female	-0.12	-4.05	***	-0.11	-5.74	***	-0.10	-3.4	***
Dependency ratio	-0.85	-16.72	***	-0.84	-28.15	***	-0.97	-18.68	***
Rural	-0.16	-5.53	***	-0.18	-9.75	***	-0.24	-7.98	***
Forest	-0.14	-4.73	***	-0.10	-5.04	***	-0.15	-4.99	***
Savannah	-0.22	-5.45	***	-0.26	-10.12	***	-0.27	-6.32	***
Survey dummy	0.65	24.62	***	0.67	37.83	***	0.65	23.86	***
Intercept	14.08	65.49	***	13.80	128.00	***	14.54	66.12	***
R^2	0.48			0.43			0.43		
No. of observations	1808			4922			1800		

3. Such regressions have to be interpreted with caution. Using them to estimate the growth effects of educational expansion can fall into a trap of the fallacy of composition. Educating one person alters their life chances given the current state of affairs, so that they will likely enjoy a higher income. But educating many people changes the state of affairs. If the income gains of education come from accessing a limited number of employment opportunities, then the returns to education will fall as the number of educated people rises. On the other hand, if income gains are from genuine productivity increases — either for the self-employed or the employed if the wage reflects the marginal product — then educational expansion will indeed lead directly to growth.

4. Evidence of the former, less happy, picture is give by looking at the Mincerean returns for the two periods (Table K.4). These returns are the coefficients on education dummies in the earnings function where the (omitted) reference category is no education.[2] The 1988 data show the expected pattern of returns increasing for each category of education,[3] though the return to primary education is not significant. But by 2003 not only have all the returns fallen — the expected effect from having more educated people available — significant positive returns are only found for senior secondary and tertiary graduates.

5. Disaggregation into rural and urban areas shows returns to have fallen in both. There was a significant return to primary education in 1988, but this is no longer the case. In 2003, in rural areas the only significant return is from post-secondary education. Plausibly, secondary graduates find employment in urban rather than rural areas, but there are a few professional positions in rural areas (teachers, health workers) for which people have received post-secondary education.

2. Those with incomplete primary are included in "no education." There are few observations in this category so their treatment does not alter the results.

3. Since all returns are with reference to the base category, not the preceding level as is often done.

Table K.3: Earnings functions using level of education (education of household head)

	Pooled data			*1988*			*2003*		
	Coeff.	*t-stat*		*Coeff.*	*t-stat*		*Coeff.*	*t-stat*	
Age of head (logged)	-0.18	-2.66	***	-0.10	-2.91	***	-0.07	-1.65	*
Primary	-0.18	-1.53	,,	0.05	0.76	..	-0.04	-0.49	..
Middle/JSS	-0.15	-3.56	***	0.12	4.85	***	-0.06	-1.69	•
SSS	0.02	0.52	***	0.30	7.33	***	0.06	1.74	*
Tertiary	0.17	2.90	***	0.40	4.58	***	0.35	8.30	***
Combined test score (logged)	0.19	5.43	***						
Female	-0.23	-5.54	***	-0.06	-2.37	**	-0.25	-7.66	***
Dependency ratio	-0.98	-15.88	***	-0.86	-22.03	***	-0.66	-12.87	***
Rural	-0.18	-4.97	***	-0.19	-8.39	***	-0.27	-8.76	***
Forest	-0.18	-4.85	***	-0.09	-3.87	***	-0.08	-2.27	**
Savannah	-0.25	-4.79	***	-0.30	-9.88	***	-0.31	-6.96	***
Survey dummy	0.60	15.38	***						
Intercept	15.58	57.40	***	15.45	121.37	***	16.18	100.45	***
R2	0.49			0.26			0.28		
No. of observations	1113			3182			1740		

Table K.4: Mincerean expenditure-based returns to education in rural and urban areas

	1988				*2003*			
	Rural		*Urban*		*Rural*		*Urban*	
Primary	0.16	*	-0.06		0.04		-0.12	..
Middle/JSS	0.13	***	0.11	***	-0.01		-0.08	*
Senior Secondary	0.31	***	0.28	***	0.04		0.07	*
Higher	-0.10		0.49	***	0.26	***	0.37	***

6. But there is an important caveat to place on these findings, since the earnings equations also include test scores. The combined test score has a significantly positive impact on average earnings.[4] Education thus has a direct effect on earnings and an indirect effect through higher test scores. Plausibly the direct channel picks up the screening function of education, whereas the indirect channel reflects genuine productivity increases. Table K.5 reports the impact of education on earnings through the two channels based on regression results for 2003 only.[5] These show the indirect effect to be stronger than the direct effect in all cases, being sufficient to offset the apparent negative returns to primary education. Hence those attending primary school and JSS, and attaining better test scores as a result, do indeed benefit from higher earnings. But children who do not make appreciable gains in cognitive achievement as a result of school attendance are no better off as a result of their schooling.

4. The correlation coefficient between the combined math and English scores is 0.78, so there two variables have been added to make a single variable.

5. The impact of schooling on test scores is derived from substituting years of schooling into the test score regressions in Annex G. The earnings regressions uses the unlogged combined test scores to facilitate the calculation.

Table K.5: Impact of education on earnings

	Years of schooling			*Level of education*		
	Direct	*Indirect*	*Total*	*Direct*	*Indirect*	*Total*
Primary	15.4	16.0	33.8	-18.5	32.0	7.6
Middle/JSS	23.0	24.0	52.6	-15.1	48.0	25.7
Secondary	30.7	32.0	72.6	-7.4	64.0	51.9
Tertiary	38.4	40.0	93.8	7.4	80.0	93.3

EDUCATION AND CHILD NUTRITION

7. The most studied welfare outcomes in the Ghanaian context are fertility, mortality, and nutrition. Existing studies demonstrate the beneficial impact of education on fertility and nutrition, and the GSS\OED survey did not include the variables necessary (a health module and mother's birth history) to analyze these outcomes. However, it is possible to report data on nutritional outcomes. These are of particular interest since an earlier analysis by Alderman (1999) of GLSS1 data found no significant impact of education on nutritional outcomes (measured by height for age). Replication of Alderman's model using the GLSS2 data gave the same result. But recent papers using less representative data for Accra (Ruel *et al.* 1999 and Maxwell *et al.* 2000) have suggested that schooling does improve nutrition through its association with better childcare practices.

8. The question that arises is whether different inputs are substitutes or complements. For example, health education and clean water are usually argued to be complements in that the impact of one is greater in the presence of the other. By contrast, education has been suggested to be a substitute for income with respect to nutrition, meaning that well-educated but less well off women can achieve the same nutritional outcomes for their children than can better off, but less well-educated, women. Testing for complementarity or substitutability requires an interactive income and education term. If the coefficient is positive, then the two inputs are complements, and if it is negative then they are substitutes.

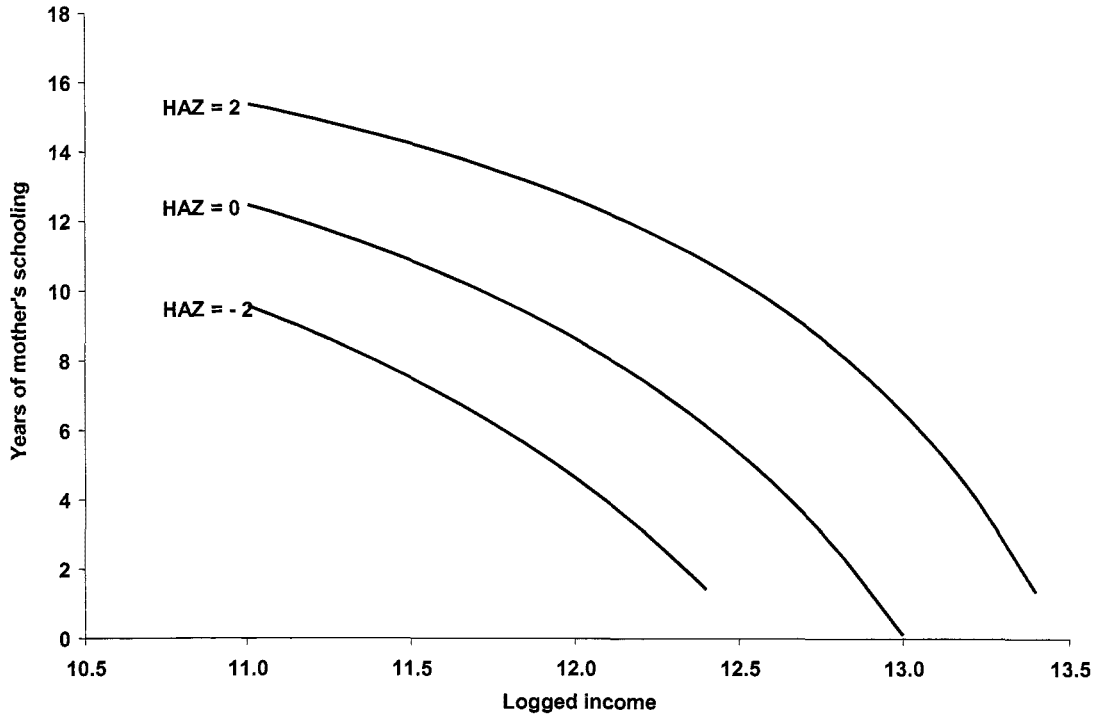
9. Two models are presented. One with a series of education dummies, as used by Alderman, and one with the years of education. The advantage of the latter is it allows some effects from incomplete primary without having to make a decision about how much primary constitutes "some." In both models, expenditure is instrumented with a set of location variables and household characteristics, since a Hausman test shows it to be endogenous. The instruments include the education of the household head, making it less likely that there will be any direct effect from father's education in the nutrition education. Parents' height is omitted. Its inclusion does not greatly alter the coefficients, but the smaller sample size (less than half of that obtained if these two variables are not included) reduces significance of the variables in some specifications.

10. The results, shown in Table K.6, are striking. The maternal education variables are not significant when the interactive term is not included. But with the interactive term all education variables are positive and significant. The interactive terms are significantly negative, indicating that education is a substitute for income, as was also found by Ruel *et al.*

This means that the impact of education on nutrition falls with income, but is positive over the range of over 90 percent of the data.[6] A child in a household with a per capita expenditure of cedis 0.16 million and mother who has completed JSS can expect a height for age z-score 4.5 points higher than a child in a household at the same income level but whose mother has no education. If the household's expenditure is cedis 3.2 million, then the "JSS premium" drops to 1.1 points.

11. The substitutability point is illustrated in Figure K.1, which plots nutritional isoquants with education and income as the two inputs in the nutrition production function. These isoquants are convex to the origin, rather than concave, as is usually the case. If they had been concave it would mean that after a certain point there is no nutritional return to higher income without increasing education. This is not the case — higher income will improve nutrition even if education remains low.

Figure K.1: Nutrition isoquants



6. The coefficient of education + education x income becomes negative with a logged expenditure of around 15. These negative effects are of course offset by the positive effect from income.

Table K.6: Determinants of height for age z score, 2003

	Model 1		Model 2		Model 3		Model 4	
Household variables								
Per capita expenditure	1.33	**	2.39	•	1.46	***	2.14	***
	(2.08)		(1.92)		(2.86)		(2.90)	
Size	0.05		0.07	*	0.06	*	0.05	*
	(1.56)		(1.81)		(1.83)		(1.70)	
Savannah	-0.18		-0.05		-0.19		-0.24	
	(-0.67)		(-0.15)		(-1.12)		(-1.40)	
Forest	0.08		0.10					
	(0.32)		(0.36)					
Accra	0.13		0.28					
	(0.53)		(1.14)					
Child characteristics								
Age in months	-0.14	***	-0.14	***	-0.14	***	-0.14	***
	(-8.23)		(-7.87)		(-8.09)		(-8.12)	
Age squared	0.00	***	0.00	***	0.00	***	0.00	***
	(7.37)		(7.06)		(7.22)		(7.35)	
Sex (Female =1)	-0.02		-0.06		-0.02		-0.07	
	(-0.16)		(-0.50)		(-0.19)		(-0.60)	
Mother's education								
Years of schooling	-0.02		2.78	•				
	(-0.55)		(1.77)					
Complete primary					-0.13		26.45	**
					(-0.64)		(2.36)	
Complete middle					-0.11		31.85	***
					(-0.41)		(2.70)	
Secondary or higher					-0.37		26.24	**
					(-1.00)		(2.27)	
Father's education								
Years of schooling	0.02		0.02					
	(1.16)		(1.32)					
Complete primary					0.33	**	0.14	
					(2.09)		(0.72)	
Complete middle					0.29	•	0.15	
					(1.64)		(0.77)	
Secondary or higher					0.13		0.17	
					(0.50)		(0.73)	
Interactive terms								
Years x expenditure			-0.19	*				
			(-1.76)					
Primary x expenditure							-1.82	**
							(-2.36)	
Middle x expenditure							-2.18	***
							(-2.70)	
Secondary+ x expend.							-1.79	**
							(-2.27)	
Intercept	-18.83		-34.31		-20.82	***	-30.40	***
	(-2.03)		(-1.89)		(-2.81)		(-2.88)	
R squared	0.34		0.34		0.34		0.34	
No. of observations	755		755		755		755	

Annex L: Evaluation Approach Paper*

I. BACKGROUND AND RATIONALE

Education and the international development agenda

> "All agree that the single most important key to development and to poverty alleviation is education. This must start with universal primary education for girls and boys equally..."
>
> James Wolfensohn, January 1999[1]

1. Education is central to the internationally adopted poverty reduction goals. This fact is recognized by the inclusion of education in two of the Millennium Development Goals (MDGs), namely those for universal primary education and gender equality in school enrolments. Support for education has also manifested itself in the Education for All (EFA) initiative. The Education for All declaration, made at Jomtien (Thailand) in 1990, gained international support through a partnership of UNESCO, UNICEF, UNDP and the World Bank. It was given a further boost by the Dakar World Education Forum in April 2000. The MDGs and EFA provide a basis for measuring progress on educational development. Each Millennium Development Goal has associated targets and indicators, and EFA has a set of 18 core indicators. These indicators, listed in appendix 1, will be utilized in this study where practicable.

2. This evaluation will test some of the key assumptions behind the strategies being proposed to meet the MDG and EFA targets. Following Dakar, a framework for action was adopted based on 12 strategies, which embody the rationale behind the design of much recent Bank lending to basic education, such as the need to engage civil society at all levels of educational development.[2] The Bank's own Education Sector Strategy can be considered as complementary to the Dakar framework, and incorporates elements such as curriculum reform and more accountable education management systems.[3] More generally, the Bank has stressed the quality aspects of EFA, stating that "many factors enter into the delivery of adequate quality education, including interactive classroom pedagogies, effective multi-grade teaching techniques, the availability of textbooks, instructional leadership from school principals, parental support, community involvement in school management, and the existence of student assessments to make schools more accountable for learning progress".[4]

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* This paper was produced by Howard White (Task Manager, OEDST) under the guidance of Alain Barbu and Roy Gilbert with inputs from Helen Abadzi, Martha Ainsworth, Soniya Carvalho, Osvaldo Feinstein, Nils Fostvedt, Patrick Grasso, Bill Hulbert, Greg Ingram, and Nalini Kumar. Inputs were also received from Benoit Millot, Rene Bonnel, Eunice Depaah, Xiao Ye at a review meeting held on September 24th, 2002.

1. Quoted in World Bank *Education Sector Strategy*, July 1999, p. iii.

2. UNESCO *The Dakar Framework for Action*, Paris, 2000.

3 The design paper shall elaborate upon EFA and the link with the Bank's own strategy.

4. "Education for Dynamic Economies: Accelerating Progress Toward Education for All", submission to Development Committee, September 2001, Education Sector, World Bank.

Education in Ghana

3. Ghana's education sector, once one of the most respected in Africa, has come to embody many of the challenges faced by the sector across the continent. During the 1980s enrolments fell, with gross primary enrolment falling from 80 per cent in 1980 to just 69 per cent by 1987.[5] The quantity as well as the quality of education suffered, as non-salary recurrent expenditures were squeezed out, falling real wages and frequent late payments demoralized the teaching force. Meanwhile government spending was excessively oriented toward the tertiary sector. Over the last 15 years the government has been tackling these problems with considerable Bank support.

4. The government embarked on an ambitious reform program in 1987, supported by two World Bank Sector Adjustment Credits (EdSAC I and II, the first SECALs to education), which reduced the length of pre-university education from 17 to 12 years, introduced curriculum reform for a greater vocational element, placed a ceiling on educational recruitment and eliminated untrained teachers. Whilst in principle there has always been free universal primary education in Ghana, fees charged at local level have been one factor in restraining enrolments. Free Compulsory Universal Basic Education (FCUBE), introduced in 1996, aimed at eliminating these fees. Since 1997 there has been decentralization of the sector, including increased community management and accountability, through the introduction of School Management Committees and School Performance Assessment Meetings. The Bank has supported increases in the quantity and quality of primary education through two projects: Primary School Development Project (1994-1998) and Basic Education (1996-2002) which included components such as school-building, teacher training and interventions to improve school management.

5. Ghana's education sector was chosen as the subject of this impact evaluation for a number of reasons. First and foremost are the range of policy-relevant evaluation questions to be addressed regarding how government and the Bank can support improved educational outcomes – and hence a test of the strategies being pursued to achieve EFA. A second factor is the prominent role of the Bank in supporting the sector over the last 15 years, with a sizeable portfolio to form the subject of the evaluation (see paragraph 13 below), including the earliest example of a sector program since several donors parallel co-financed the EdSACs.[6] Third, are strong complementarities with other activities, notably Education for All[7] (for which Ghana is one of the pilot countries), *WDR 2003*, the planned OED education sector review[8] and the on-going Joint Evaluation of External Support for Basic Education in Developing Countries supported by the Netherlands.[9] Fourth is the availability of suitable baseline data from the second round of the Ghana Living Standards Survey (GLSS) in 1988,

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5. Data from United States Statistical Information Service, which reports the most complete data series available.

6. A number of other donors have been actively involved in the sector, notably USAID and the UK (formerly ODA, now DFID).

7. Ghana is a pilot country for the EFA "fast-track" initiative.

8. The OED review will take Uganda and Malawi as case studies. Hence Ghana adds a west African case to the list of countries being studied.

9. Ghana is one of the cases in the Basic Education Evaluation. The documents for that study have been analysed to ensure that this study does not overlap with that evaluation.

which collected facility data from schools and carried out education tests on all 9 to 55 year olds in a national sample of households.

II. ADDRESSING THE KEY EVALUATION QUESTIONS

The context for impact evaluation

6. Impact evaluation has taken various meanings at different times. The most common, which are not mutually exclusive, are:

- A concern with the impact of an intervention on welfare outcomes, meaning that it is concerned with the final stage of log-frame indicators.
- Conducting a with versus without analysis, i.e. establishing the counterfactual.
- Having a broader focus than merely a specific project, to examine the effect of support to a sector, or even country.
- An analysis of sustainability, by analyzing the lasting effects of an intervention several years after it has been completed.

7. Over twenty years, OED produced over 70 Impact Evaluation Reports (IERs).[10] A preliminary review of these reports shows that each of the different meanings of impact has been used. In addition to the work of OED, the World Bank's Research Department (Development Economics and Chief Economist, DEC) has been engaged in impact evaluation, including a research project entitled "Impact Evaluation of Education Reforms". Less recently, DEC sponsored the 1988 data collection and analysis of educational achievement in Ghana.[11] DEC's analyses are mostly concerned analyzing the welfare impact of public policy. They do not share OED's mandate of focusing on the impact of specific Bank-supported interventions.

8. This evaluation will embrace all four meanings of the term impact, though the key focus is on a counterfactual analysis of project and welfare outcomes. Earlier OED studies often had difficulties in establishing a satisfactory counterfactual on account of the lack of baseline data. The design of this study takes advantage of a nation-wide survey conducted in 1988.

Evaluation questions

9. This impact evaluation is concerned with final outcomes and the role of the World Bank in achieving those outcomes. This evaluation will focus on four questions: (1) What are the determinants of educational outcomes (that is, educational achievement)[12] for children of

10. Imagebank lists 72 separate IERs covering the period 1979-1999. Preparatory work for this evaluation will review previous education studies by OED, other education-related evaluation work at the Bank, and evaluations of the education sector undertaken by other agencies. For a review of these documents see Anju Gupta Kapoor "Review of impact evaluation methodologies used by OED over the past 25 years", *OED Working Paper*, 2002.

11. See, for example, Paul Glewwe (1991) "Schooling, Skills and the Returns to Government Investment in Education: an exploration using data from Ghana" *Living Standards Measurement Survey 76,* Washington D.C., World Bank.

12. In this study "educational achievement" refers to test scores and "educational attainment" the highest level of education attained.

primary-school age in Ghana? (2) Which education interventions ("treatments" in evaluation terminology, drawing on the analogy of medical research) have the greatest impact on the determinants of educational outcomes?; (3) What has been the role of the Bank in promoting education interventions which result in improved educational outcomes?; and (4) How do educational outcomes in Ghana promote improved welfare outcomes?

10. The following points should be observed with respect to the above:

- The evaluation concerns primary education outcomes and will not in general be concerned with Bank support to secondary, tertiary or non-formal education.

- The evaluation will judge the impact of Bank projects and policy advice. This impact has been achieved through both (a) the creation of school infrastructure, provision of materials and teacher training and (b) institutional reform supported by a number of agencies. In the latter case attribution will not always be possible. But it will be possible to say if the types of reform supported by the Bank have been beneficial for education outcomes.

- Impact here refers to both educational outcomes and the consequent improvements in socio-economic well-being (higher income, reduced mortality etc.). This evaluation will, to the extent possible, be concerned with both of these.

- OED evaluation is objective-based, so that the precise formulation of the above evaluation questions will reflect the stated objectives of the four projects under review, and the implicit strategy for achieving the international development goals for education as embodied in the Millennium Development Goals and EFA.

- Some evaluations judge project impact by including a project dummy variable in a multiple regression to establish the determinants of the relevant outcome variable. Such an approach is unable to explain why particular project interventions have, or have not, had the desired effects. Utilizing a theory-based approach built around a log-frame, this evaluation will combine a process-oriented approach with regression-based impact analysis, and hence "open the black box" of what is happening inside projects. This approach involves modeling the determinants of the desired outcomes, and linking those determinants to the specific interventions supported by the Bank. The corresponding steps in the analysis are out-lined below.

The Approach

11. Since 1986 there have been 10 Bank projects in support of the Ghana education sector totaling US$ 302 million in IDA credits (see Appendix 2),[13] representing at least 20 per cent of external support to the sector.[14] The focus of this evaluation will be on the four projects

13. This figure includes only the education component of the Health and Education Rehabilitation Project.

14. Calculation based on data from DAC on-line database, from which data are not very reliable. A project listing from the Ministry of Education for the 1990s, which accurately records all Bank projects, puts the Bank's share of external support as high as 63 per cent.

identified in paragraph 4 above which have supported primary education.[15] However, *relevance* shall be addressed taking into account the whole of the Bank's education portfolio in Ghana: (i) examining the relative share of the education portfolio in the light of the country's needs and priorities; (ii) analyzing the intra-sectoral composition of Bank support against the priorities of the Government of Ghana and the Bank's country strategies during the period; (iii) comparing the objectives of Bank projects with government's own policy objectives and the most pressing policy issues of the time.

Box 1. Linking classroom building to increased enrolments

School building supports higher enrolments. Although this seems obvious, it is not at all obvious how to measure this effect. The first point is that rehabilitation or expansion of existing schools is the norm, not the construction of wholly new facilities. So if access (distance) is the problem it is not tackled by these projects. Second, even at existing schools, new classrooms may replace existing ones rather than be a net addition to the size of the school. If this is the case, parents may nonetheless be more willing to send children to school or there may be an indirect impact on enrolment through higher teacher motivation. Both effects seem probable if brick classrooms are replacing open, thatched structures, as are common in rural Ghana. When there is a net addition in classroom size, the impact on enrolments is not simply the net increase in classrooms time class size, since (1) demand is needed to meet the supply, and (2) the increase in classrooms can be used to reduce class-size. The required approach is econometric modeling of the enrolment decision, with the determinants including variables affected by classroom building (such as average class size).

12. The evaluation criteria relate to different levels of a log-frame. The log-frame provides the basis for a theory-based approach, since it identifies the links from activities to intended outputs and hence to outcomes. It is therefore particularly suited for an impact evaluation, which seeks not only to measure project impact but to identify the factors behind achieving that impact. Appendix 3 shows a log-frame for the support to formal basic education. The log-frame itself is purely descriptive. The analytical challenge comes in testing the links from one box to another. This is far from straightforward, as considering just one example demonstrates (see Box 1).[16] Identification of indicators for each level of the log-frame will take into account the EFA core indicators and the MDGs. For example, the analysis of enrolments will be disaggregated by gender and measurement of teacher quality will use EFA core indicators such as the percentage of teachers who have attained the required academic qualifications and who are qualified to teach by national standards.

13. Following this log-frame, the key steps in the analysis are as follows:

- Documenting the activities supported by the World Bank, which cover both improved supplies and facilities and institutional development.[17] This step identifies the

15. The Junior Secondary Schools in Ghana's education systems cover grades usually counted as primary.

16. This log-frame is based on an analysis of the relevant project documents. The design paper for this evaluation will set the analysis in the context of EFA-related strategies.

17. *Institutional development* refers to both activities and the outcomes from both those activities and other activities with less direct institutional development effects. For primary education projects institutional development may be addressed at three levels: (1) central government level, with a focus on the Ministry of Education and Government Education Service; (2)

interventions, or treatments, which are to be the subject of the evaluation. These activities result in project outcomes. Insofar as physical outputs are concerned, these are determined from project documentation and project MISs. Determining the role of the Bank in institutional development, including reforms, requires a qualitative approach. Substantial reforms took place during the period under review, with the Bank as a key player in supporting these reforms.

- Quantifying the link from Bank-supported project outcomes to school-level outcome variables measuring the quantity and quality of schooling.[18] Specific questions concern the impact of classroom building, changes in school management and teacher quality (skills and motivation) on enrolments. The design paper will lay out the scope of the analysis more fully.

- Analyze the significant determinants of educational outcomes (modeled as both levels and changes over time), as measured by achievement in individual-level test outcomes. These determinants include the school quality variables affected by project activities.

- Examine the impact of educational achievement and attainment on socio-economic well-being.

14. A specific example of the approach to attributing impact is thus as follows. World Bank support resulted in the building of x number of classrooms.[19] The increase in the number of classrooms reduced class size to y, which has a z impact on school enrolments, and a change of z leads to a w improvement in welfare. This is just one channel, as new classrooms can also affect the pupil-teacher ratio and teacher motivation.

III. METHODOLOGY

15. The range of evaluation questions requires a mixed-methods approach. Issues of institutional development are mostly dealt with through qualitative methods (document review and key informant interview) whereas measurement of efficacy relies more on quantitative methods. Table 1 summarizes the various approaches likely to be used to address different questions.[20]

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the capacity of local government officials dealing with the education sector; and (3) school management (both headmasters and PTA members).

18. The OED evaluation criterion *efficacy* can be assessed against project outputs (e.g. numbers of teachers trained and classrooms built), intermediate outcomes (higher enrolments, better classroom methods, improved school management), and final outcomes (improved learning outcomes and consequent socio-economic well-being).

19. This figure is the actual number constructed adjusted for "replacement effects", whereby new classrooms replaced old ones. Where replacement occurs the possible impact of the quality of school infrastructure on school enrolments and achievement needs to be allowed for.

20. Subject to change during formulation of precise evaluation questions.

Table 1. Data collection methods

	Document review	*Key informant interviews*	*Secondary data analysis*	*School survey*	*Household/ individual survey*
Institutional development and implementation of reform:	x	x			
Central government	x	x			
Local government	x	x		x	
School management		x			x
Teacher morale and methods		x			x
Educational outcomes:					
Enrolments	x		x	x	x
Learning outcomes				x	x
Intermediate variables:					
School-building	x		x		
Teacher training	x		x		

16. The initial document review will map out a time-line for the sector and the Bank's involvement. This process will generate the objectives of Bank support and the specific interventions (treatments) which have been applied. These objectives and interventions shall be set in the context of EFA-related strategies. This analysis will lead to the development of the related evaluation questions, and hence a toolkit to guide the qualitative fieldwork, which will examine the process of reform and the role of the Bank in that process.[21] This qualitative fieldwork will comprise interviews with key informants at both national and local level and visits to schools in both urban and rural areas. Organizations to be covered include relevant government agencies (MoE, GES, and local government officials), the teachers' union, headmasters' association, and PTAs at the local level.

17. Ghana is rich in secondary data, including a computerized Education Management Information System (EMIS). The initial review will document what data are available and list the existing studies made using these data.[22] Possible gaps relevant to this study will be identified and filled though commissioned studies.[23] The OED study will also utilize existing data rather than duplicate existing data collection.

18. The main quantitative data collection tool will be a household survey modeled on the 1988 GLSS. Specifically, fifty of the same communities will be re-surveyed (but not the same individuals), applying a reduced version of the questionnaire used in 1988, including the

21. Toolkits were developed by the Public Sector Management anchor, and adapted for OED's review of social funds. Although analysis of the reform process will be largely qualitative, quantitative indicators of reform, such as budget analysis, shall also be developed, partly to triangulate the different approaches. Where possible, these indicators will be based on EFA and MDG-related indicators, and on key performance indicators from the Bank credits. Recording progress on reform is one thing, attributing responsibility is another. It is not possible to prove attribution for policy reform. The evaluation seeks to establish "plausible significant influence" of the Bank on policy outcomes.

22. A synthesis study was underway for the MoE during the preliminary field visit in May of this year. The results of that study should be available for this evaluation.

23. For example, data are available on school-level exam results since 1987. It seems that no detailed analysis has been made of these data.

educational tests for math, English/local language and a reasoning (Ravens) test.[24] The school survey (comprising a facility survey and separate teacher questionnaire) will also be repeated, in an expanded form to capture more aspects of school management and quality of schooling.[25] These data will allow modeling at the individual, household and community levels to examine, for example, how school-building and changes in school management affect enrolments, and how classroom practices and teacher motivation affect pupil's educational performance. The availability of household data will make it possible to control for external factors. Community-level data will be linked to the 1988 data to examine the determinants in changes in community-level enrolment and community average educational scores over the fifteen-year period.[26] Using this approach, attribution to Bank-support is indirect.[27] Specifically, and as shown by the log-frame, the analysis will establish which interventions, of the sort supported by the Bank, have a significant impact on educational achievement.

19. The facility-level data will constitute a panel of schools, allowing examination of school-level changes for over 50 schools over the 15-year period. The purpose of this analysis is partly descriptive: how have schools fared over the last 15 years? The analysis will also help address issues of *sustainability*. Questions include: What is the current state of Bank-supported infrastructure?[28] Are teachers and government officials who have received Bank-financed training still working in relevant positions to utilize that training? Are Bank-supported changes in teaching methods and school management being applied?

20. The links between educational outcomes and socio-economic well-being are well documented. This study will apply established methods to the primary data. An analysis shall possibly be made of rates of return to education, but examining the rate of return to educational achievement (education scores),[29] rather than attainment (years of schooling), and estimates made of the impact of achievement on nutrition and fertility.

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24. The 1988 study used only a in English test. However, an important debate concerns the differential effects of literacy in a local language and English (or equivalent).

25. Questions of this sort are available from the Institute for Educational Quality, a Washington-based organization which has carried out extensive work for USAID, including in Ghana in the mid-90s.

26. The availability of surveys at a fifteen year interval offers a unique opportunity to describe changes in educational inputs and outputs over a fifteen year period. Using these data for analysis of determinants has the advantage of removing community-level fixed effects (by differencing). However, a problem is that observations of school quality are made at two points of time, whereas some many children covered in the survey may been educated under a different school regime in, say, the mid-90s. This problem can be tackled by restricting the sample to those in, or who have recently left, school.

27. The Primary School Development Project targeted support to 1,983 schools so a direct approach would be to isolate "Bank-supported schools" from other schools and conduct a control group analysis. It is only worthwhile to compare school-level variables for Bank-assisted schools and others if a suitable control can be established – but there are limited other data to construct such a control, which would be especially difficult since the 1,983 were chosen as "the most disadvantaged". Moreover, a control of this sort cannot say what is what about the intervention which "worked".

28. Data from EMIS can (and may) be used to track changing scores in the 1,983 schools against a control of other schools, noting again the difficulties of establishing a satisfactory control group.

29. However, the survey will collect expenditure data rather than income. The pros and cons of such an approach are discussed in the design paper.

IV. DISSEMINATION

21. During the preliminary visit in May 2002 considerable enthusiasm was expressed by MoE officials for a launch workshop in Accra, which is a good opportunity to define the scope for other necessary work. This workshop will be held as soon as possible, most likely late November 2002. A further workshop will be held in Accra to present preliminary findings to government, donors, NGOs and teachers' representatives. Given the proposed collaborative nature of the program of impact evaluations, allowance is also made for presentations to other major donors (e.g. DFID in London).

V. COLLABORATION WITH OTHER AGENCIES

22. This evaluation seeks to build up capacity for such evaluations amongst both other agencies and borrower governments. They will do this by operating in a collaborative manner. This study is being partly financed from DFID resources, and co-operation with DFID staff in Accra is being sought.[30] Discussions were held with relevant government agencies during the preliminary field visit in May 2002, and Ghana Statistical Services identified as the likely partner to conduct the survey. A firm basis for collaboration with the Ministry of Education (MoE) and Government Education Service (GES) was established at that time. Collaboration will be sought with other donors active in the sector, such as USAID. The Ghanaian Evaluation Association will be contracted regarding possible collaborators.

VI. SCHEDULE AND TASK MANAGEMENT

23. The inception phase of this study, comprising the initial document review and compiling of the questionnaires, has taken place in the period from August to October 2002. A design paper, including draft questionnaires, have been produced as a part of this process. A preliminary field visit in October oriented the questionnaires to the current realities of the Ghanaian education system. Data collection is to be undertaken by Ghana Statistical Services (GSS). The pre-test of the survey instruments is scheduled for November and the survey itself in January and February 2003. The researcher from the evaluation team will accompany the survey teams, with the task manager present for some of the time. The second phase, data analysis, will begin in May 2003, with a first draft report for internal OED distribution by late July 2003, and a draft for management review by early October 2003. The report will be sent to the Committee on Development Effectiveness (CODE) early November 2003.

24. The commissioned studies will be undertaken parallel with the above activities and are due 31st December 2002. Currently envisaged studies are: (1) the political economy of education reform and the role of the World Bank, and (3) curriculum reform.

25. The evaluation will prepared by a team of OED staff and consultants with the assistance of Ghanaian government officials and consultants under the Task Management of Howard White (OEDST). An advisory panel will be appointed to review the proposed evaluation design and draft final report.

30. For example, participating in fieldwork or commissioning of parallel studies.

VII. BUDGET

26. The program of impact studies is being supported by the DFID-OED partnership agreement. The total budget for this study is $500,000.

Appendix 1. MDG and EFA Indicators

Education-related MDGs, targets and indicators

Goals and targets	*Indicators*
Goal 2: Achieve universal primary education	
Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	6. Net enrolment ratio in primary education 7. Proportion of pupils starting grade 1 who reach grade 5 8. Literacy rate of 15-24 year-olds
Goal 3: Promote gender equality and empower women	
Target 4: Eliminate gender disparity in primary and secondary education preferably by 2005 and to all levels of education no later than 2015	9. Ratios of girls to boys in primary, secondary and tertiary education 10. Ratio of literate females to males of 15-24 year-olds

Core EFA Indicators

1	Gross enrolment in early childhood development programs, including public, private, and community programs, expressed as a percentage of the official age-group concerned, if any, otherwise the age-group 3 to 5.
2	Percentage of new entrants to primary grade 1 who have attended some form of organized early childhood development program.
3	Apparent (gross) intake rate: new entrants in primary grade 1 as a percentage of the Population of official entry age.
4	Net intake rate: new entrants to primary grade 1 who are of the official primary school entrance age as a percentage of the corresponding population.
5	Gross enrolment ratio.
6	Net enrolment ratio.
7	Public current expenditure on primary education a) as a percentage of GNP; and b) per pupil, as a percentage of GNP per capita.
8	Public expenditure on primary education as a percentage of total public expenditure on education.
9	Percentage of primary school teachers having attained the required academic qualifications.
10	Percentage of primary school teachers who are certified to teach according to national standards.
11	Pupil teacher ratio.
12	Repetition rates by grade.
13	Survival rate to grade 5 (percentage of a pupil cohort actually reaching grade 5).
14	Coefficient of efficiency (ideal number of pupil years needed for a cohort to complete the primary cycle, expressed as a percentage of the actual number of pupil-years).
15	Percentage of pupils having reached at least grade 4 of primary schooling who master a set of nationally defined basic learning competencies.
16	Literacy rate of 15-24 year olds.
17	Adult literacy rate: percentage of the population aged 15+ that is literate.
18	Literacy Gender Parity Index: ratio of female to male literacy rates.

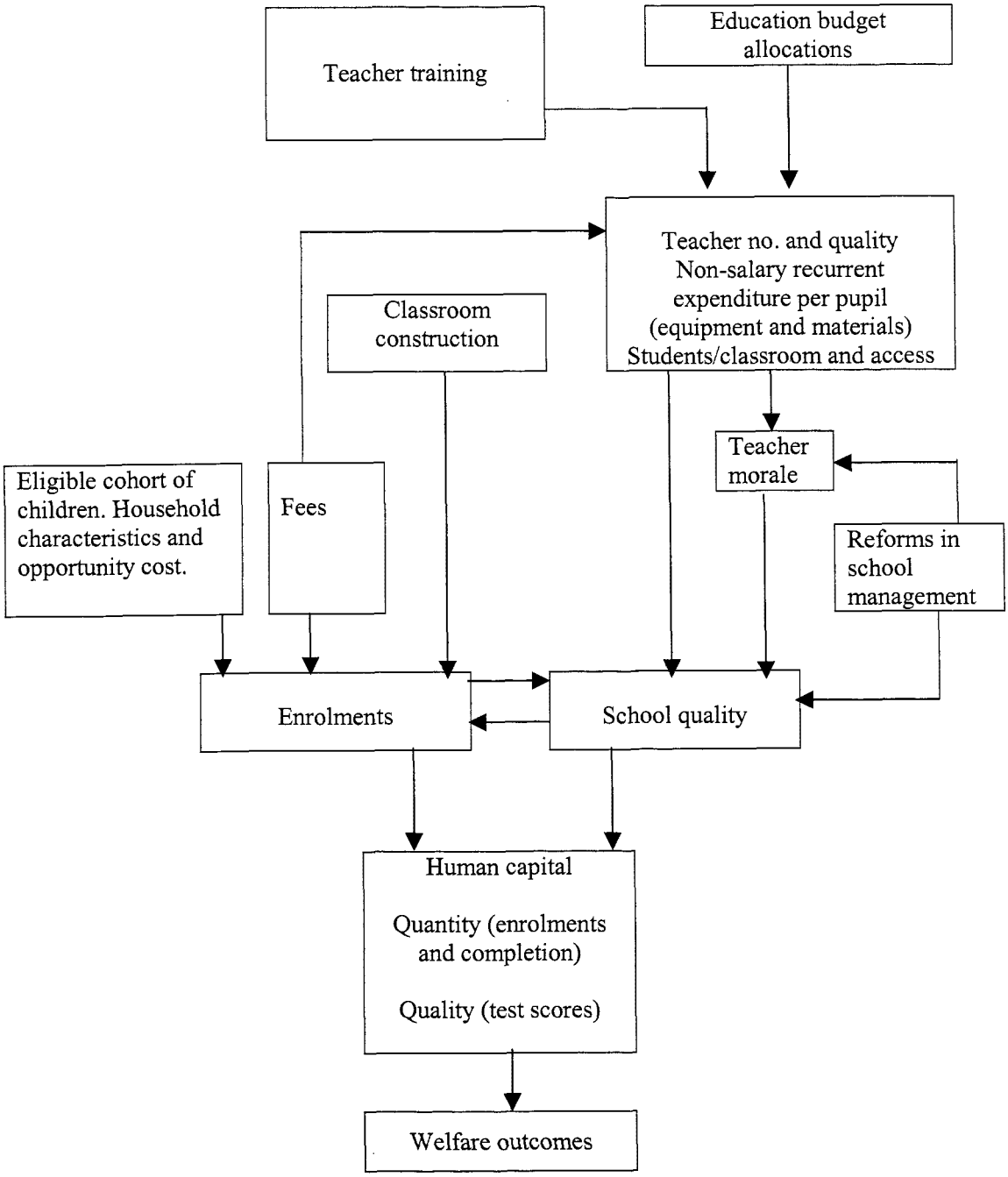
Source: *Education for All Assessment: Statistical Documentation*, World Education Forum, Dakar, April 2000, Appendix II

APPENDIX 2. BANK SUPPORT TO GHANA EDUCATION SECTOR

Project	*ID*	*Budget*		*Rating**	*Status*
		IDA	*Total*		
Health and education rehabilitation	P000876	18.0	18.1	n.a.	Closed
o/w education component		6.1			
Education sector adjustment	P000891	38.3	45.5	S	Closed
Education sector adjustment II	P000896	53.2		S	Closed
Community and secondary school construction	P000954	14.7	19.6	S	Closed
Literacy and functional skills	P000917	27.8		S	Closed
Tertiary education	P000933	44.8	51.0	Marg. S	Closed
Primary school development	P000964	53.2	56.6	Marg. U	Closed
Basic education	P000975	34.7		S	To close 12/02
Vocational skills and informal sector	P000948	5.8		U	Closed
National functional literacy program	P000974	23.7		S (impl: U)	To close 12/04

Note: *ICR (or PSR for current projects).

APPENDIX 3. FLOW CHART LOG-FRAME FOR SUPPORT TO BASIC EDUCATION



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