EDUCATION SECTOR ANALYSIS METHODOLOGICAL GUIDELINES

VOLUME 1

UNESCO
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Educational, Scientific and
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International Institute
for Educational Planning

Pôle de Dakar
EDUCATION SECTOR ANALYSIS

THE WORLD BANK

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EDUCATION SECTOR ANALYSIS METHODOLOGICAL GUIDELINES

SECTOR-WIDE ANALYSIS,
WITH EMPHASIS ON PRIMARY
AND SECONDARY EDUCATION

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With the financial support of:

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Foreword

Many developing countries have placed education at the centre of their social and economic development strategies and have invested in strengthening the ability of their education systems to enrol more children and youth. As a result, enrolment rates are much higher today than they were in the 1980s, and the average number of years of schooling has increased dramatically in the past 25 years.

Yet, although much has been achieved, many challenges remain. In 2012, pre-primary gross enrolment rate in the low income countries was only 19 percent. Worldwide, 58 million primary and another 63 million lower secondary school-aged children were still out of school, some dropping out too early and others never even entering school. Girls, children with disabilities, rural dwellers, and those from poor families are at a distinct disadvantage when it comes to schooling and learning, especially when these sources of disadvantage overlap.

Above all, learning levels in developing countries are dismally low. Millions of children who go to school do not learn the basics. Out of around 650 million children of primary school age, as many as 250 million either do not reach Grade 4 or have not learned to read or write. Although young people are spending a lot more time in school and training, they are too seldom acquiring the knowledge and skills they will need to lead productive working lives. This takes a heavy toll on the prospects for inclusive growth and poverty reduction in their countries.

The Millennium Development Goals and Education for All goals remain an unfinished business. Today, as the post-2015 agenda and implementation modalities are being defined through large consultations and intense debates worldwide, the ability of education systems to deliver better quality education presents a critical challenge. Evidence-based analytical work to inform and monitor national education sector plans may help to meet this challenge, but only, of course, if the findings from these analyses serve as a basis for reform. Greater ownership of evidence and education sector analyses and improved capacity to use these are needed to ensure that this happens.

These guidelines, a joint product of more than 25 UNESCO, World Bank, UNICEF, and GPE Secretariat education economists and specialists who have been providing technical support to government teams during the last 15 years, constitute a substantive contribution to fulfilling the need for more evidence. They present methodologies for the analysis of policy issues with the aim of strengthening the knowledge required for the development of more equitable and efficient education sector plans. They can help provide government teams with increased autonomy with the process of data collection, analysis and interpretation as they also include detailed tools for the interpretation of findings. But while government teams responsible for monitoring and planning education policies are the target audience for this work, other potential users include development partners, research centres and universities. Ultimately, the goal is for these guidelines to encourage greater accountability for better and more equitable education and learning, from the classroom to the halls of policymaking, and for greater effectiveness in the use of public and external resources.

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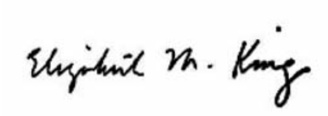

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Acronyms and Abbreviations

Acronym	Volume	Signification
ADRA	Vol 2	Adventist Development and Relief Agency (NGO)
AER	Vol 1	Average Enrolment Rate
AIDS	Vol 1&2	Acquired Immune Deficiency Syndrome
BREDA	Vol 1&2	UNESCO's Regional Bureau for Education in Africa
CAMES	Vol 2	African and Malagasy Council for Higher Education
CAR	Vol 1&2	Central African Republic
CBA	Vol 2	Competency-based Approach
CBT	Vol 2	Complementary Basic Training
CEMAC	Vol 1	Economic and Monetary Community of Central Africa
CFAF	Vol 1	CFA Franc
CNRS	Vol 1	*Centre National de la Recherche Scientifique*
CONFEMEN	Vol 1	*Conférence des ministres de l'Education des Etats et gouvernements de la Francophonie*
CSEE	Vol 1	Certificate of Secondary Education Examination
CSR	Vol 1	Country Status Report
CWIQ	Vol 1&2	Core Welfare Indicator Questionnaire
DFID	Vol 1	Department for International Development
DHS	Vol 1&2	Demographic and Health Survey
DIT	Vol 2	Diploma in International Trade
DRC	Vol 2	Democratic Republic of Congo
ECD	Vol 1&2	Early childhood development
ECERS	Vol 2	Early Childhood Environment Rating Scale
ECOWAS	Vol 1	Economic Community of West African States
ECVM	Vol 2	Household living conditions surveys
EFA	Vol 1&2	Education for All
EGMA	Vol 1&2	Early Grade Mathematics Assessment
EGRA	Vol 1&2	Early Grade Reading Assessment
EMIS	Vol 1	Education Management Information System
ENS	Vol 1	*Ecole Normale Supérieure* (Teacher Training Institution)
FPR	Vol 2	Female Participation Rate
FTE	Vol 2	Full-time equivalent
FTI	Vol 1	Fast Track Initiative (Now the GPE)
GDP	Vol 1&2	Gross domestic product

GER	Vol 1&2	Gross Enrolment Rate
GIR	Vol 1	Gross Intake Rate
GPE	Vol 1&2	Global Partnership for Education
GPI	Vol 1	Gender Parity Index
GIZ	Vol 1&2	German Cooperation Agency
HDI	Vol 1	Human Development Index
HECDI	Vol 2	Holistic Early Childhood Development Index
HIPC	Vol 1	Highly Indebted Poor Countries – Multilateral debt relief initiative
HIV	Vol 1&2	Human immunodeficiency virus
ICT	Vol 2	Information and communication technologies
IDB	Vol 1	Islamic Development Bank
IDE	Vol 2	Institute of Distance Education
IEC	Vol 1&2	Internal Efficiency Coefficient
IHS	Vol 2	Integrated Household Survey
ILO	Vol 1&2	International Labour Office
ILO	Vol 1	International Labour Organisation
IMF	Vol 1&2	International Monetary Fund
INS	Vol 2	*Institut National des Statistiques*
INSAE	Vol 2	*Institut National des Statistiques et de l'Analyse Economique*
ISCED	Vol 2	International Standard Classification of Education
JSS	Vol 1	Junior Secondary School
KAP	Vol 2	Knowledge, Attitude and Practice (Survey approach)
LAMP	Vol 2	Literacy Assessment Monitoring Programme
MBB	Vol 2	Marginal Budgeting for Bottlenecks
MDG	Vol 2	Millennium Development Goals
MICS	Vol 1&2	Multiple Indicators Cluster Survey
MK	Vol 2	Malawi Kwacha
MRY	Vol 1&2	Most Recent Year
NER	Vol 1	Net Enrolment Rate
NFE	Vol 2	Non-formal education
NGO	Vol 1&2	Non-governmental organisation
OECD	Vol 1	Organisation for Economic Cooperation and Development

OLS	Vol 1	Ordinary Least Squares
OOS	Vol 1	Out-of-School
ORS	Vol 2	Oral rehydration salts
OVC	Vol 2	Orphans and vulnerable children
PASEC	Vol 1&2	*Programme d'Analyse des Systèmes Éducatifs de la CONFEMEN*
PCR	Vol 1	Primary Completion Rate
PETS	Vol 1	Public Expenditure Tracking Survey
PRSP	Vol 1&2	Poverty Reduction Strategic Paper
PTA	Vol 1	Parent-Teacher Association
PTR	Vol 1&2	Pupil-teacher ratio
RAMAA	Vol 2	Research to Measure the Learning Outcomes of Literacy Programme Participants
SABER	Vol 1&2	Systems Approach for Better Education Results
SACMEQ	Vol 1&2	Southern and Eastern Africa Consortium for Monitoring Educational Quality
SADC	Vol 1&2	South African Development Community
SCR	Vol 2	Secondary Completion Rate
SLE	Vol 1	School life-expectancy
SSA	Vol 2	Sub-Saharan Africa
STD	Vol 1	Sexually transmissible disease
TEVET	Vol 2	Technical, Entrepreneurial, Vocational Education and Training
TEVETA	Vol 2	Technical, Entrepreneurial, Vocational Education and Training Authority
TIMSS	Vol 1	Trends in Mathematics and Science Study
TTISSA	Vol 1	Teacher Training Initiative for Sub-Saharan Africa
TVET	Vol 1&2	Technical and Vocational Education and Training
UC	Vol 1&2	Unit cost
UIS	Vol 2	UNESCO Institute of Statistics
UNAIDS	Vol 1	Joint United Nations Programme on HIV/AIDS
UNDP	Vol 1	United Nations Development Programme
UNESCO	Vol 1&2	United Nations Educational, Scientific and Cultural Organisation
UNICEF	Vol 1&2	United Nations Children's Fund
UPE	Vol 1	Universal Primary Education
USAID	Vol 1	American Cooperation Agency
UWEZO	Vol 1	'Capability' in Kiswahili. Student literacy and numeracy assessment Initiative in Kenya, Tanzania and Uganda
WB	Vol 2	World Bank
WCARO	Vol 1	UNICEF's West and Central Africa Regional Office
WDI	Vol 2	World Development Indicators
WFP	Vol 1	World Food Programme
WHO	Vol 1&2	World Health Organisation

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Introduction

Education levels have risen sharply in developing world over the last decade. Nevertheless, many countries are still far from reaching of universal primary completion. In addition, education systems face current and growing challenges on other fronts: disparities that affect the poor, girls and children/youth living in rural areas are still striking; learning outcomes are generally below expected standards; training does not sufficiently match labour market demand or reflect the skills needed for economic growth; and sector management, efficiency and accountability are largely improvable.

BACKGROUND AND PARTNERSHIPS

In 1999, guidelines were developed for preparing country-specific education sector analyses, named Education Country Status Reports (CSR), aiming to enable decision makers to orient national policy on the basis of a factual diagnosis of the overall education sector and to provide relevant analytical information for the dialogue between government, development partners and civil society.

Since then, around 70 CSR-type reports, covering more than 40 countries, have been prepared thanks to partnerships between government and development partners teams (usually the World Bank, UNICEF and UNESCO; but African Development Bank, AfD and GIZ have also supported the preparation of several CSRs) and a learning-by-doing approach that allowed to build analytical capacity of government teams. Reports have been prepared mainly for African countries, although horizons recently expanded, with Yemen for instance.

CSRs are usually instrumental in the preparation or revision of governments' education sector plans, as required by the donor community to qualify for Global Partnership for Education (GPE) financing, among others. They have also been used for preparing donor-supported operations and the education sections of Poverty Reduction Strategic Papers (PRSP).

RATIONALE

The rationale for more detailed and updated CSR guidelines is threefold.

Primarily, it relates to the political economy of the policy dialogue and reform process. In order to maximise the chances of analytical findings being turned into reforms, governments must increase their ownership of the process and internalisation of the analysis. Providing government teams with more detailed methodological guidelines will help build national analytical capacities and enhance the preparation of education sector analysis with progressively less external support, a necessary condition for increasing government ownership.

Secondly, the present guidelines constitute a valuable update of the 1999 guidelines, as requested by government teams in charge of analysis and by reports' users: (i) expanding coverage to the entire education spectrum, from early childhood development to higher education; and (ii) presenting detailed and practical methodological approaches to analysis. These are all the more helpful that the scope and methodologies used for analysing education systems have evolved tremendously over the last 13 years, in particular thanks to an increase in the availability of data and surveys.

Finally, the approach proposed in the guidelines and their content are in line with the moving landscape of international aid for education. Support is less and less often project-based and more and more often program-based, which requires education sector analysis of the entire education system. Development partners are stepping up their efforts towards aid harmonisation and coordination, putting emphasis on joint support to the implementation of education sector plans whose preparation and/or updates require a holistic analysis of the education system, including economic analysis.

The guidelines and the way to use them are also aligned with the global strategies and visions of the development partners supporting the preparation of this kind of analytical report. One of UNESCO's priorities is national capacity strengthening, which is enhanced by the learning-by-doing and country-ownership approach recommended for the application of these guidelines. UNICEF has recently reaffirmed its focus on equity through its vision ("A Promise Renewed") in favour of the most disadvantaged children and young, alongside with the setting up of new analytical, monitoring and planning tools (such as bottleneck analysis, Monitoring of Results for Equity Systems –MORES, and Simulations for Equity in Education - SEE). These guidelines will be very useful for supporting the implementation of these tools, in particular as they lead to providing good quality data and analysis. Finally, the approach is also in line with the World Bank Africa Strategy that is based on the three pillars of knowledge, partnership and financing. CSR-type education sector analyses contribute to education sector knowledge, are prepared in partnership and are instrumental for countries to gain access to financing.

TARGETED AUDIENCE/USERS

The primary audience and key users these guidelines are addressed to are government teams in charge of education sector analysis. Teams often include the ministries of education, finance, planning, social affairs and labour, national statistical institutes and civil society representatives (teacher and student unions, parent associations). Other potential users include research centres, universities and development partners (in particular their technical staff). The guidelines were prepared in English and French.

OUTLINE AND CONTENT

The guidelines are articulated in two volumes:

- **The first** includes six sector-wide thematic areas: context; access; cost and financing; quality, system capacity and management; external efficiency; and equity.

- **The second** covers four specific sub-sectors: early childhood development; higher education; literacy and non formal education; and technical and vocational education and training. There are no primary and secondary general education specific chapters because the volume 1 covers already largely those sub-sectors.

Each guidelines' chapter starts with an overview that includes the objective, key policy issues to address, analytical methods and usual data sources.

The guidelines offer practical tools for data processing and analysis (data check procedures, definitions and formulas of indicators and analytical methodologies). They also contain qualitative tools (such as examples of questionnaires for stakeholder interviews), a relatively new aspect in CSR-type reports. They are illustrated with numerous examples from existing CSR-type reports, offering presentations and discussions of findings. Examples are mainly (but not only) from African countries' education sector analysis because so far the methodology has been mainly applied in African countries. That being said, examples are relevant and easily replicable in countries from other continents.

The approaches to analysis offered here mainly focus on the use of existing raw data and surveys (that are often underutilised) rather than preparing new field surveys. At the same time, the guidelines put emphasis on the need to build/reinforce sustainable education management information systems (EMIS), able to produce good and timely data. Cross-checking administrative data with household survey data is usually helpful for improving EMIS.

These guidelines were prepared by more than 25 education economists and specialists from UNESCO, World Bank, UNICEF and GPE Secretariat (see the Acknowledgments section), who have been involved in preparing education sector analysis and in training government teams over the last 15 years. Consequently the guidelines focus more specifically on methodologies where capacity gaps are the widest, based on the experience of the support provided to government teams.

RECOMMENDATIONS FOR A RELEVANT USE OF THE GUIDELINES

Although the guidelines aim to be comprehensive, country contexts vary. Government teams are encouraged to select the chapters and sections relevant to their analysis "à la carte" according to their main education policy issues and specific data constraints.

It is also highly recommended that, at the end of the process, teams collect key findings of the different chapters and present them in a policy-relevant way, in an executive summary or policy matrix. An Education Sector Analysis is like a jigsaw which sheds light on reform options only once the different analytical pieces are articulated and balanced. Then it can be a helpful policy making tool for decision makers and partners seeking to increase equity, service delivery efficiency and learning outcomes of the national education system.

The guidelines encourage placing emphasis on cross-country comparisons. The use of a common detailed methodological guide will further strengthen the comparability across countries of the different country-specific analytical reports and their use in each country-specific report prepared.

CHAPTER 1

CONTEXT OF THE DEVELOPMENT OF THE EDUCATION SECTOR

› Chapter Objective:
To analyse the socio-demographic, humanitarian and macroeconomic contexts affecting the education sector, including past trends and future prospects.

1. THE SOCIAL, HUMANITARIAN AN DEMOGRAPHIC CONTEXTS

ISSUE

The demographic, humanitarian and social development contexts have a critical and direct impact on education policy given that they determine both the number of children to enrol and the social constraints the education system faces.

OBJECTIVES

- Analyse past trends and future projections for the total population and the school-aged population to identify the constraints placed by demographics on the education system;
- Analyse key social indicators that define the national social development context;
- Evaluate the prevalence of given illnesses or epidemics (HIV/AIDS, malaria, and so on) likely to have a significant impact on the school-aged population and education sector staff; and
- Evaluate the risks associated with natural disasters and with conflicts and their impact on the education system.

METHODS

- Study the distribution of the total population and the school-aged population by age, gender and location, including past trends and future prospects. When appropriate, consider migration waves, such as refugees or groups displaced due to conflict;
- Review the country's situation in both historical and geographic perspectives, based on social development indicators (malnutrition, infant mortality, the share of the population living under the poverty line, literacy, and so on);
- Evaluate the HIV/AIDS and malaria prevalence rates in the total population, among youth, and for the active population, and their impact on the education system (children orphaned by HIV/AIDS, share of teachers affected by illness, and so on);
- Describe the country's linguistic situation; and
- Describe the risks associated with natural disasters and with conflicts and their impact on the education system.

SOURCES

- National: Official population data and projections; social indicators and linguistic information based on population census and household surveys; national contingency plan; conflict analysis; vulnerability analysis; and

- International: United Nations Population Division; UN specialised agencies (UNAIDS, WHO, UNDP, UNICEF, UNHCR, and so on).

2. THE MACROECONOMIC AND PUBLIC FINANCE CONTEXTS

ISSUE

The evaluation of education systems' development prospects requires knowledge of the macroeconomic constraints a country faces and some understanding of its budgetary room for manoeuvre.

OBJECTIVE

- Evaluate the current and projected levels of resources available for public expenditure, and education in particular.

METHODS

- Study past trends in GDP, budget resources (as a % of GDP), and external resources; and compare the indicators to those of other countries of similar development levels; and
- Project future scenarios for GDP, tax income, and public resources.

SOURCES

- National: National budget and macroeconomic data, from national statistical institutes and the ministries of planning, economy, development, finance and/or the budget; education ministries' budgets;
- Data on external funding of the education sector, from the relevant donor or technical partners' thematic group when available, or from the OECD-DAC; and
- International: Estimations and projections of GDP and GDP growth prepared by the World Bank and the IMF.

Introduction

Social, demographic, humanitarian and economic factors are critical considerations in the analysis of the development of education systems given their influences in the short, medium and long term on the school-aged population and the quality of education services.[1] The analysis of the demographic context enables the estimation and planning of the number of children the system will have to provide services for. It also identifies social and humanitarian factors that may provide further constraints to the development of education, such as poverty, which can affect education demand and learning outcomes.[2]

The analysis of a country's macroeconomics and public finance enables the estimation of past public expenditure, and the resources allocated to education in particular, as well as those likely to be available in the future. The identification of demographic and economic constraints to the development of the education sector are the first step, prior to any further in-depth reflection on the scope for implementing new policies. This provides the framework with which realistic policies must comply. The forecast of such constraints by education ministries should facilitate improved ownership of the final allocations, generally determined by the budget and finance ministries, to achieve greater control of education sector policy.

SECTION 1 THE SOCIAL, HUMANITARIAN AND DEMOGRAPHIC CONTEXTS

The age distribution of the population and its evolution determine the size of the school-aged population, the starting point of any education policy. This analysis will provide the number of children to be enrolled at each level, which is a starting point for assessing requirements in terms of resources, including teaching staff, pedagogical material, textbooks, and classrooms.

The main objective is thus to document the demographic evolution over the previous 10 to 15 years, and the most likely projections for the future, both for the total population and the school-aged population, by level. The distinction by gender and location (both urban/rural area of residence and region or district) is advisable.

It is important throughout this demographic analysis to consider the impact of exceptional phenomenon that may affect or alter the structure or size of the population, such as war, forced migration, and HIV/AIDS. The resulting projections will be key for the analysis of enrolment (Chapter 2) and equity (Chapter 6).

Beyond the purely demographic dimension, it is helpful to present some basic social indicators that facilitate the understanding of specific social situations that can impact the demand for education, or its supply. These include the share of the population living below the poverty line, malnutrition indicators, orphanhood, infant mortality (as a further reflection of living conditions), the prevalence of HIV/AIDS and malaria, adult literacy, natural disaster and conflict risks, etc.

1.1 THE EVOLUTION OF THE TOTAL POPULATION AND THE SCHOOL-AGED POPULATION

1.1.1 ASSESS THE QUALITY AND RELIABILITY OF NATIONAL DEMOGRAPHIC DATA

Before any analysis, it is important to assess the quality and relevance of the demographic data supplied by national statistical institutes. The reliability of these data may sometimes be questionable, especially when the last population census is old. The review of the data quality should be performed on the basis of single-age data, as age group data occasionally conceal single-age errors.

When national single-age data and/or official projections of acceptable quality exist (for example at the Ministry of Planning or at the National Institute of Statistics), it is important that they be used. Indeed, nationally validated data that is accepted by other ministries (Finance, in particular) will reinforce the credibility of the analysis and the estimations carried out.

However, the quality of population data can be poor. The most common data issues encountered are data discontinuity, or inconsistent data evolution by single-age, generally due to rounded age figures being mis-stated during census and surveys. Indeed, parents often give an approximate age for their children, either due to ignorance (where birth registration is not common) or convenience. This can result in nonsensical data, for instance where the 10 years age population is twice the size of the 9 or 11 years age population, or where projections for the 10 years age group are higher than those for the 6 years age group four years earlier.

When the reliability of the national data is questionable, authors must apply some judgment as to the gains to be achieved in marginally improving data quality, against the possible negative impact in terms of national ownership of the analysis and resulting policy recommendations. When the decision to correct the data is taken, it will often be necessary to correct the basic census population data through smoothing techniques, before repeating the projection exercise by single-age. Annex 1.1 explains how to evaluate the quality of data by single-age and correct common population data projection issues.

1.1.2 COMPUTING POPULATION GROWTH RATES

The analysis should describe the past trends in the evolution of the total population, as well as those for the official age groups equivalent to each education cycle. Annual population growth rates will be most appropriate.

● Key Definition

The average annual growth rate of a given population between years X and Y is obtained through the following formula (See Annex 1.2 for further details):

$$\left(\frac{Population_Y}{Population_X}\right)^{\frac{1}{Y\text{-}X}} - 1$$

Therefore, where the period of interest is 2000 to 2010, the average annual growth rate is:

$$\left(\frac{Population_{2010}}{Population_{2000}}\right)^{\frac{1}{10}} - 1$$

See Annex 1.2 for more details on the way to compute average annual growth rate.

1.1.3 COMPUTING THE SCHOOL DEMOGRAPHIC PSEUDO-DEPENDENCY RATIO

The value, evolution, and relative ranking of the school demographic pseudo-dependency ratio are further helpful indicators. The ratio varies considerably among countries, and reflects the demographic (and then economic pressure) on education supply and demand. The school demographic pseudo-dependency ratio (DPDR) is the share of the school-aged population relative to the total population:

● Key Definition

$$DPDR = \frac{School\text{ - }Aged\ Population}{Total\ Population}$$

Official school ages should be used for the school-aged population.

The ratio can be interpreted through two complementary approaches: (i) the proportion of the population in need of education services, as indicated by the ratio itself, and (ii) the proportion of the population potentially contributing to finance the education system (because they are active), either directly or through taxes, as indicated by the complementary share of the population (1 - DDR, see section 1.1.4). Countries with greater shares of school-aged children have proportionately lower shares of active adults.

Example 1.1 below, drawn from the Côte d'Ivoire CSR, 2010, illustrates the analysis of corrected and smoothed population single-age data. The age groups used are the official schooling ages for each education level (preschool, primary, lower secondary and upper secondary). The analysis clearly underlines the evolution of the population between the two census years and projected evolutions, including those for the future school-aged population.

EXAMPLE 1.1

(Demographic Context): The Demographic Context of Côte d'Ivoire, 2010

Source: Quoted and translated from Côte d'Ivoire CSR, 2010.

Côte d'Ivoire carried out general population and housing censuses in 1988 and 1998. Table 1.1 provides the main evolutions made apparent by the two censuses, as well as projections for 2006 (used as the reference year for the CSR) and 2020 (used as the mid-term horizon for prospective analysis).

TABLE 1.1 - Evolution of the Total and School-Aged Populations (Thousand), Côte d'Ivoire, 1988-2020

	1988 Census			1998 Census			2006 Projection			2020 Projection		
Age-group	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
3-5	-	-	-	752.6	712.2	1,464.8	817.6	820.3	1,637.9	1,245.9	1,231.5	2,477.5
6-11	905.8	951	1,856.8	1,343.6	1,259.9	2,603.5	1,443.6	1,423.7	2,867.3	2,125.6	2,113.8	4,239.4
12-15	443.4	467	910.4	774.1	746	1,520.1	893.9	845	1 739	1,187.2	1,188	2,375.2
16-18	323.2	285.7	609	507.2	532.1	1,039.3	619.4	582.5	1,201.9	787.4	790.5	1,577.9
Total Population	**5,527.3**	**5,288.4**	**10,815.7**	**7,844.7**	**7,522**	**15,366.7**	**10,024**	**9,633.8**	**19,657.7**	**14,348.6**	**13,900.7**	**28,249.3**

Findings

Over the 1988-98 inter-census period, the total resident population grew from 10,815,694 to 15,366,672 inhabitants, equivalent to an annual average growth rate of 3.6 percent. This rate consolidates both the natural growth of the 1988 resident population and the return from abroad of part of the positive migratory balance that characterised the 1988-98 period, estimated at 1.2 million people. Thus the natural population growth rate is effectively 2.7 percent per year over the period.

The projections of the total population are based on an annual growth of 3.1 percent between 1998 and 2006, and 2.6 percent between 2006 and 2020, given the demographic transition underway and minor immigration. On this basis, the national population would reach 19.7 million by 2006 and 28.2 million by 2020.

The population of primary school age (6 to 11 years) increased from 1,856,838 in 1988 to 2,603,500 in 1998, implying an annual average growth rate of 3.4 percent. This is slightly lower than the growth of the total population, suggesting that the country had already started a process of demographic transition in the 1990s.[3] The post-1998 projections (both the national statistics and United Nations figures) incorporate this transition process into their estimations. This implies that the future growth rate of the young population will be lower than between 1988 and 1998. The young population is expected to grow by 2.4 percent over the 1998-2020 period, against 3.4 percent for the 1988-98 period.

Overall, even if the demographic constraint will remain significant in the immediate future (the number of youth aged 6 to 11 years is expected to reach 4.24 million in 2020, up 47 percent from 2.87 million in 2006), the figures reflect a gradual reduction of this age group's growth rate.

The demographic pseudo-dependency ratio for the group of children aged 6 to 11 years is computed as 16.9 percent in 1998 (2,603.5 / 15,366.7); the ratio is expected to drop to just 15.0 percent in 2020 (4,239.4/28,249.3). This implies a reduction in the relative weight of school-aged youth in the global population, and a concomitant increase in the active adult population potentially contributing to finance the education system, from 83.1 percent (1–0.169) to 85.0 percent (1–0.150).

1.1.4 COMPUTING THE DEMOGRAPHIC DEPENDENCY RATIO

The previous indicator is in fact an adaptation of a common indicator in demography and economy: the demographic dependency ratio. This indicator can also be usefully analysed, as it provides information not only on the weight of the school age population, but also on the demographic and economic pressure of all the non-working population (children and elderly) compared to the active, or productive, population – the one which contributes to national wealth and revenues of the state.

● Key Definition

The demographic dependency ratio is the number of children, youth and elderly (the dependents) as a percentage of the potentially active population:

$$DDR = \frac{\text{Dependent Population (children and elderly)}}{\text{Active Population}}$$

Various conventions are used to define these ages: OECD for instance uses the age group 20-65 as the active population, while the younger and older age groups are the dependent population. In contrast, the United Nations use the age group 15-65 for the productive population. In any case, if historical or geographic comparisons are done, caution should exercise to ensure that the same definitions are used.

1.2 BASIC SOCIAL INDICATORS

In order to describe the social development context of a country, its evolution, and to place it in international perspective, comparing it to other countries with similar levels of development, the most relevant and commonly available indicators are:

- **The share of the population living below the poverty line.**
  This population group is the most financially and socially vulnerable. It is typically the population group with least access to education services also, due to: (i) direct (school fees, school supplies) and indirect (uniforms, transport) costs; (ii) opportunity costs (foregone earnings associated with time spent at school instead of working); and (iii) poverty-related vulnerability (illness resulting from the lack of access to health services, wounds resulting from labor). When conducting international comparisons, the poverty line established by the United Nations is preferable to the national threshold, although this can also be used. The Gini coefficient may also be used to illustrate the inequality in the distribution of national wealth (See Chapter 6 for an explanation of its computation and use);

- **The share of the urban population.**
  It is generally easier to provide education services in urban areas, given their higher population density, than to scarcely populated villages in rural areas. Children living in urban areas are also more exposed to cultural and educational events, and to written material (books, newspapers, advertising, and so on), which favors both literacy and school results;

- **The demographic density rate.**
  Population density is of particular interest and relevance given its direct impact on education logistics. Lightly populated areas are more difficult to provide education services to, given the relatively high cost for the system to provide infrastructure and staff for small groups, and/or the need for children to cover great distances to reach the nearest school. The lightly populated areas may also need different teaching approaches, such as multigrade teaching/multigrade classrooms. Regional variations are particularly worthy of analysis;

- **The adult literacy rate.**
  The literacy rate of individuals aged over 15 years reflects not only the past achievements of an education system (in terms of the number of people educated and the quality of the education received), but also the socioeconomic context in which children are raised. Research has demonstrated that the children of literate parents are more likely to be enrolled in school, and achieve better learning outcomes;

- **The malnutrition rate and the infant mortality rate.**
  These two indicators are used to reflect children's living conditions, and especially their sociofinancial vulnerability and their access to health services. The malnutrition rate is also often used as an indirect indicator of children's well-being. At the individual level, it has often been demonstrated that malnutrition is a major cause of pupil absenteeism and attention deficit in class;

- **The prevalence of disabilities.**
  Disabilities among the population have various kinds of impact on the education system, and their importance is often all the more present in countries that are or have been affected by conflict, and/or have health systems that are weak and sometimes allow minor diseases or impairments to turn into lasting and debilitating conditions. The prevalence of disabilities among the general population informs on the importance of a portion of the population that is economically vulnerable and often socially marginalised. In addition, the prevalence of disabilities among the school aged population is an important factor for the access, learning, and progression of students in the education system. As much as possible, the data should be disaggregated by gender and types of disabilities. Sources for disability statistics include national data (such as the census, population surveys and administrative data registries), as well as international data sets and a large number of recent studies.[4]

- **HIV/AIDS and malaria adult prevalence rates.**
  The HIV/AIDS pandemic and malaria affect education systems in different ways. One important aspect is the potential number of orphans, as vulnerable children are often marginalized and less likely to enroll. Another is the number of teaching staff that require replacing, temporarily or permanently. When the prevalence rates are high, especially that of HIV/AIDS, education sector analysts may dedicate a section of Chapter 1 to their potential impact on education (See Section 1.3 ahead); and

- **The human development index (HDI).**
  The HDI, calculated yearly by UNDP, synthesises three dimensions of human development: (i) life expectancy, measured at birth; (ii) the level of education, measured by the average length of schooling received by adults aged over 25 years and the expected schooling careers for school-aged children; and (iii) living standards, measured by the logarithm of gross income per capita, in purchasing power of parity. The index, whose value ranges between 0 and 1, generally provides a country's international ranking. It is therefore helpful to identify countries of similar HDI levels that can then be used to carry out international comparisons throughout the report.

EXAMPLE 1.2

(Social Context): Social Context of Malawi, 2010

Source: Quoted from Malawi CSR, 2010.

Poverty and Inequality.
According to the UNDP development report (2007/08), 63 percent of the Malawian population is living below the US$2 a day income poverty line and 21 percent below the US$1 a day poverty line. Nevertheless, those percentages are lower than the SADC average (69 percent and 41 percent, respectively).

The Gini index (39 in Malawi) indicates significant inequalities in access to resources, services, and opportunities among Malawians. There is a large discrepancy between the average per capita income of the richest and the poorest sections of the population. The richest 10 percent of Malawi's population have an average per capita income that is 11 times higher than the average per capita income of the poorest 10 percent. Nevertheless, when compared to other SADC countries, Malawi appears as one of the least unequal countries. The SADC average of the Gini index stands at 52.

Malnutrition and the Child Mortality Rate.
Malnutrition in Malawi is extensive and a major social development challenge. The prevalence of malnutrition is estimated to be 49 percent. Dietary diversity and the average amount of calories consumed daily are low across the country (for instance, rural people eat mainly maize). Nationally in 2008, 44 percent of preschoolers were stunted (with 18 percent being severely stunted). These figures have remained more or less constant over the past 15 years. Malawi has the highest malnutrition in the SADC region (the SADC average is 33 percent). Malawi's mortality rate for children below the age of five is 122 children per every 1,000, which is close to the SADC average of 131.

Adult Literacy Rates.
When parents are more literate, they are more likely to enroll their children in school. The adult literacy rate is clearly a context factor for school demand and it is noteworthy to compare Malawi to other countries in that regard. The adult (meaning 15 years and older) literacy rate in Malawi is estimated to be 69 percent, which is better than the African average (62.9 percent) but lower than the SADC countries' average (75.3 percent).

Urbanization Rate.
The percentage of people living in an urban setting is also an important context indicator because the demand for education is higher in urban areas than in rural ones and it's easier to deliver education services in urban areas (for instance because it's easier to allocate teachers in urban areas). Malawi however, has a very low urbanization rate with only 17.7 percent of the population living in cities. This proportion is much lower than both the African average (37.9 percent) and the SADC countries' average (35.9 percent).

Household surveys, especially MICS and DHS, are often the best sources for many of these indicators. When data permits, it is appropriate to present a historical perspective of the indicators for the country of study before providing international comparisons.

Example 1.2, drawn from the Malawi CSR, 2010, presents a selection of the indicators mentioned above. For each, the text explains the relevance of the chosen indicator, its recent evolution where available, and its level compared to the continent or subregion.

1.3 IMPACT OF HIV/AIDS ON EDUCATION

Given the importance of their impact on education supply and demand, quality and management, the specific analysis of HIV/AIDS may be required when the prevalence rates are high.

Education demand

HIV/AIDS can have a considerable negative impact on demand for education, in several ways: (i) children who are ill, through birth or blood transfusion for instance, are temporarily or permanently unable to attend school because of their condition. The stigma related to the illness also provides disincentives to enrolment; and (ii) the vulnerability of households with an affected adult is more acute, especially if the adult is a bread-winner, making the enrolment of children less likely as a result of the financial constraint faced, the need for the child to care for the affected adult or the need for the child to help with household chores or productive work. Any and all of the above may have a long-term impact on the structure of education demand, slowing or delaying expected enrolment growth, and requiring specific remedial policies.

Education supply

HIV/AIDS can also have an impact on the supply of education services, as a result of the high rate of illness-related absenteeism or death, among teachers, qualified and experienced education inspectors, and administrative staff.

How is the impact of HIV/AIDS on education evaluated?
To evaluate the impact of HIV/AIDS, the following questions may be answered:

Demand:
- What is the number of children orphaned by HIV/AIDS? Are their enrolment rates below those of other children? and
- What is the impact of HIV/AIDS on children's absenteeism, drop-out, repetition, and completion, by education level? To establish this, authors may compare the indicators for affected children with those of a control group.

Supply:
- Are teachers affected more than the rest of the population?
- What is the impact of HIV/AIDS on teachers' absenteeism?
- What is the impact of the illnesses on the recruitment needs for new and replacement teachers? and
- Would it be helpful to include illness among the job allocation criteria, to facilitate ill teachers' access to health centres?

The availability of specific national epidemiological surveys will be particularly helpful in providing the data required to respond to these questions. Should the detailed information not be available, the following steps can be taken:

Estimate the number of children orphaned by HIV/AIDS and past trends:
- On the basis of UNAIDS data on the number of children aged under 17 years orphaned by HIV/AIDS, estimate the number of school-aged orphans, for both the primary and lower secondary cycles; and
- On the basis of UNAIDS past trends in the number of orphans and the probable evolution of the illness, project the number of school-aged orphans for future years.

Estimate the proportion of teachers affected by the illness and its likely evolution. If data permits, estimate the number of teaching staff to be replaced due to absence or death:
- In the absence of data on the prevalence rates among national teaching staff, the usual approach consists in assuming that teachers are affected by the illnesses in equal proportions as the population aged over 15 years, ideally the sub-population of those adults who have reached secondary school at least. Indeed, it is known that education changes social behaviour and attitudes; as all teachers are educated, this group constitutes the best proxy basis for projections.

Example 1.3 below, drawn from the Congo CSR, 2010 presents the overall national situation of the pandemic and regional disparities, before describing the levels of illness-related orphanhood and the impact on the teaching staff and resulting recruitment requirements.

EXAMPLE 1.3

(HIV/AIDS Impact): The Impact of HIV/AIDS on Education, Congo, 2007

Source: Quoted and translated from Congo CSR, 2010.

In its report on the status of the AIDS pandemic of December 2005, UNAIDS estimated that at least 110,000 Congolese live with AIDS. About 80,000 adults aged 15 to 49 years are seropositive or ill from AIDS, implying a prevalence rate of 4.9 percent. The number of AIDS-related deaths in 2003, including both adults and children, was estimated at 9,700. In 2004, according to the Congolese health ministry, the national AIDS prevalence average conceals considerable regional disparities, ranging from 1.0 percent in the Likouala and Plateaux departments, 3.3 percent in Brazzaville, to 10 percent in the Sibiti department of Lekoumou.

HIV/AIDS affects the education system through both school-aged children and the teaching staff. The death of parents of children of primary school age increases the number of orphans, making their enrolment comparatively more difficult. Indeed, the difference in the likelihood of enrolment for children whose parents are both alive and those whose parents are not is 10 percentage points. Overall, as a result of the AIDS pandemic, but also (in fact mainly) due to the unrest that occurred in the 1990s, 15 to 16 percent of school-aged children are orphans, amounting to 85,000 school-aged children in total, 20,000 of which have been orphaned by HIV/AIDS.

In the near future the number of orphans is expected to drop under the combined effect of: (i) a considerable reduction in the mortality of fathers due to non-AIDS causes (currently 65,000); and (ii) a likely stabilisation in the number of children orphaned by HIV/AIDS (estimated to be 40,000 in 2015).

In terms of teaching staff, the prevalence of HIV/AIDS is comparable to the rate for the adult population, of 4.9 percent. Thus, approximately 250 primary teachers are likely to be affected. Projections are not easy to perform, either for the overall population or for teachers in particular, as they depend on changes in individual behaviour and on progress made in making medical treatment available. The information available on the patterns of evolution of the illness suggests differences according to Sub-Saharan African regions. In applying the average evolution pattern of the illness for central African countries, the prevalence of HIV/AIDS could reach eight to nine percent by 2015.

On this basis, and assuming that Congo reaches universal primary completion by 2015 and follows the indicative framework of the Fast Track Initiative (pupil-teacher ratio of 40:1), the number of seropositive teachers could reach 1,650 in 2015, of the then projected total of 18,000. The empirical information available suggests that about 180 teachers will need replacing every year because of the illness, and that about the same number will die. It would therefore be appropriate to plan for teachers to replace those still practicing, and to increase the number of teachers undergoing training to compensate for the consequences of HIV/AIDS on the teaching staff.

1.4 THE COMPOSITE SOCIAL CONTEXT INDEX

The international comparison of a country's overall social context can be made more direct by the computation of a synthetic composite index of the main social indicators. This index developed by the Africa Region of the World Bank includes the demographic dependency rate, child malnutrition, infant mortality, HIV/AIDS prevalence, adult literacy, and the rate of urbanization (Annex 1.4 explains the calculation methodology).

TABLE 1.2 - Composite Social Context Index, ECOWAS Countries, 2010 or MRY

ECOWAS Country	Composite Index of Social Context
Benin	44.0
Burkina Faso	37.7
Cape Verde	64.5
Côte d'Ivoire	41.1
Gambia, The	50.6
Ghana	57.9
Guinea	43.2
Guinea-Bissau	45.3
Liberia	48.3
Mali	37.7
Niger	33.1
Nigeria	46.7
Senegal	47.8
Sierra Leone	40.7
Togo	48.1
ECOWAS Countries' Average	45.8
Sub-Saharan African Countries' Average	**50**

Source: World Bank Africa Region database, 2011.

The index has been specifically built on the basis of the selected variables given their demonstrated impact on education systems.[5] Table 1.2 presents the index for the Economic Community of West African States (ECOWAS) countries.

1.5 LINGUISTIC CONTEXT

The use of languages is of considerable importance to education, both in terms of supply and demand, and on a policy level, especially where various official languages exist or various dialects are spoken. In such countries, a teaching language (or various) must be chosen, where each option offers both opportunities and challenges. To offer education in a single language that is not the main language of communication of a large proportion of the population is likely to create an additional factor of discrimination in education, potentially to the point of exclusion.

Studies of learning outcomes have demonstrated that when children are taught in their mother tongue, they are quicker to learn, achieve better results in school, and pursue their education for longer. On the other hand, offering education in local languages, even if only for the first years of primary, faces several practical challenges. In each chosen language, teaching materials must be produced and teachers must be trained; teacher allocation processes must contemplate linguistic ability for specific areas. Finally, the choice may be complicated by more than one local language being spoken in a given area.

Education sector analysts are therefore invited in this section to:

- Identify the official national language(s), the teaching language(s), and the local dialect(s). Where appropriate, it will be helpful to identify any *lingua francas* or vehicular languages, even if not official, in as much as they federate considerable sections of the population;

- Analyse the share of the population that master the official or teaching language(s), and the share for whom it is the mother tongue. Given that a population's linguistic characteristics are very slow to change, the study of a historical perspective of language use is superfluous. On the other hand, to offer a regional perspective of language use will be important; and

- Describe the share of the population that uses the most common language, be it the official language or the *lingua franca* (such as Wolof in Senegal or Sango in the Central African Republic). This indicator is a useful measure of linguistic uniformity, be it at the regional, departmental, or local level; as such, it provides a general sense of the feasibility of teaching in a local language.

The information required for this section is generally available in population census or household survey data.

1.6 HUMANITARIAN CONTEXT

In countries facing recurring or sporadic humanitarian crises such as natural disasters (floods, drought, earthquakes, volcanic eruptions, etc.), conflicts (armed, political, social or other types), or massive population displacement (refugees or internally displaced persons), it is relevant to analyse the impact of such disasters and conflict on school supply and demand as well as the potential contributions of the education system to conflict mitigation. Indeed, disasters and conflicts can shatter education gains, jeopardise years of investment in the education sector, and drastically slow down progress towards set objectives. It is also acknowledged that education is not neutral in the face of conflicts that affect the society at large. Therefore, it is crucial to better understand the relationship between education and conflict.

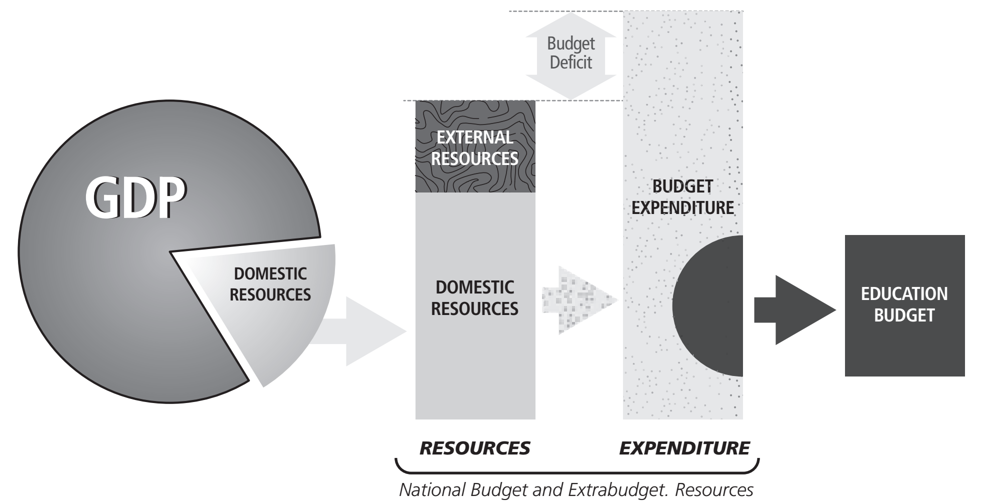
This section can describe the main humanitarian risks facing a country, together with their potential or actual impact on the education system and the capacity of the country to manage crises including within the education system itself (vulnerability analysis). In addition, conflict drivers will be analysed - be they relating to political, economic, social or security factors. The extent to which the education sector is influenced by these dynamics or is contributing to them will also be described (conflict analysis).

The recommended method is to build upon the findings of the most recent conflict and vulnerability analyses of the education sector. When relevant, these analyses may feed into a specific chapter, in particular in high humanitarian risk and post-crisis contexts.

SECTION 2 THE MACROECONOMIC AND PUBLIC FINANCE CONTEXTS

In addition to the demographic constraint that sets the education needs to be satisfied, the development of a school system is also framed by national and international funding opportunities. National funding depends on two variables that do not flow directly from education policy: (i) the level of wealth of a country, measured by the gross domestic product (GDP); and (ii) the state's capacity to mobilise a share of those resources (through taxes or other public levies), and the size of the share mobilised.

FIGURE 1.1 - Relation between GDP, Tax Income, External Resources, and Public Expenditure



The analysis is therefore structured here, as illustrated by Figure 1.1, around the relation between national wealth, GDP, and domestic (tax and non-tax) and external resources on the one hand, and public expenditure, and especially education expenditure, on the other. The detailed analysis of the education budget is dealt with in Chapter 3. Note that Figure 1.1 shows the situation of a budget deficit (when national budget expenditures are greater than the resources), which is found in most cases; it is however possible to be in a situation of budget surplus (resources are greater than expenditures).

2.1 GDP AND GDP PER CAPITA TRENDS

The analysis of the evolution of macroeconomic aggregate indicators such as GDP is important to understand a country's overall level of wealth and development. The state's capacity to levy a share of national wealth for the operation of public services is also crucial, to identify the additional resource mobilisation opportunities for public services in general, and education in particular.

Key Definitions

GDP is defined as the total value of the wealth produced in the course of a year by the economic actors (state, private sector and civil society) residing within the national territory. As such, it is a measure of national wealth. It is generally computed by the ministry of economy, or by the national statistics institute in charge of national accounts, and is also estimated by the World Bank and the IMF.

GDP per capita is an indicator of individual wealth, measuring the average wealth by inhabitant, and thus illustrating general living standards:

$$\text{GPD per capita} = \frac{\text{GPD}}{\text{Total Population}}$$

Typically, education sector analysts will present GDP and GDP per capita trends in a table and comment on them, both in current and constant prices. Current price information is appropriate to explain the present situation and the breakdown of GDP; constant prices must be used on the other hand for the analysis of historical trends. This enables correcting for inflation and making different time-series data comparable.

To convert current prices into constant prices, a GDP deflator (also known as the Consumer Price Index) is used, which can generally be found on the World Bank or IMF websites when it is not available locally (See Annex 1.3 for further detail on the calculation of the GDP deflator when it is not available). As much as possible, the same source should be used for the deflator, the constant prices and the current prices GDP figures.

EXAMPLE 1.4

(Macroeconomic Context): Macroeconomic Context, Mali, 2010

Source: Quoted and translated from Mali CSR, 2010.

TABLE 1.3 - GDP and GDP per capita Trends, Mali, 1995-2008

	1995	2000	2005	2006	2007	2008	Annual Average GDP Growth
GDP (Billions of FCFA)							
In Current Prices	1,231	1,725	2,894	3,201	3,425	3,921	9.3%
GDP Deflator (Ref. 100 in 2008)	*1.53*	*1.41*	*1.16*	*1.10*	*1.07*	*1.00*	
In Constant Prices (2008)	1,889	2,431	3,350	3,526	3,677	3,921	5.8%
Real GDP Growth Rate	6.2	3.2	6.1	5.3	4.3	6.6	
Population (Millions)	9.6	10.8	12.2	12.6	13.0	13.3	2.5%
GDP per capita (Thousands of FCFA)							
In current prices	127,963	159,105	237,086	254,574	264,303	293,720	6.6%
In constant prices (2008)	196,413	224,285	274,445	280,359	283,809	293,720	3.1%

Findings

Income per capita has improved very little, given sustained demographic growth. Between 1995 and 2008, Mali's GDP increased by a factor of three in current prices, from FCFA 1,231 billion to FCFA 3,921 billion, equivalent to average annual growth in current prices of 9.3 percent. Real growth, adjusted for inflation (i.e., in constant prices), is considerably more modest, although nevertheless worthy of note, at 5.8 percent per year, from FCFA 1,889 billion to FCFA 3,921 billion over the period.

Furthermore, even if GDP per capita improved between 1995 and 2008, its progression has been slower than that of GDP given the sustained demographic growth that the country has witnessed over the period. In 2008 constant prices, the annual average growth rate of GDP per capita for the 1995-2008 period was 3.1 percent, meaning that GDP per capita increased from FCFA 196,413 to FCFA 293,720.

2.2 PUBLIC RESOURCES

Public resources are obtained from two sources: domestic resources and external funding:

- **Domestic resources**
  Domestic resources are obtained mainly from levies (duties and taxes) applied by the state to the creation of national wealth. The share of these levies to GDP is referred to as the tax burden (which refers to direct and indirect tax income and compulsory levies, and the non-tax burden (which includes other resources such as income from state heritage and business, industrial, and financial interests, fines and betting). Taxes generally represent the greatest part of income, except where the state is a shareholder in natural resource exploitation companies, such as mining or oil. The level of a state's income therefore depends mainly on the ability to raise taxes, which is often weak in countries with considerable informal economies.

- **External Resources**
  Resources from international aid, also called official development assistance (ODA), are the main source of external resources. This aid can include loans or grants, under the shape of global budget support (when the funds offered are completely fungible with national resources), sector budget support (to assist with the development of a particular sector, either through recurrent or capital expenditure), or project funds.

Example 1.5 below illustrates the situation of Mauritania's public resources, and places it in regional context, showing the great variations that can exist, even between countries of similar levels of economic development. As above, data is offered in both current and constant prices, to enable historical analysis.

Domestic resources often represent the vast majority of resources available to the state. It happens however that, in countries with difficult economic and/or fiscal situations, very large amounts of external aid are needed to help the government run its programs. When these represent a large proportion of the resources available, there is a risk of dependency on external aid, especially when this aid is used to run recurrent budgets. While the aid itself is often crucial to the functioning of the public sector, this places the state in a vulnerable situation because of the inherent high volatility of aid and the lack of control over a large part of the budget. It can thus be useful to review the level of aid dependency and its evolution, in order to inform on the robustness of the budget.

● Key Definition

The external aid dependency rate is, for a given budget year, the amount of external aid expressed as a percentage of the total budget resources (domestic resources and external aid):

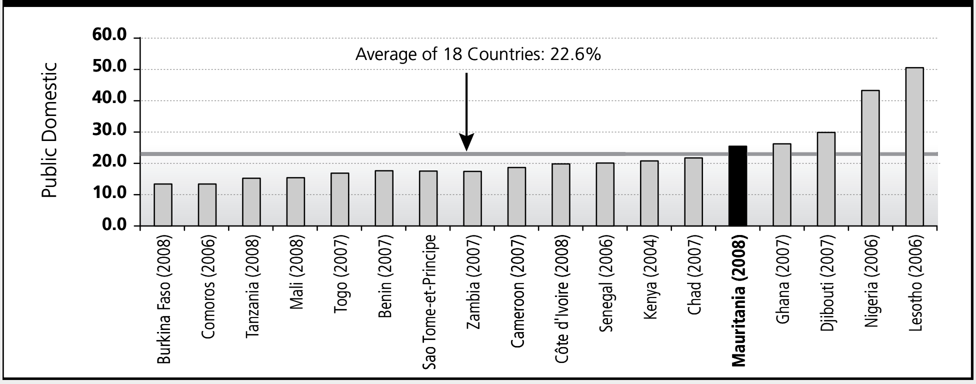
$$\textit{Aid dependency rate} = \frac{\textit{External Aid}}{\textit{Total budget resources}}$$

EXAMPLE 1.5

(Public Resources): Mauritania's Public Resources, 2010

Source: Quoted and translated from Mauritania CSR, 2010.

FIGURE 1.2 - International Comparison of Domestic Public Resources, Countries whose GDP per capita is between US$500 and US$1,500, 2007 or MRY



Findings

The share of domestic resources collected by the state (tax and non-tax burdens) has increased over the 1995-2008 period. After a considerable rise between 1995 and 2006, from 19.7 percent of GDP to 29.5 percent of GDP, it has dropped slightly since, reaching 25.6 percent of GDP in 2008. When compared with African countries with similar national wealth (whose GDP per capita is similar to Mauritania's, at about US$1,090), domestic public resources vary from 13.6 percent of GDP in Burkina Faso to 50.8 percent of GDP in Lesotho. The average of the 18 countries is 22.6 percent, indicating that Mauritania is above the average. The rise of GDP over the period and the increase of the share of it levied by the state have improved the level of domestic public resources: (i) in nominal terms, from UM 33.9 billion in 1995 to UM 258.5 billion in 2008; (ii) in real terms (2008 constant prices), from UM 118.1 billion in 1995 to UM 258.5 billion in 2008, more than double.

TABLE 1.4 - The Evolution of Public Resources, Mauritania, 1995-2008	1995	2000	2005	2006	2007	2008	Average Annual Growth Rate
Public Resources (Billions of UM)	**33.9**	**62.1**	**131.3**	**466.4**	**204.3**	**258.5**	16.9%
Share of GDP (%)	21.4	24.1	26.6	64.3	27.8	28.5	
In Constant 2008 UM (Billions)	118.1	150.4	202.7	546.1	238.7	258.5	6.2%
Domestic Resources (Billions of UM)	**31.1**	**56.3**	**121.0**	**214.0**	**188.0**	**232.2**	16.7%
Share of GDP (%)	19.7	21.8	24.5	29.5	25.6	25.6	
In Constant 2008 UM (Billions)	108.4	136.3	186.8	250.5	219.6	232.2	6.0%
Per capita (Constant 2008 UM)	47,456	54,337	64,293	83,786	71,417	73,424	3.4%
External Resources (Billions of UM)	**2.8**	**5.8**	**10.3**	**252.5**	**16.3**	**26.3**	18.8%
Share of GDP (%)	1.8	2.3	2.1	34.8	2.2	2.9	
In Constant 2008 UM (Billions)	9.7	14.1	15.9	295.6	19.0	26.3	8.0%

Progress is however more modest when related to the total population. Domestic public resources per capita, in 2008 constant prices, rose from UM 47,456 in 1995 to UM 73,424 in 2008, equivalent to an increase by a factor of 1.5. The evolution over the 2003-08 period was particularly irregular, following a peak and trough pattern and reaching a maximum of UM 83,786 per capita in 2006.

Table 1.4 also shows that the state has benefitted from considerable financial support in the form of grants, both to finance the budget deficit and specific investment projects (even if the distinction between both types of funding is not always clear). Although these contributions have increased overall during the 1995-2000 period, they have demonstrated a relative degree of volatility, representing a minimum of 0.5 percent of GDP in 1997 and a maximum of 34.8 percent of GDP in 2006, in a special political context where the democratic transition was supported from abroad.

2.3 PUBLIC EXPENDITURE

The analysis of public expenditure should both describe the total budget envelope, from which education expenditure is allocated, and observe the evolution of the budget deficit, which indicates both the vulnerability and flexibility of public finance.

It is important in this analysis to isolate expenditure that is destined for debt repayments, including both domestic debt, due to national financial institutions, and external debt, due to international financial institutions, bilateral and multilateral development partners. Debt service effectively reduces the amount of public resources available for domestic policy action. Countries with high levels of debt service are limited in their ability to provide social services, and education in particular.

This section may possibly be consolidated with the previous section, as per Example 1.6 below, drawn from The Gambia CSR, 2011. In this example, the authors chose to express all values as percentages of GDP, which avoids the use of the GDP deflator. Indeed, given that GDP and the observed values (resources and expenditure) are all in the same unit of measurement (the price of the given year), the percentages are comparable through time.

EXAMPLE 1.6

(Public Expenditure and Deficit): Government Revenue, Expenditure and Deficit, The Gambia, 2011

Source: Quoted from The Gambia CSR, 2011.

Government revenues including grants have shown a cyclical trend between 2004 and 2010, and decreased slightly over this period from 17.7 percent of GDP in 2004 to 17.2 percent in 2010. On the other hand, domestic revenues excluding grants grew steadily between 2004 and 2007 (from 14.5 percent of GDP to 16.9 percent) before experiencing a decline in 2008. In 2010, domestic revenues excluding grants represented 13.6 percent of GDP, below the ECOWAS average estimated at 19.8 percent of GDP. External grants steadily declined between 2004 and 2007 from 3.1 percent of GDP to 0.9 percent of GDP, before rising to 3.9 percent of GDP in 2009 and dropping to 3.7 in 2010.

TABLE 1.5 - Total Government Revenue, Expenditure and Deficit (% of GDP), The Gambia, 2004-10

(% of GDP)	2004	2005	2006	2007	2008	2009	2010*
Revenue and Grants	**17.7**	**15.6**	**17.1**	**17.8**	**16.2**	**18.7**	**17.2**
Domestic Revenue	14.5	14.4	16.2	16.9	15.2	15.0	13.6
Grants	*3.1*	*1.2*	*1.0*	*0.9*	*1.0*	*3.5*	*3.7*
Budget Support	-	-	0.1	0.1	0.3	0.7	0
Project Grants	-	-	0.9	0.8	0.7	2.8	3.7
Government expenditure and net lending	**21.5**	**21.8**	**22.3**	**17.7**	**18.0**	**22.0**	**22.8**
Recurrent Expenditures	11.7	13.3	13.7	12.6	13.9	14.0	13.9
Discretionary expenditures	6.7	7.1	8.8	8.7	10.8	11.1	11.3
Interest	5.0	6.2	4.9	3.9	3.1	2.9	2.6
External	1.3	1.3	1.2	1.1	0.6	0.6	0.5
Domestic	3.7	4.9	3.7	2.8	2.5	2.3	2.2
Development Expenditure	9.2	8.0	8.4	4.7	3.7	7.5	8.2
External	8.7	7.4	7.9	3.8	2.2	5.2	6.2
Domestic	0.5	0.6	0.4	0.9	1.5	2.3	2.1
Net lending	0.6	0.5	0.3	0.4	0.4	0.5	0.6
Deficit Including grants	-3.9	-6.2	-5.2	0.1	-1.8	-3.5	-5.6
Deficit Excluding grants	-7.0	-7.4	-6.1	-0.8	-2.8	-7.0	-9.2

As a result, expenditures have varied over time. From 21.5 percent of GDP in 2004, government expenditures and net lending increased to 22.3 percent in 2006, and then declined to 17.7 percent in 2007, before again increasing to 22.8 percent in 2010. The share of recurrent expenditure has been more or less constant, and significant, fluctuating between 12 percent and 14 percent of GDP. Despite the 2007 debt relief package, debt interest (particularly that of domestic debt) continues to represent a high proportion of recurrent public expenditure, averaging 23 percent between 2007 and 2010 (for example in 2009, debt interest represented 2.8/13.8 = 20.3% of the total recurrent expenditure).

Development expenditure is mostly supported by foreign contributions, through grants and loans. The total amount of foreign funding has represented 5 percent of GDP over the last five years (an average of 76 percent of public capital expenditure over the last five years). Although the fiscal deficit (excluding grants) was successfully reduced from 7.0 percent of GDP in 2004 to just 0.8 percent in 2007 thanks to the debt relief package, it again increased to 9.2 percent of GDP in 2010.

2.4 THE COMPOSITE ECONOMIC CONTEXT INDEX

Here again, a comparative international perspective of a country's global level of economic development can be provided by the composite economic context index, a synthesis of the main macroeconomic indicators. This index, similar to the composite social context index discussed earlier, has also been developed by the Africa Region of the World Bank. It includes GDP per capita, domestic resources as a share of GDP, real GDP growth, external development aid for education and the share of pupils enrolled in private institutions (the bigger this share is, the less public financing is needed for education).

As for the composite social context index, the composite economic context index has been specifically built with the above variables given their demonstrated importance for education

TABLE 1.6 - Composite Economic Context Index, CEMAC Countries, 2010 or MRY

Country	Index
Cameroun	36.6
Congo, Rep.	71.3
Gabon	56.0
Equatorial Guinea	89.6
Central African Republic	38.9
Chad	39.3
CEMAC Countries' Average	**55.3**
Sub-Saharan African Average	**50.0**

Source: World Bank Africa Region database.

systems, and has been adjusted so that the average for Sub-Saharan Africa is 50, and the standard deviation is 10. This facilitates its interpretation and cross-country comparisons. Again, a score below 50 indicates that a macroeconomic context is unfavorable, comparatively speaking.

Table 1.6 below displays the index for CEMAC countries.

2.5 THE COMPOSITE GLOBAL CONTEXT INDEX

A combination of both composite indexes mentioned above, social and economic, has also been developed. This composite global context index can be used to summarise the sociodemographic and economic contexts as they apply to the education sector. The scoring system is similar to the other context indexes, with an average of 50 and a standard deviation of 10. The global index can also be used to identify countries with similar contexts, which can then be used for relevant international comparisons when analyzing the results of education sector in following chapters. Table 1.7 above presents the composite global context index for the SADC countries.

TABLE 1.7 - Composite Global Context Index, SADC Countries, 2010 or MRY

Country	Index
South Africa	66.3
Angola	52.7
Botswana	61.7
Lesotho	52.0
Malawi	46.6
Maurice	77.3
Mozambique	49.9
Namibia	58.8
Congo, Dem. Rep. of	47.9
Seychelles	69.7
Swaziland	50.4
Tanzania	53.6
Zambia	47.1
Zimbabwe	44.6
SADC Countries' Average	**55.6**
Sub-Saharan African Average	**50.0**

Source: World Bank Africa Region database.

This section of the report may include a summary profile in its introduction or conclusion, with the main indicators analysed above. This profile will also be a useful quick-reference tool, and will help readers to understand the national context with ease. Table 1.8 offers an example of a typical country socioeconomic profile. Education sector analysts will determine when best to delete, extend, modify or add sections in line with the importance of given issues for the country under study.

TABLE 1.8 - Key Social and Economic Indicators, Liberia, 2010

CONTEXT SHEET				
Sociodemographic Context	**2000**	**2010**	**Global Context Index (Ranking: 24 out of 47)**	
Total Population ('000s)	2,832	4,115	Mauritius	77.3
Primary School-Aged Population ('000s)	466	667	…	…
Demographic Dependency Ratio	16%	16%	Swaziland	50.4
Child Malnutrition Rate	22.8%	20.4%	Mozambique	49.9
Mortality Rate (‰)	140	117	Burundi	49.4
HIV/AIDS Prevalence	3.3%	1.5%	Eritrea	49.3
Adult Literacy Rate	52.0%	59.1%	**Liberia**	**48.3**
Urbanization Rate	54.0%	61.5%	Kenya	48.3
			Togo	48.0
Economic Context	**2005**	**2009**	Democratic Republic of Congo	47.9
GDP (Millions of constant 2009 US$)	651	874	Uganda	47.2
GDP Growth Rate	4.7%	5,0%	…	…
GDP per capita (constant 2009 US$	209	229	South Sudan	32.9
Tax Burden (% of GDP)	15.6%	26.9%	ECOWAS Countries' Average	45.7
			Sub-Saharan African Countries' Average	50.0

Source: Authors' calculations based on Liberia CSR, 2010 and World Bank data.

2.6 FUTURE PROSPECTS

Having documented trends over the previous decade, it is useful to speculate on future perspectives. On the basis of macroeconomic data, future GDP, tax income, and domestic public resources can be estimated. This prospective analysis section can be distinct and separate, or future perspectives can be incorporated into each of the relevant sections examining past trends and the present context. This prospective work is often carried out within the elaboration of macroeconomic frameworks, by ministry of economy and finance. In the absence of such official projections, authors may make assumptions as to the stability or the evolution of the average annual growth rates considered above. In Example 1.7, the official projections developed by the Ministry of Economy and Finance of Mali and validated by the council of ministers have been used. As stated earlier, the use of official data and statistics is preferable, when they are available and reliable, to encourage ownership of the analysis' conclusions by the government and its partners.

EXAMPLE 1.7

(Public Resource and Expenditure Projection): Projected Government Resources and Expenditure, Mali, 2010

Source: Quoted and translated from Mali CSR, 2010.

The resources available for the education sector depend on the evolution of the global macroeconomic framework (GDP and government income) and on the share of public resources allocated to education. The estimations carried out here are based on the Ministry of Economy and Finance's accounts for 2008 and 2009, as published in the 2008 report on the economic and social situation of Mali and its perspectives for 2009, and adopted by the council of ministers on July 15, 2009.

TABLE 1.9 - Macro and Resource Forecasts for Recurrent Education Expenditure, Mali, 2009-12

		Forecasts			
	2008	2009	2010	2011	2012
GDP (Billions of FCFA)	3,912	4,123	4,498	4,900	5,329
Income (% of GDP)	15.5%	16.4%	16.5%	16.5%	16.6%
Domestic resources, not including grants (Billions of FCFA)	607.3	701.0	738.3	777.3	819.1
Recurrent Public Expenditure, not including Debt Service (Billions of FCFA)	445.0	541.5	573.9	608.2	664.4
Recurrent Education Expenditure (% of Total Recurrent Expenditure)	28.7%	29.0%	29.3%	29.7%	30.0%
Resources for Recurrent Education Expenditure (Billions of FCFA)	127.7	157.2	168.4	180.5	193.3

Findings

According to forecasts, public domestic resources (not including grants) would rise from 15.5 percent of GDP in 2008 to 16.6 percent of GDP in 2012; recurrent public expenditure (not including debt service) would rise from 11 percent of GDP in 2008 to 13 percent of GDP in 2012. Domestic resources (not including grants) would thus increase from FCFA 607 billion in 2008 to

FCFA 819 billion in 2012, and recurrent public expenditure (not including debt service) would increase from FCFA 445 billion in 2008 to FCFA 664 billion in 2012.

It is helpful to indicate that all of these public resources depend on GDP growth, and that if it is weaker than expected, then fewer resources may be mobilised for public expenditure. In 2008, recurrent education expenditure represented 28.7 percent of total recurrent expenditure, not including debt service.

Given that budget allocations are cabinet policy decisions, various hypotheses can be contemplated for their evolution over the coming years. The government's known ambition is that recurrent education expenditure reaches 30 percent of total recurrent expenditure by 2012. If education continues to be a government priority, the state could be assumed to gradually increase the share of public recurrent resources allocated to education over the coming years to reach 30 percent; in the worst case scenario, the share would be assumed to remain constant at its 2008 level. On the basis of these assumptions, the resources likely to be mobilised for recurrent education expenditure could be around FCFA 193 billion (30 percent) by 2012.

In addition to these estimated amounts, further resources may be mobilised for the education system through capital expenditure, financed on the national budget, and external resources, through overseas development assistance.

NOTES

1 Sociopolitical contexts also have an impact on education systems, for which relevant analysis methodologies are presented in Chapter 4.

2 See also Chapter 6 for approaches to the analysis of disparities and equity.

3 One usually defines demographic transition as the period when population growth rates decline year after year: the population continues to grow but at an increasingly slower pace.

4 For more details see the WHO-World Bank World Report on Disability.

5 To facilitate its interpretation and international comparisons, the index has been adjusted so that its Sub-Saharan African average is 50 and its standard deviation is 10. Therefore a score below 50 indicates a comparatively unfavorable social environment.

CHAPTER 2

ENROLMENT, INTERNAL EFFICIENCY AND OUT-OF-SCHOOL CHILDREN

› Chapter Objective:
To understand the quantitative performance of the education system, for all levels and types of teaching, in terms of enrolment capacity, coverage of different age groups, obstacles to the access to and completion of cycles, efficiency and exclusion.

1. THE EVOLUTION OF ENROLMENT AND EDUCATION SYSTEM ENROLMENT CAPACITY

ISSUE

To what degree do education systems respond to the population's quantitative education needs?

OBJECTIVES

- Describe historical trends in enrolment by level and school type (public, private, community and so on) over the past decade;
- Analyse the status and trends in enrolment for each level and type of school; and
- Analyse national capacity to enroll the entire school-aged population.

METHODS

- Present historical enrolment data by level and type of school; and
- Calculate gross enrolment rates (GER) by level and their evolution over the past decade, to establish the system's physical capacity.

SOURCES

- School data from administrative surveys (for enrolment);
- Demographic data (to establish the school-aged population and compute the GER), available from national statistical institutes; and
- Household surveys, to compute GERs and compare them with the results obtained above.

2. SCHOOL COVERAGE: SCHOOLING PROFILES, SCHOOL LIFE EXPECTANCY AND EDUCATION PYRAMIDS

ISSUE

What are the conditions of first year access, intra-cycle retention and cycle completion? What is the average number of years of education received?

OBJECTIVE

- Refine coverage measurement with indicators of access and completion.

METHODS

- Compute schooling profiles, equivalent to a succession of access rates;
- Calculate school life expectancy; and
- Build an education pyramid.

SOURCES

As above.

3. THE SUPPLY AND DEMAND ISSUES ON ACCESS AND RETENTION

ISSUE

It is common to explain education systems' shortfalls in access and retention in terms of an inadequate supply of schooling. Is this hypothesis verified? Are access and retention shortfalls not also due to weak demand for education on behalf of families? What are the respective scales of these supply and demand issues?

OBJECTIVES

- Access: Establish whether children's non-attendance of school is due more to supply or demand issues; and
- Retention: Evaluate if children abandon school, or if schools abandon children, failing to offer the grades or facilities they need.

METHODS

The direct analysis of demand is complicated by the lack of data and its multiple facets. Supply shortcomings will be examined first, and on the basis of a simulation of supply, outstanding enrolment gaps will be assumed to be demand-related.

- Access: Compare school coverage with supply (measured by the number of schools or teachers per population) to simulate the impact of greater supply;
- Retention: Estimate the share of pupils who cannot pursue their education due to the following grade being unavailable in their school, to compute the share of new entrants that cannot complete a cycle for that reason; and
- Simulate retention rates assuming grade continuity was offered in all schools.

SOURCES

As above.

4. INTERNAL EFFICIENCY

ISSUE

Internal efficiency measures the children who complete a cycle as a share of those who access it, and is a key measure of education effectiveness. Dropout and repetition are perturbations that an efficient system should reduce to the minimum.

OBJECTIVES

- Analyse student flows (repetition, promotion and dropout), keeping in mind that efficiency can be measured by the share of pupils who finish the cycle in the minimum number of years;
- Compare the gap between the resources effectively mobilised and those required in principle to effectively educate the same number of pupils, and determine whether the gap is mostly due to dropout or repetition; and
- Identify the factors that are associated with dropout and repetition.

METHODS

- Analyse student flows through repetition and retention;
- Measure the system's efficiency in the use of public resources with the internal efficiency coefficient (IEC); and
- Analyse the factors that are associated with repetition and dropout based on econometric models, using school administrative data.

SOURCES

As above.

▶

5. OUT-OF-SCHOOL CHILDREN

ISSUE

What is the number and share of unenrolled children? Did they never have access to school, or did they drop out? Which children are likely to be in the same situation?

OBJECTIVES

- Estimate the number and share of children that are out of school;
- Estimate the number and share of children who have never had and never will have access to school, and those who have dropped out; and
- Draw up an outline and estimate the number of enrolled children that are likely to drop out over the coming years.

METHODS

- Use household survey data, and if necessary administrative data, to determine the share of out-of-school children;
- Determine the share of children who have never had access to school, and those who have dropped out;
- Estimate, on the basis of household surveys, the probability that an individual will access school one day, and deduce the share of children who will probably never access school; and
- Describe the characteristics of pupils having abandoned school, and deduce the share of children with the same characteristics at risk of drop-out.

SOURCES

As above.

Introduction

This chapter aims to analyse enrolment, system's internal efficiency and out-of-school children. It is divided into five sections: i) the evolution of enrolment and of system's enrolment capacity; ii) school coverage analysis; iii) supply and demand issues; iv) internal efficiency; and v) out-of-school children.

SECTION 1 THE EVOLUTION OF ENROLMENT AND EDUCATION SYSTEM ENROLMENT CAPACITY

The introduction of the chapter may include a presentation of the structure of the education system, with its various cycles, their durations and respective official school ages and possible schooling careers (showing the bridges between general and technical streams, for instance). This provides readers, as per Example 2.1, with a good basis to understand the analyses developed throughout the report.

1.1 THE EVOLUTION OF ENROLMENT

The objective of this section is to review approaches to the analysis of key trends in the evolution of enrolment over the last 10 to 15 years. School census data can be used (statistical yearbooks or education management information systems – EMIS – where they exist). It is however key to ensure that they are exhaustive by comparing the list of schools from one year to another and detect potential missing ones. It is also important to consider the under or over reporting of numbers by school directors during the census. There is a risk of over-reporting if a bonus or grant is given according to the number of pupils enrolled. On the other hand, there is a risk of under-reporting if school heads receive fees from parents that should be transferred in part to central services. Where such phenomena exist, it is helpful to: (i) compare school census data with those collected by the ministry's pedagogical departments (inspectorate networks, pedagogical advisors and so on) and/or (ii) organise a flash-survey in a sample of schools to cross-check the school census data. Later corrections can then be made to the number of enrolled pupils if necessary.

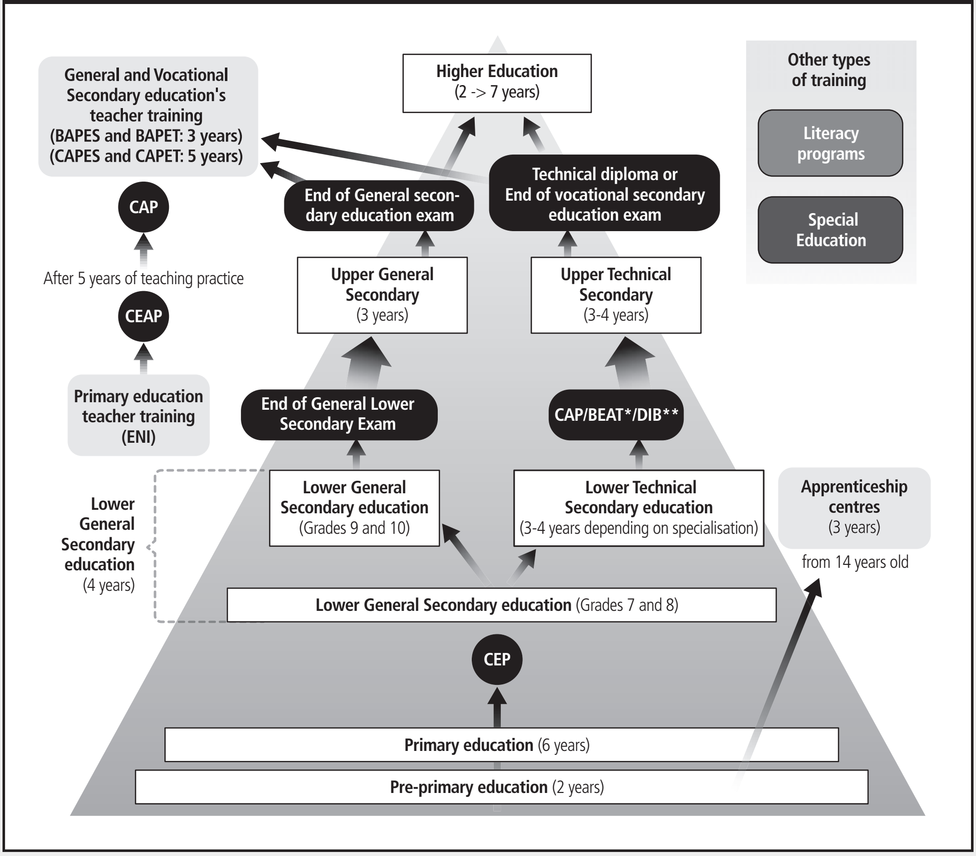
As per Example 2.2 below, the enrolment growth dynamic can be determined through the average annual growth rate (See Annex 1.2). Distinctions should be made by level (preschool, primary, secondary and so on), type of education (general, technical and so on) and type of school (public, private, community and so on). The respective shares of pupils enrolled in each type of school may also be analysed over time (to determine the trend in the evolution of the share of private education, for instance).

EXAMPLE 2.1 (Education System Structure): Structure of the Beninese Education System, 2010

Source: Adapted and translated from the Benin CSR, 2010.

The Beninese education system is divided into four main cycles: preschool, primary, secondary (general and technical) and higher. Vocational training through apprenticeships, literacy, specialised education and teacher training respond in turn to the specific needs of certain population groups. Figure 2.1 describes the succession of these cycles and their articulation.

FIGURE 2.1 - The Structure of the Beninese Education System



Note: * CAP – Vocational Skills Certificate (Certificat d'Aptitude Professionnel); BEAT – Tropical Agriculture Study Certificate (Brevet d'Etudes d'Agriculture Tropicale); DIB – Certified Nurse Diploma (Diplôme d'Infirmier Breveté).

Findings

Pre-primary education lasts for two years and is offered by pre-schools to children aged three to five years. The primary cycle is composed of six grades, the last of which is validated by a primary school leaving examination. Primary school pupils are theoretically aged 6 to 11 years. […]

EXAMPLE 2.2

(Evolution of Enrolment): Enrolment Trends by Level, The Gambia, 2000/01-2009/10

Source: Adapted from The Gambia CSR, 2011.

Findings

Since 2000, The Gambia has witnessed an increase in enrolment at all educational levels. The average annual growth rate in ECD enrolment between 2006 and 2009 was of nine percent. Enrolment dropped between 2006 and 2008, but then surged from 2008 to 2009 due to the policy of attaching ECD centres to lower basic schools in deprived communities.

TABLE 2.1 - Enrolment Trends, by Education Level and Type of Provider, The Gambia, 2000/01-2009/10

Number of Students	2000/01	2005/06	2008/09	2009/10	Average Annual Growth Rate 2005-09
ECD (Including Private) *	n/a	n/a.	42,760	62,145	9 %
Basic					
Lower Basic	181,835	207,474	224,955	227,668	2 %
Government	138,318	156,542	155,731	152,799	-1 %
Grant-Aided	15,923	18,288	18,089	17,756	-1 %
Private	3,962	7,512	13,089	14,275	17 %
Madrassa	23,632	25,132	37,256	42,838	14 %
Upper Basic	41,493	67,937	73,205	75,613	3 %
Government	30,835	50,090	51,805	53,553	2 %
Grant-Aided	6,102	8,747	9,980	9,951	3 %
Private	4,200	5,400	6,612	5,452	0 %
Madrassa	356	3,700	4,808	6,657	16 %
Subtotal	223,328	275,411	298,160	303,281	2 %
Senior Secondary					
Government	11,999	18,549	21,005	19,943	1 %
Private	3,320	11,353	14,308	13,535	4 %
Madrassa	235	1,615	2,267	2,663	13 %
Subtotal	15,554	31,517	37,580	36,141	3 %
Higher Education					
Teacher Training	523	544	785	1,522	29 %
Higher (Excl. Teacher Training)	1,425	5,584	6,022	5,613	0.1 %
Subtotal (incl. Teacher Training)	1,948	6,128	6,807	7,155	3.9 %

*Note** : The ECD growth rate is calculated over the 2006-09 period.

Lower basic enrolment for the 2000-09 period has progressively increased from 181,835 to 227,668. Although the average annual growth rate since 2005 is higher for private institutions (17 percent), this level of education is provided mainly by public institutions which in 2009 enrolled over 67 percent of all pupils. Since 2005, madrassa enrolment has grown by a reported *14 percent. Part of this increase is due to the change of status of some schools achieving accreditation, from* darahs to madrassas. *Upper basic enrolment grew considerably from 41,493 in 2000 to 75,613 in 2009, with a steady increase since 2005 at an average annual growth rate* *of 3 percent. The share of private schools stagnated mainly due to the increase in government schools offering the upper basic level in deprived areas, aiming to expand community access to the full basic cycle. Between 2000 and 2009, enrolment in senior secondary more than doubled, from 15,554 to 36,141 students, which can partly be attributed to the knock-on effect of the implementation of the Universal Basic Education policy, stipulating nine years of compulsory schooling. Enrolment in madrassas witnessed the greatest growth.*

With an average annual growth rate of 3.9 percent between 2005 and 2009, higher education enrolment (including teacher training) has increased substantially. The annual average higher education enrolment growth rate between 2000 and 2009 reaches an impressive 15.5 percent per year (based on calculations from data of the table). This increase is mainly attributable to the growth in teacher training enrolment that has witnessed an overall average annual growth rate of 29 percent between 2005 and 2009, responding to greater demand, especially in basic education, fuelled by the Universal Basic Education policy. In 2009 a new qualification was introduced to train and retain more qualified teachers at the lower basic level. The University of The Gambia and the Management Development Institute grew most markedly at respective average annual rates of 27 percent and 18 percent, whereas other institutions witnessed a decrease in enrolment in non-teaching courses.

1.2 EVOLUTION OF ENROLMENT CAPACITY: GROSS ENROLMENT RATE COMPUTATION

The gross enrolment rate (GER) for a given cycle is obtained by dividing the number of pupils enrolled at that level by the population of theoretical school age for that level. The GER is an indicator that measures the share of pupils that a country is capable of enrolling, with respect to the total number of children that should be enrolled.

● Key Definition

The Gross Enrolment Rate (GER) is the enrolment at a given level of education, regardless of age, as a percentage of the population in the theoretical school-age group corresponding to the level:

$$GER = \frac{\textit{Total Enrolment for the Level}}{\textit{Population of the Theorical Age Group for the Level}}$$

Theoretical school ages depend on the official cycle access age, and the duration of the cycle. Primary cycles, for instance, vary between four and eight years, according to the country. The official age to access grade 1 ranges from five to seven years. So in a country where the official primary cycle access age is six years and the primary cycle lasts for six years, the theoretical school age group is 6 to 11 years.

Data on the school-aged population (the denominator term of the formula above) are obtained from population censuses and should be coherent with those analysed in Chapter 1. As per Example 2.3 below, the GER may be considered from both national and international perspectives.

EXAMPLE 2.3

(GER Analysis): Gross Enrolment Rates, by Level and in International Context, Congo, 1986-2005

Source: Adapted and translated from the Congo CSR, 2010.

National Perspective

The evolution of enrolment must be compared to the corresponding school-aged population groups to determine the potential education demand that education services face. It is common practice to compute gross enrolment rates (GERs). Table 2.2 offers estimations by level since 1986.

TABLE 2.2 - Gross Enrolment Rates, by Level, Congo, 1986-2005

%	Preschool	Primary	Lower Secondary	Upper Secondary	TVET		Higher
					Pupils/ 100,000 Inhabitants	Share of Total Secondary	Students/ 100,000 Inhabitants
1986	3.0	146	93	21	1,733	15	544
1990	2.8	135	69	17	573	7	452
1995	1.1	122	66	26	1,001	11	631
2000	2.9	87	46	15	739	12	458
2004	7.0	112	55	14	1,327	17	329
2005	7.3	111	61	19	1,341	16	353

Findings

Table 2.2 shows that preschool coverage dipped at the end of the 1990s and early 2000s, when less than three percent of children aged three to five years attended. The rate has more than doubled since (from 2.9 percent in 2000 to 7.3 percent in 2005). However this coverage remains weak, as in most Sub-Saharan African countries.

For primary, the GER has been consistently higher than 100 percent, except at the end of the 1990s, when the country was undergoing hardship. The rate is artificially inflated by excessively high repetition (24 percent in 2005, down from close to 40 percent in 1990). If repetition was excluded from the computation, coverage (often called the average enrolment rate) would not be higher than 90 percent.

The GER for lower secondary decreased continuously to reach 46 percent in 2000, barely more than a third of its level at the beginning of the 1980s. A positive trend has appeared since 2000 however: the GER gained 15 percentage points between 2000 and 2005 (rising from 46 percent to 61 percent). At upper secondary, the overall trend in enrolment rates has been a descending one over a long period. There has been a slight improvement since 2003 however. In terms of technical education, the table shows a strong increase since the dip of 2000. In 2005, 1,341 *students per 100,000 inhabitants were enrolled, about twice the number of 1990 (573 students per 100,000 inhabitants). Technical education has also increased as a share of total secondary (including general and technical and vocational streams), virtually doubling since 1990.*

In higher education, there has been a slight increase in enrolment since 2004, estimated at 353 students per 100,000 inhabitants in 2005.

International Perspective

Table 2.3 shows how Congo's GERs compare with African averages. The comparability of the figures is limited for Africa overall, on the one hand due to different durations of the primary and secondary cycles (that may last between five and eight years) and on the other because of the significance of the lower and upper secondary cycles (some countries, in fact, only have one secondary cycle whereas others have two). For these reasons, it is preferable to target the 20 francophone African countries with similar education system structures and available data.

TABLE 2.3 - Gross Enrolment Rates by Level, Congo and African Averages, 2003/04 or MRY

	Preschool (%)	Primary (%)	General Secondary (%)		TVET *	Higher *
			Lower	Upper		
Congo 2004/05	**7.3**	**111**	**61**	**19**	**1,341**	**353**
Africa	12.4	92.4	35.6	14.9	229	334
Francophone Africa	**4.2**	**82.4**	**28.1**	**11.7**	**305**	**297**
Range	1 – 20	39 – 134	11 – 61	2 – 28	27 – 1,379	64 - 622
Anglophone Africa	22.4	106.8	44.9	18.8	133	435
Other African Countries	25.0	90.7	39.3	17.0	169	201

Note: The table presents simple averages. * Number of students per 100,000 inhabitants.

Findings

A comparative examination of the GERs for the Congo at different education levels underlines the following findings: (i) the weak development of preschool is shared by many countries on the continent; and (ii) for other levels, coverage is higher in Congo than the regional average. In particular, the coverage of TVET is significantly higher than the average of francophone countries (by a factor of four). Higher education enrolment is 30 to 50 percent higher than the francophone countries' average.

BOX 2.1
The Limitations of the GER and NER in Describing School Coverage

Given that its definition includes children of all ages and repeaters, the GER does not appear to be a good indicator of school coverage. Although early or late entry is a minor issue (that all children attend school is most important), the inclusion of repetition means that the rate is artificially inflated, which is a problem. A child who repeats three primary grades will be included in the GER for nine years rather than six (See Annex 2.3).

Consequently, the GER is often considered as an indicator of the system's physical capacity rather than one of school coverage: a GER of 50 percent indicates that school infrastructure can only cater for half of school-aged children. A GER of 100 percent would not imply that all children attend school, but that schools have the capacity to educate all children of school age. It is therefore frequent that 70 to 80 percent of school-aged children are effectively enrolled, and that a significant number of over-aged children still attend school due to repetition. GERs can thus reach or be higher than 100 percent, despite 20 to 30 percent of children being out-of-school. Capacity exists, but is filled with repeaters.

The net enrolment rate (NER) is often used in parallel to the GER to assess school coverage. The NER is defined as:

$$NER = \frac{\textit{Number of enrolment children of theorical school age}}{\textit{Population of theorical school age}}$$

The NER is a measure of participation, whose value resides in the measure of the enrolment of a group of theoretical school age for a given cycle. Educationists consider that children make the most of their education when they follow specifically designed programmes at the intended age. A given grade's teaching approaches will be adapted to the corresponding theoretical age, and may be too complex for younger children or inappropriate for older ones. The latter face additional issues related to late schooling (higher income-related opportunity cost of education, puberty, maternity and so on).

The NER is thus a measure of school coverage for theoretical age groups, but is unfortunately ill-adapted to measure overall coverage. Its main drawback is to exclude, by definition, late entrants, early starters and repeaters. On the other hand, the NER will account for repeaters two years running as long as they are still of theoretical school age, even if they never reach the end of the cycle, and at the secondary and higher levels, effective attendance ages are often quite different to theoretical ages. As a result, the NER can provide totally biased measures of enrolment.

Furthermore, the NER is severely affected by the inaccuracy of single-age data. Children's reported ages as per school censuses are often wrong, due to children's or their teachers' ignorance, particularly when the registration of births is not widespread, or due to amendments to the birth register.

Finally, both the GER and the NER provide an average value for the entire cycle, which is insufficient to describe individuals' schooling careers. For a more complete description, these indicators must be supplemented with a measure of the share of children who start school (access) and of the share of them who remain in school until the end of the cycle (retention). These descriptions of access and retention levels of an education system are key to enable decision-makers to define appropriate policies.

It is advisable to control for the quality of data when GERs are computed on the basis of school statistics and demographic data, by comparing the rates to those obtained through similar calculations based on household survey data. Given that such surveys provide both factors (the number of children enrolled and the total number of school-aged children at the time of the survey) required to compute the rate, this new indicator has the advantage of being independent from demographic projections that can be particularly uncertain when the latest population census is not recent.

The computation of the GER on the basis of household surveys nevertheless has the disadvantage of being based on a sample rather than an exhaustive census. If the sample is perfectly representative the bias will be minimal, but for the later education levels (especially upper secondary and higher) the number of enrolled students sampled may not be sufficiently representative to obtain a reliable measure of the GER.

The point therefore is to establish how close the value of the GER obtained by the traditional method is to the value of the GER obtained from household data, to measure their reliability. When the values obtained through both methods are significantly different, the quality of the data used should be diagnosed through the following techniques: (i) detailed analysis of the household survey sample and its representativity, and review of the phrasing of the survey question on school attendance;[6] (ii) evaluation of the quality of demographic data, performing adjustments as required (See Chapter 1); and (iii) analysis of factors that could potentially motivate the under or over-reporting of enrolled children during administrative school surveys (See Section 1.1).

SECTION 2 SCHOOL COVERAGE: SCHOOLING PROFILES, SCHOOL LIFE EXPECTANCY AND EDUCATION PYRAMIDS

To compensate the mentioned shortcomings of the GER (see box 2.1 and annex 2.3 for more details), other indicators such as the schooling profile, retention rates and school life expectancy are used.

2.1 SCHOOLING PROFILES AND RETENTION

Schooling profiles present the advantage of providing more detailed information on enrolment than the simple average offered by the GER. They give a visual representation of schooling careers, from cycle access to completion. They also enable the analysis of retention, providing a more precise enrolment diagnosis. In this section, three main approaches to building schooling profiles will be reviewed. These methods each rely on different basic information, each offer a specific interpretation, and they are complementary.

- **The Longitudinal Profile** follows one cohort of students through the cycle, and describes their progression through the successive grades of the cycle.

- **The Cross Section Profile** describes the conditions of access, at a given time, to the different grades of the cycles (several cohorts are thus considered).

- **The Semi-Longitudinal Profile** is a combination of the above and describes the expected schooling career for children starting school, based on the current rates of promotion between one grade to the next.

The cross section (or transverse) profile, which is the most straightforward to construct, is presented below with an explanation of its interpretation. Annex 2.4 presents the methodologies to compute the other schooling profiles.

2.1.1 CROSS SECTION SCHOOLING PROFILE

The cross section schooling profile is the series of access rates to each grade of a given cycle. The first point of the profile is the gross intake rate (GIR), defined as the ratio between the number of grade 1 new entrants and the population of the official cycle access age. The analysis of its evolution is helpful to evaluate the trends in terms of access to Grade 1 of the cycle.

• Key Definitions

An Access Rate is the number of non-repeaters in a given grade, regardless of age, as a percentage of the population of official school age for that grade:

$$\textit{Access Rate to Grade i} = \frac{\textit{Non-Repeaters in Grade i}}{\textit{Population of Theoretical Grade i Age}}$$

The Gross Intake Rate (GIR) is the total number of new entrants in the first grade of primary school, regardless of age, as a percentage of the population of official primary school access age:

$$GIR = \frac{\textit{New Entrants to Primary Grade 1}}{\textit{Population of Theoretical Grade 1 Age}}$$

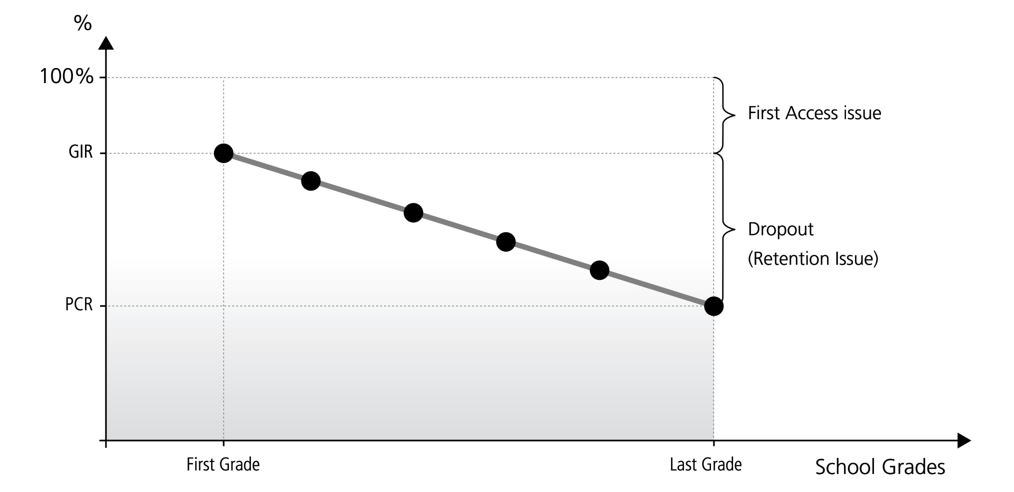
The Primary Completion Rate (PCR) is the total number of pupils in the final grade of primary, net of repeaters, as a percentage of the population of official primary graduation age:

$$PCR = \frac{\textit{Non - Repeaters in Final Grade of Primary}}{\textit{Population of Theoretical Primary Graduation Age}}$$

The last point of the profile is the access rate to the last grade of the cycle, which measures the share of children reaching that grade. For the primary level, this is the indicator that best describes the completion of the cycle, even if it is imperfect as it considers the children who enter the last grade of the cycle rather than those who effectively complete that grade or pass a leaving examination. However, the difference between the number of last grade entrants and the number of last grade completers is often minimal given that school statistics are often collected part way through the school year. Furthermore, the leaving exam success rates often provide a biased perspective of the completion of the cycle, in particular when these exams are used as admission tests for the next cycle.

Thus, the access rate to the last grade of primary (or primary completion rate – PCR) is the best measure of primary completion at a given point in time that planners have at their disposal. It is the most appropriate to measure the goal of universal primary completion, which is "That all children access the primary cycle and complete it." The primary completion rate is also important because the duration of the primary cycle (five to seven years, generally) has been determined by several empirical studies to be the minimal amount of schooling required to achieve sustainable literacy.

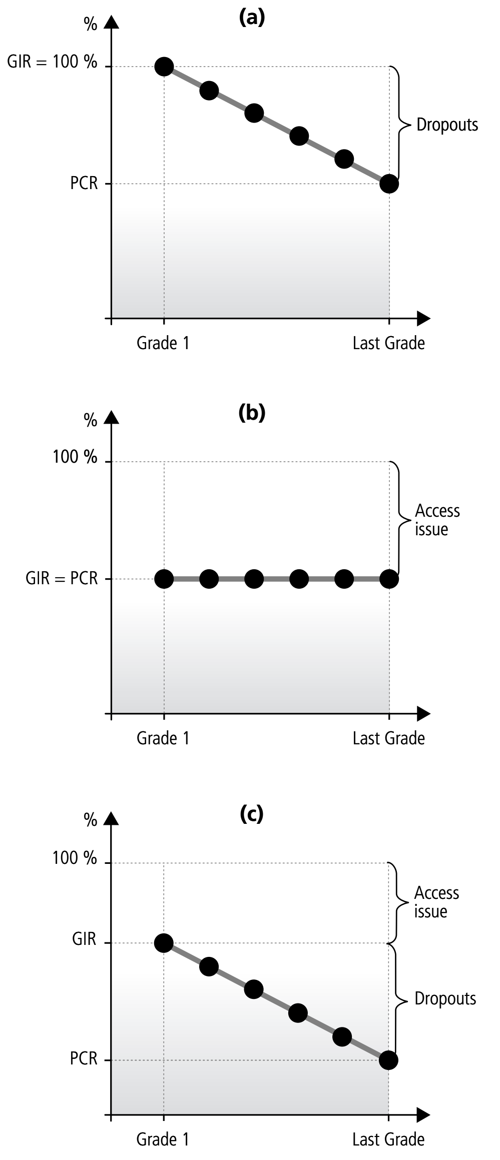
FIGURE 2.2 - Schematic Representation of the Schooling Profile



The value of the schooling profile resides mainly in its ability, as per Figure 2.2 above, to visually indicate the level of enrolment for each grade and to easily distinguish between access and retention issues. It especially distinguishes between the two main factors of weak cycle completion: weak first grade access, and high dropout during the cycle. Figure 2.3 below graphically illustrates the most common situations.

It is important to note that the Gross Intake Rate, which constitutes the first point of the cross section schooling profile, includes several cohorts in its calculation (in the numerator), and that its complement to 100 percent is not the proportion of children who do not have access to school. The "access issue" visualized on the profile (see Figure 2.2) is thus notional,

FIGURE 2.3 - Schematic Schooling Profiles and their Interpretation



and its value itself should not be directly interpreted. In fact it happens that the GIR is equal to, or greater than, 100 percent but that an access issue still exists for a number of children, while this issue is not visible on the cross section profile. This issue of interpretation of the proportion of children who do not have access to school can be resolved thanks to the calculation of a generation access rate from household survey data which is the probability of a child to have access to school one day. This calculation, more complex than that of the indicators presented here, is detailed in section 5.1.2, which specifically deals with the analysis of children who never have access to school.

Figure 2.3a describes the situation where the access issue is small, but only a share of children who entered first grade reaches the last grade of the cycle; education policy should therefore focus on retention issues. In Figure 2.3b a low number of children access the cycle, but all those who do complete it; education policy should focus here on barriers to grade 1 access. Figure 2.2 illustrates both access and retention issues, leading to low completion rates; policy will have to address both issues.

Thus, a flat schooling profile constitutes a retention ideal for the system (no dropout). Conversely, a slanted profile reflects the scale of dropout throughout the cycle and indicates low internal efficiency.[7] In this analytical perspective it is helpful to present a retention profile, which is computed in the same way as the schooling profile except that the reference population is the group of children who have gained access to school rather than the entire school-aged population. The retention profile is then a succession of survival rates (or retention rates) for each grade. The first point of the profile is set at 100 percent. The following points (equivalent to the survival rates) are obtained by applying each grade's promotion rate to the previous point.

• Key Definitions

The Effective Promotion Rate is estimated by the total enrolment net of repeaters for a given grade, as a percentage of total enrolment net of repeaters for the previous grade the year before*:

$$\textit{Effective Promotion Rate to Grade } i = \frac{\textit{Non Repeaters in Grade } i \textit{ for Year } t}{\textit{Non Repeaters in Grade } (i\text{-}1) \textit{ for Year } t\text{-}1}$$

The Effective Transition Rate (between two cycles) is the effective promotion rate to the first grade of the higher cycle.

Note: * A slightly different definition can also be found in the literature: non repeaters in grade i for year t divided by (enrolment in grade i-1 in year t-1 minus repeaters in grade i-1 in year t). That being said, calculations show that the difference between the two definitions is marginal.

In practice, when the Semi-Longitudinal schooling profile (see annex 2.4 for the methodological details) has already been computed, the retention profile can be derived from it quite simply, by dividing each access rate of the schooling profile by the gross intake rate. Given that it only uses school data, this indicator is particularly helpful when the reliability of demographic data is in doubt (especially when they are projections based on old census data).

When the data permits, the analysis may be completed by examining the evolution of schooling and retention profiles from one school year to another, as per Example 2.4, to review any changes in terms of Grade 1 access and student flows.

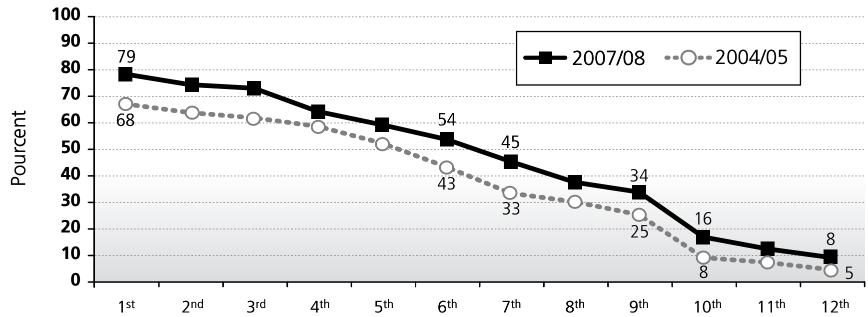
EXAMPLE 2.4

(Schooling and Retention Profiles): Cross Section Schooling and Retention Profiles, Mali, 2004/05 and 2007/08

Source: Adapted and translated from the Mali CSR, 2010.

The cross section schooling profile enables a finer analysis of schooling careers by visualising the access rates by grade, for a given school year.

FIGURE 2.4 - Cross Section Schooling Profiles, Mali, 2004/05 and 2007/08

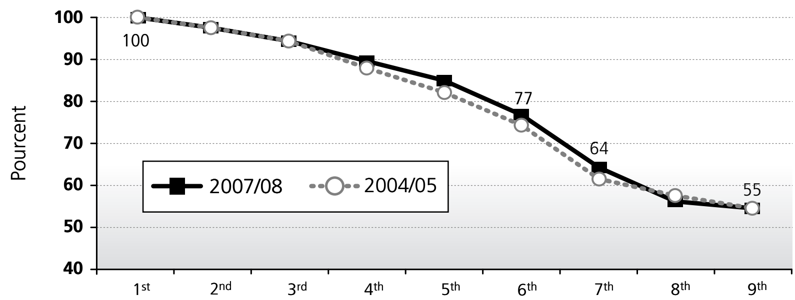


Findings

In 2007/08, Grade 1 access is estimated at 79 percent which means that about 21 percent of children never access school (against 32 percent in 2004/05). The completion of the primary cycle (6th grade), measuring progress towards universal primary education, has improved, from 43 percent in 2004/05 to 54 percent in 2007/08.

In 2007/08, 45 percent of children access the second basic education cycle and 34 percent complete it. The access rates to the first and last grades of general secondary are 16 percent and 8 percent respectively.

FIGURE 2.5 - Expected Basic Education Retention Profile, Mali, 2004/05 and 2007/08



Findings

Retention in both basic education cycles has been stable between 2004/05 and 2007/08. Of 100 pupils entering Grade 1, 77 reach Grade 6 and just 55 reach Grade 9. Universal primary education implies a retention rate of 100 percent at Grade 6.

2.2 SCHOOL LIFE EXPECTANCY

Just as life expectancy at birth is an indicator frequently used in demography to evaluate the level of a country's human development, school life expectancy is an indicator used to provide an aggregate measure of the level of coverage provided by a country's education system. In demography, life expectancy at birth is the average number of years individuals may hope to live given current levels of mortality. School life expectancy (SLE) is computed in the same way; it is the average number of schooling years the children of a given country may hope to complete (repeated years are not included) given the prevailing conditions offered by an education system.

To compute school life expectancy, the average of individuals' respective schooling career durations and information on enrolment and individuals' terminal schooling levels are required (what number or share of children finish their education at each level?). An individual who has never accessed school has a career of zero years duration; an individual accessing grade 1 but not reaching grade 2 has a career whose duration is of one year, and so on.

The cross section schooling profile, as a series of access rates to different grades, provides the information required for the calculation of SLE. For instance, the share of children who finish their education in grade 5 is the difference between those who access grade 5 and those who access grade 6. Generally speaking, the share of individuals who end their education in grade J (or for whom grade J is the terminal grade) is the difference between the access rate for grade J and the access rate for grade *J+1*.

The share of pupils for whom a given grade is the terminal one is computed for each grade offered, and the school life expectancy is obtained as the average of the numbers of years completed, weighted by the respective proportions of the cohort.

To be more practical, a simplified formula is used to obtain the SLE, computing the sum of the access rates to each grade (See Box 2.2 for an explanation of the formula). If care is taken to effectively include the access rates to each grade of education, including the highest grades of higher education, the sum of access rates represents the duration of education that a child can expect to complete in the prevailing conditions offered by an education system.

BOX 2.2
Simplified Formula of School Life Expectancy

Generally speaking, SLE can be calculated as follows:

$$SLE = \sum_{j=1}^{N} j \times (A_j - A_{j+1}) = \sum_{j=1}^{N} j \times A_j - \sum_{j=1}^{N} j \times A_{j+1} = \sum_{j=1}^{N} j \times A_j - \sum_{j=2}^{N+1} (j-1) \times A_j$$

Where *j* represents the grade, A_j is the access rate to grade *j*, and *N* is the last level offered by the system. Thus:

$$SLE = A_1 + \sum_{j=2}^{N} (j - (j-1)) \times A_j - N \times A_{N+1}$$

However, $A_{N+1} = 0$, as *N* is the last level offered by the system. The above equation can therefore be written as:

$$SLE = A_1 + \sum_{j=2}^{N} A_j = \sum_{j=1}^{N} A_j$$

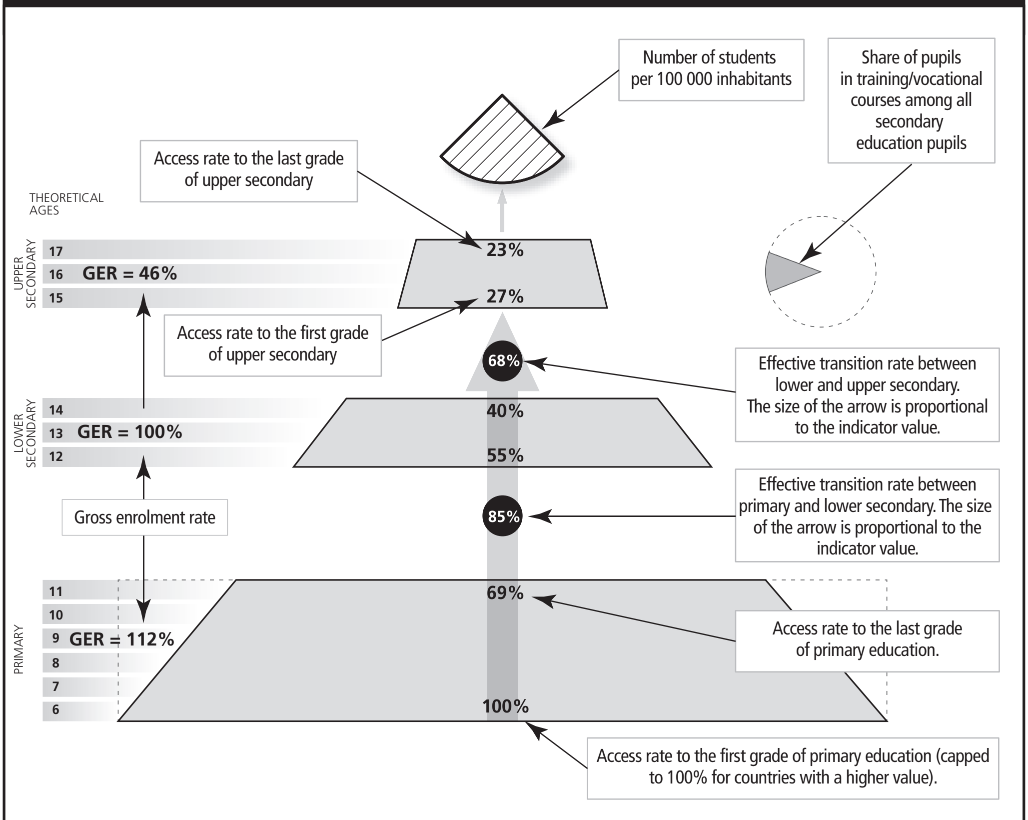
School life expectancy is thus equivalent to the sum of access rates to the different grades.

If the schooling profile is not available, the SLE can also be estimated on the basis of gross enrolment rates and percentage of repeaters (See Annex 2.2).

2.3 EDUCATION PYRAMIDS

Education pyramids are another way of representing schooling profiles. They use the access rates to different levels (to make the presentation more easily understandable only the access rates to the first and last grades of each cycle are presented) and represent each cycle as the section of a pyramid, with primary at the base and higher education at the summit. The visual presentation of the shares of a cohort at the entry and exit of each cycle is helpful to provide an evaluation of school coverage and dropout throughout schooling careers in a single figure. The pyramid also enables the clear visualisation of the transition between cycles. Figure 2.6 describes the meaning of the various components of the education pyramid.

FIGURE 2.6 - The Components of the Education Pyramid



Source: Education for All in Africa, UNESCO/BREDA, 2007.

Example 2.5 below illustrates the use of the education pyramid to summarise the recent analyses. Here again, international comparisons can be made.

EXAMPLE 2.5 **(Education Pyramids): Education Pyramids for Malawi, 2007 and Sub-Saharan Africa, 2005/06**

Source: Adapted from the Malawi CSR, 2010.

The education pyramid summarises the different indicators obtained for access, retention, and completion of each level of primary and secondary education, as well as higher education and TVET coverage (See Figure 2.7). It can be compared to the pyramid representing the average results for these indicators for Sub-Saharan Africa (See Figure 2.8).

FIGURE 2.7 - Educational Pyramid for Malawi, 2007

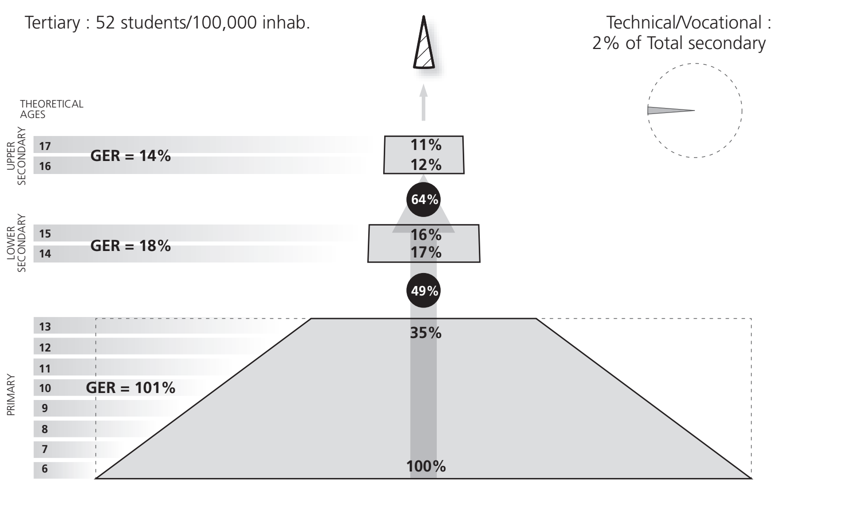
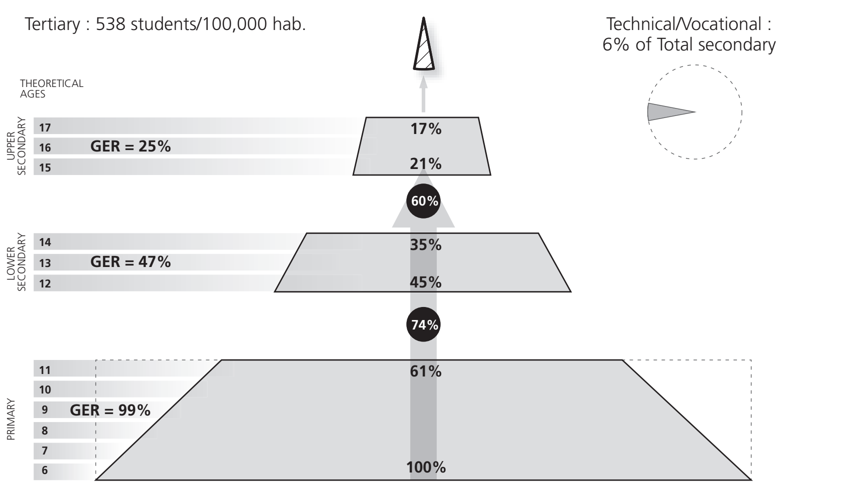


FIGURE 2.8 - Educational Pyramid for Sub-Saharan Africa, 2005/06



SECTION 3 THE SUPPLY AND DEMAND ISSUES ON ACCESS AND RETENTION

Experience has shown that it is not sufficient to build schools and train teachers for children to attend school. There are numerous situations where a significant share of children stay out of school or drop out, despite the availability of adequate infrastructure and personnel. This section aims to estimate the respective impacts of supply and demand issues, identify the causes of low demand for education, and reach conclusions that may inform education policy.

3.1 ACCESS-RELATED SUPPLY AND DEMAND

3.1.1 THEORETICAL APPROACH

One of the most useful results of this type of analysis is to determine the respective shares of out-of-school children that: (i) live in areas where supply is inexistent or insufficient; and (ii) do not face supply issues in their area, but are not enrolled. In a complementary approach, it is interesting to establish how such figures differ by gender, area of residence, and region or province.

Table 2.4 proposes theoretical figures for the share of: (i) children living in areas with no local school; and (ii) children who attend school when one is available locally. To illustrate the conclusions that can be drawn, two situations are considered.

TABLE 2.4 - Two Examples of the Effect of School Supply and Demand on Access

%	Global Access Rate	Share of Children Facing Supply Issues	Access Rate without Supply Issues
Case 1	60	32	88
Case 2	60	10	67

Note :
In both cases, the global access rate (the weighted average of the respective access rates with and without supply issues) is the same, assuming that none of the children facing supply issues go to school:
Case 1: Access rate = 32% x 0% + (100% - 32%) x 88% = 68% x 88% = 60%.
Case 2: Access rate = 10% x 0% + (100% - 10%) x 67% = 90% x 67% = 60%.

In the first case, 32 percent of children face school supply issues, and 88 percent of those with a school nearby access primary grade 1. In such conditions, it is clear that significant progress must be made in improving school access through supply policies (including school building and teacher deployment in areas where they are in short supply). Potentially, the global access rate might increase from 60 percent to 88 percent as a result.

In the second case, the situation is starkly different: only 10 percent of children face supply issues, but the share of those who do not and effectively access school is much lower than in case 1, at 67 percent. It is therefore expected that even with a standard supply policy, the improvement in the global access rate would be relatively modest, from 60 percent to 67 percent. This suggests that under-enrolment is first and foremost explained by low school demand (for the service offered).

School characteristics likely to influence demand on behalf of families include: programme content, teacher characteristics, school time-tables (over the year or throughout the day) and so on. Indeed, education services may not respond to parents' needs or expectations. This may be particularly true in highly traditional or withdrawn areas. Families' demand for education is also affected by their capacity to cover schooling costs. These costs are often much higher than potential school fees (See Chapter 3 on household contributions to education).

3.1.2 PRACTICAL METHODOLOGY TO ESTIMATE THE RESPECTIVE WEIGHTS OF SUPPLY AND DEMAND IN SCHOOL ACCESS USING ADMINISTRATIVE SCHOOL DATA

The importance of supply and demand factors is likely to differ from one area to another within a given country, and should therefore be disaggregated by region, province or district, as per Example 2.6 below. A supply index may be created to assist in this process, which will enable the comparison of supply conditions between regions. The index may be based on the number of schools or teachers per region in proportion to the school-aged population, or the average distance to the nearest school. One of these indicators or a combination of several may be compared to the indicator for the outcome, the gross intake rate.

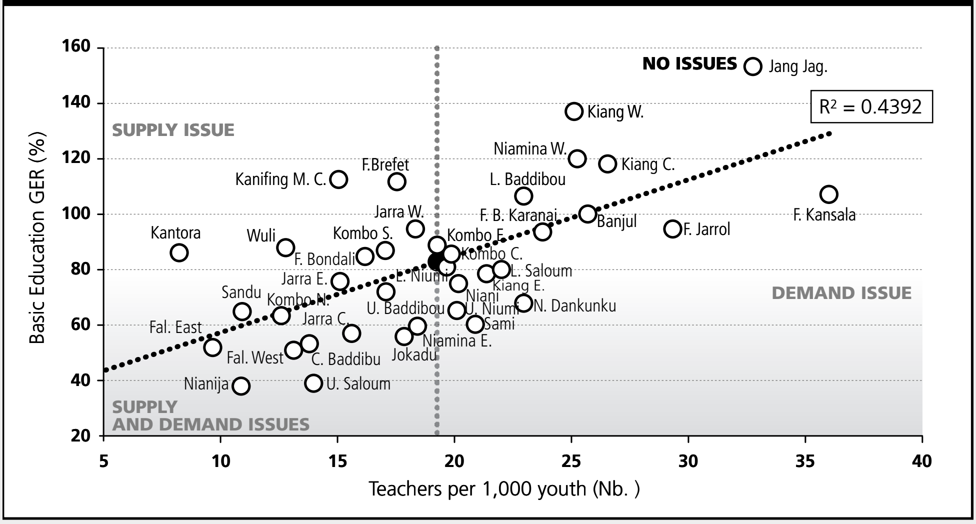
Furthermore, each may be plotted against the national averages, to identify regions where supply is lower or higher than the national average. When supply is above the national average but the access rate is significantly lower, it is likely that demand issues exist. Example 2.6, drawn from The Gambia CSR, 2011, provides an illustration.

EXAMPLE **2.6**

(Regional Analysis of School Supply and Demand): Analysis of Supply and Demand in Terms of School Access, by District, The Gambia, 2009

Source: Adapted from The Gambia CSR, 2011.

FIGURE 2.9 - Relation of Basic Education GER to Number of Teachers per 1,000 Youth (7 to 15 Years), by District, The Gambia, 2009



Note: The slanted R² line is equivalent to the expected enrolment ratio for a given level of supply. The vertical dotted line is equivalent to the average supply index.

Findings

The analysis of education supply and demand issues at the district level shows marked differences in the levels of expected enrolment and the level of school supply.

The districts that combine below-average supply and a level of enrolment below expectations face both schooling supply and demand issues. This group includes: Falladu East, Central Baddibu, Nianija, Falladu West, Upper Saloum, Jarra Central, Kombo North, Upper Baddibu, Jokadu and Niamina East.

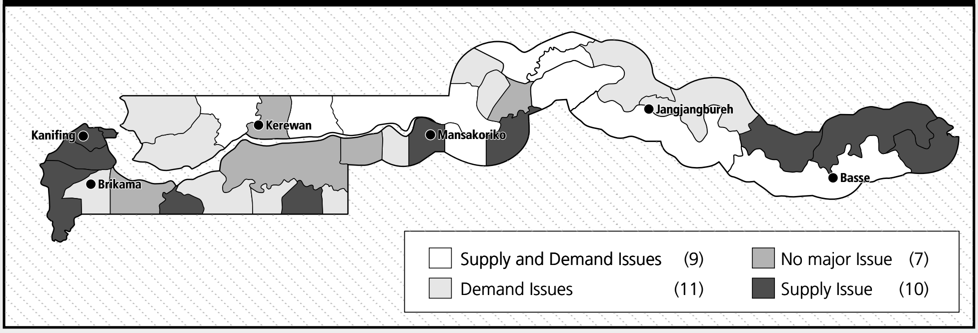
The districts whose enrolment is below expectations despite education supply being above average specifically face a demand issue. This group includes: Upper Niumi, Sami, North Dankunku, Kiang East, Niani, Lower Saloum, Foni Jarol, Foni Kansala and Foni Bitang Karanai.

The districts where enrolment is higher than expected despite supply being below average mainly face supply constraints. This group includes: Kantora, Kanifing Municipal Council, Wulli, Sandu, Jarra East, Jarra West, Foni Bondali, Kombo South and Foni Brefet. It would be appropriate to increase the supply of education in these districts to increase enrolment.

The districts that have a higher level of education supply and a level of enrolment in line with or higher than expected face no major issues of supply or demand. This group includes: Banjul, Jangjangbureh, Lower Baddibou, Kiang Central, Kiang West and Niamina West.

It may be worthwhile to present the conclusions reached above on a map of the country, to link the distribution of issues encountered to other factors, where appropriate.

MAP 2.1 - Supply and Demand Diagnosis, by District, The Gambia, 2009



3.1.3 USING HOUSEHOLD SURVEYS DATA FOR THE IDENTIFICATION OF FACTORS AFFECTING ACCESS-RELATED DEMAND

It may be helpful to link the lack of demand for education to school and population characteristics. Two approaches to this analysis are possible: econometric and descriptive.

Econometric Analysis

This approach will aim to estimate to what extent social and environmental factors are associated with children's access to school. On the basis of household survey data, this approach may provide information on the importance of the distance to school in the decision to enroll children, relative to other socioeconomic factors. This will inform potential supply-oriented policies: if distance to school is not a major factor for families, building more schools near villages will not improve access rates.

EXAMPLE 2.7

(Modelisation of Primary Access Demand): Correlation of the Distance to School with the Demand for Primary Access, Mauritania, 2008

Source: Adapted and translated from the Mauritania CSR, 2010.

Table 2.5 presents the results of a statistical analysis that describes to what extent the distance to school is associated to the probability of accessing basic education for children aged 11 to 12 years.

TABLE 2.5 - Modelisation of the Correlation between Distance to School and Basic Education Access (Children Aged 11 to 12 Years), Mauritania, 2008

Variables	Coefficients *
Time required to reach the nearest school	
Under 15 minutes (Ref Over15 minutes)	0.588
Urban Aera (Ref Rural Area)	0.472
Boys (Ref Girls)	0.329
Living Standard (Ref. Q1 - the Poorest Quintile)	
Q2	0.381
Q3	0.670
Q4	1.194
Q5 (the Wealthiest Quintile)	1.947
Constant	0.878

Note: * All variables are significant at the 1% level.

Findings

The estimation shows that for given sociodemographic characteristics, the probability of access to basic education is negatively associated with the distance to school. The results indicate that the access rate is likely to drop when the time required to reach school is above 15 minutes.

Descriptive Analysis

The descriptive analysis is complementary to the econometric analysis described above and is based directly on households' survey responses. Example 2.8 below presents the main reasons stated by parents for not sending their children to school, and the reasons for their lack of satisfaction with school for those who do.

EXAMPLE 2.8

(Analysis of Factors Affecting Access-Related Demand): Causes of Non-Attendance and Dissatisfaction with School Mentioned by Parents, Benin, 2003

Source: Adapted and translated from the Benin CSR, 2009.

Two main reasons lead parents to withdraw their children from school: (i) direct, indirect and opportunity costs (school supplies are too expensive, children's help/work is needed at home to contribute to the family economy or take care of younger siblings); and (ii) parents' perceptions of school (time-tables are thought inappropriate, academic expectations are thought too stringent and so on). Demand for education is therefore closely related to supply.

FIGURE 2.10 - Reasons for Non-Attendance Stated by Parents, Benin, 2003

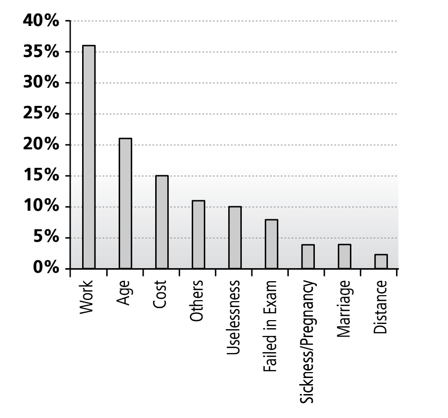
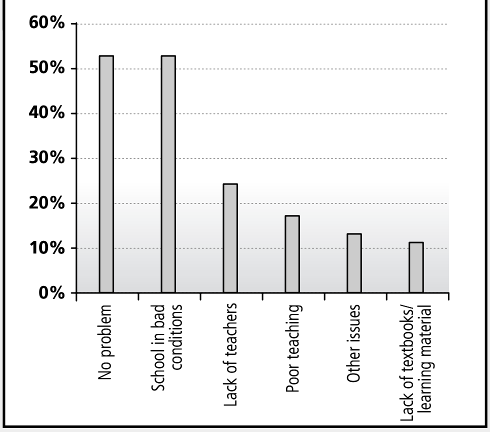


FIGURE 2.11 - Causes of Dissatisfaction with School Stated by Parents, Benin, 2003



Findings

The results of the Questionnaire on Basic Wellbeing Indicators (QUIBB) carried out in 2003 indicate that children's work is the most common reason for non-attendance of school cited by parents, which tends to confirm that low enrolment is primarily a demand-related issue, even if school characteristics fail to satisfy a majority of parents. The other causes mentioned by surveyed parents (about 5,350 households) also seem to reflect demand-side factors, including the age of children, the cost of schooling and the perceived uselessness of education.

3.2 RETENTION-RELATED SUPPLY AND DEMAND

Supply and demand factors can also explain school dropout and retention. This section will review potential causes for these phenomena and establish which are related to schools and which are related to families' expectations.

3.2.1 INCOMPLETE SCHOOLS AND EDUCATION DISCONTINUITY (SUPPLY ISSUE)

A school is classified as incomplete when it does not offer all the grades of a given cycle. In such cases the risk of dropout is high, especially if no alternative school nearby offers the missing grades. A first step in this analysis will therefore be to determine, as per Example 2.9 below, the proportion of incomplete schools in the education system and the number of pupils that attend them.

EXAMPLE 2.9 (Analysis of Supply - Incomplete Schools): Distribution of Schools According to the Grades Offered, Burkina Faso, 2006/07

Source: Adapted and translated from the Burkina Faso CSR, 2011.

This example aims to evaluate the extent to which the absence of grade continuity or the availability of a full cycle explains dropout during a cycle. As a first step each school can be classified according to the number of years of education offered, and the share of pupils enrolled in incomplete schools calculated for a given school year (See Table 2.6).

TABLE 2.6 - Distribution of Schools According to the Number of Grades Offered and Enrolment, Burkina Faso, 2006/07

Grades offered	Number of Schools	Share of Schools	Number of Pupils	Share of Pupils
1Grade	963	11.8%	58,510	3.7%
2 Grades	898	11.0%	84,487	5.4%
3 Grades	1,423	17.4%	174,089	1.2%
4 Grades	804	9.8%	120,708	7.7%
5 Grades	623	7.6%	107,907	6.9%
6 Grades	3,471	**42.4%**	1,015,557	**65.0%**
Total	8,182	100.0%	1,561,258	100.0%

Findings

Only 65 percent of pupils are enrolled in schools offering the complete primary cycle. This does not however necessarily mean that 35 percent (100 percent - 65 percent) are facing a supply shortage at this point of their schooling career. Indeed, some schools open new grades as their pupils complete the existing ones, or use an alternate year enrolment system. This happens to be the case in Burkina Faso where Biennial (every two years) recruitment is widespread.

It is worth keeping in mind however, that some schools may be incomplete in a given school year, and yet still offer grade continuity to their pupils and the opportunity to pursue their education to the end of the cycle. Indeed, as per Example 2.9, schools in sparsely populated areas may practice an alternate year enrolment system, whereby new grade 1 enrolments are only accepted every two years. Thus, school data may show that only three grades are offered for any given school year, despite pupils systematically promoting to the following grade and being able to complete the cycle. It is also common that some recently opened schools do not initially offer all grades, but gradually inaugurate new successive classes as pupils finish the existing ones, also ensuring that their pupils can complete the cycle. Consequently, even if the analysis on the share of incomplete schools is interesting, it may overestimate the scale of education supply discontinuity.

A method (shown in Example 2.10) is therefore offered to evaluate the true extent of grade continuity, based on the identification of classes for which the following grade will be unavailable the following year. With the data for two successive school years, it is possible to identify the number of classes in the first year for which the next grade is unavailable in the second year, indicating a situation of grade discontinuity. The number and share of pupils that cannot pursue their education in the same school can then be obtained for each grade, by summing up the numbers enrolled in the classes identified. An estimation of the share of new entrants that will not be able to pursue their schooling to completion of the cycle due to the unavailability of all grades can then be reached by aggregating the shares obtained for each grade through a multiplication.

On the other hand, the retention rate (through to the last grade of the cycle) for pupils enrolled in schools with full continuity along the cycle can be computed. This will provide an estimation of what the retention rate would be if all schools offered full grade continuity.

It can be noted that the question of supply also includes a qualitative dimension: beyond the availability of schools themselves, the quality of the education offered has a direct impact on retention (as well as a less direct impact on access). We will however keep the reflection on these aspects for Chapter 4, which specifically deals with the quality of learning and its links with student flows.

3.2.2 PRACTICAL METHODOLOGY TO ESTIMATE THE RESPECTIVE WEIGHTS OF SUPPLY AND DEMAND IN SCHOOL RETENTION USING ADMINISTRATIVE SCHOOL DATA

As for school intake, the respective impacts of supply-side and demand-side factors on retention can be estimated at the sub-national level.

EXAMPLE 2.10 **(Impact of Incomplete Schools on Retention): Regional Supply and Demand Issues and their Impact on Retention, Mali, 2006/07-2007/08**

Source : Adapted and translated from the Mali CSR, 2010.

TABLE 2.7 - Share of Schools and Pupils Facing Grade Discontinuity between 2006/07 and 2007/08, by Grade, Mali

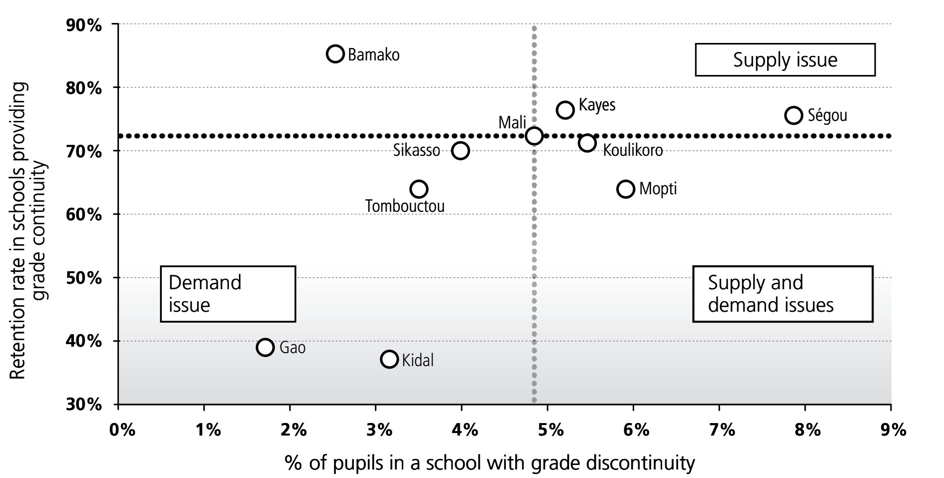
	Share of Schools	Share of Pupils
First Basic Cycle		
Grade 1 (No Grade 2)	7.6%	6.3%
Grade 2 (No Grade 3)	6.4%	4.9%
Grade 3 (No Grade 4)	6.6%	4.6%
Grade 4 (No Grade 5)	7.0%	4.4%
Grade 5 (No Grade 6)	7.1%	4.7%
Cycle Subtotal	**7.0%**	**5.1%**
Second Basic Cycle		
Grade 7 (No Grade 8)	8.5%	4.2%
Grade 8 (No Grade 9)	8.3%	3.9%
Cycle Subtotal	**8.4%**	**4.1%**

Findings

At the national level, about five percent of pupils enrolled in the first basic education cycle in 2006/07 would not be able to pursue their schooling to the next grade in the same school in 2007/08 (See Table 2.7).

The analysis is of greater use still when carried out at the regional level. Figure 2.12 crosses data for the share of pupils facing grade discontinuity with data for the retention rates expected should all schools offer full continuity (estimated as the average retention rate among schools that offer full cycle continuity), by region.

FIGURE 2.12 - Education Supply and Demand Seen through Grade Continuity and Retention, by Region, Mali, 2007/08



Findings

Generally speaking, the share of children facing grade discontinuity varies from 1.7 percent in the Gao region to 8.0 percent in the Ségou region. Figure 2.12 effectively categorises regions into four groups according to the supply and demand issues they face:

- *Regions of the first group (top right), Kayes and Ségou, have high retention rates in complete schools but a high share of pupils in incomplete schools. It should therefore be possible to improve retention and the access rates to different grades by improving school supply. This can be achieved by building new classrooms in incomplete schools and through greater use of the single-teacher rural school model.*

- *The second group (bottom left) comprises the regions of Gao, Kidal, Tombouctou and Sikasso. Here, the share of children in incomplete schools is lower, as are the retention rates in complete schools. The poor retention is more likely to be due to the weakness of demand for education than to insufficient supply. A demand-oriented policy targeting the population (or the relevant subgroups) will be more appropriate than a classic school supply policy.*

- *The third group (bottom right), comprising Mopti and Koulikoro, has the peculiarity of high shares of pupils enrolled in incomplete schools and low retention rates, even in complete schools. These regions first and foremost face a supply issue in as much as children cannot pursue their schooling in the same school and are forced to curtail their education. There is also a demand issue here as even pupils in complete schools do not always finish the cycle.*

- *The fourth and last group (top left) only comprises Bamako, home to the capital city. Here, high retention rates and a low share of children enrolled in incomplete schools indicate that this is the only region with no particular supply or demand issues.*

3.2.3 USING HOUSEHOLD SURVEYS DATA FOR THE IDENTIFICATION OF FACTORS AFFECTING RETENTION-RELATED DEMAND

As in the case of access, demand-side factors affect retention and dropout. These include the evolution of families' perceptions of the costs and benefits of education throughout their children's schooling careers.[8] Household surveys are again helpful to explore the main dimensions of low demand for education, assuming that information on schooling is available for two successive years. Questions may be included such as: "Did your child attend school last year?" and "Is your child attending school this year?"

Econometric models can then be used to attempt to identify the factors that are associated with dropout. The correlation of each variable will be directly estimated, as per Example 2.7 or Example 2.11, to simulate the completion of a cycle by different population groups accordingly.

As for the analysis of access-related supply and demand factors above, it is also possible to describe the reasons offered by parents for the interruption of their children's schooling, and their potential general discontent with their local school.

EXAMPLE 2.11 **(Analysis of Factors Affecting Retention-Related Demand): Simulation of Completion Rates According to Socioeconomic Factors, Congo, 2005**

Source: Adapted and translated from the Congo CSR, 2010.

This analysis, based on the 2005 Congolese Household Survey, focuses on the disparities that may exist in terms of primary completion according to wealth quintile, gender, and the distance to school. The rates computed here differ from traditional rates in that they are calculated on an individual basis through econometric models.

TABLE 2.8 - Simulation of Completion Rates through Logistic Regressions, by Gender, Wealth Quintile and Distance to School, Congo, 2005

Wealth Quintile	Distance to School	Completion Rate	
		Girls	Boys
Q1 (The Poorest Quintile)	> 30 mn	**30.5**	31.4
	< 30 mn	37.9	38.9
Q2	> 30 mn	43.6	44.7
	< 30 mn	51.8	52.9
Q3	> 30 mn	67.1	68.0
	< 30 mn	73.9	74.7
Q4	> 30 mn	78.7	79.4
	< 30 mn	83.7	84.3
Q5 (The Wealthiest Quintile)	> 30 mn	89.0	89.4
	< 30 mn	91.8	**92.2**

Findings

Considering the extreme groups in this example, a girl from the poorest quintile living over 30 minutes away from school is 61 percentage points less likely to complete the cycle than a boy from the wealthiest quintile living less than 30 minutes away from school. The ratio of probabilities is thus of 1 to 3. The result is almost the same for a girl from the wealthiest quintile and living less than 30 minutes away from school.

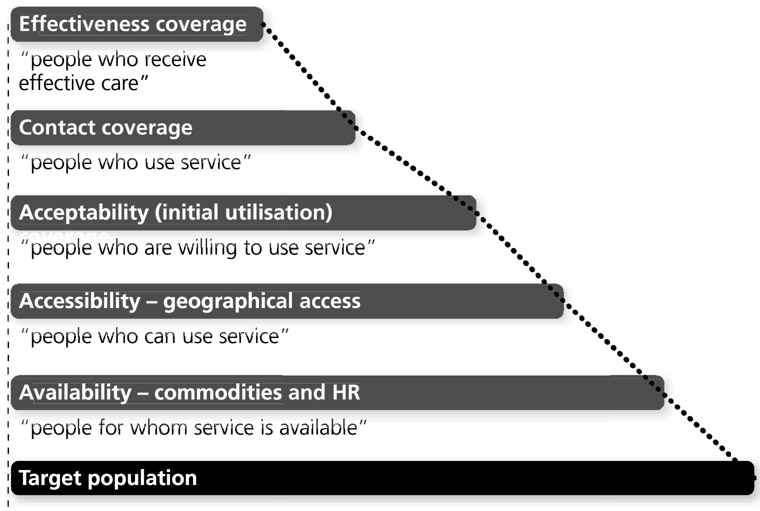
The table also indicates that supply issues are more accentuated among the poorest children. A gap in terms of completion of 7.4 percentage points (37.9 – 30.5) between the poorest girls living near their school and those living far from their school could be reduced through supply policies: the probability of completing school increases by 24 percent (7.4 / 30.5) when schools are near girls' homes. This gap decreases with each wealth quintile however. In terms of retention, the least favoured population groups are thus comparatively more prejudiced by the distance to school. This indicates that a supply policy aiming to provide proximity schooling would benefit the poorest families most.

However, the difference of 61 percentage points is mainly explained by demand-side factors: schools are available nearby but children do not attend. In terms of retention, there is no significant difference according to gender for children from the wealthiest quintile. The scale of demand-side issues is far greater than the supply-side issues. A supply-oriented policy would therefore prove insufficient to correct the disparities.

3.3 BOTTLENECK ANALYSIS

UNICEF has developed a conceptual framework called Bottleneck Analysis that allows, when applied to the education sector, to identify and quantify the determinants (both supply-side and demand-side) impeding schooling (or learning outcomes). This tool is very useful for supporting the preparation of education programmes addressing the identified bottlenecks. Figure 2.13 shows the original framework, designed for the health sector.

FIGURE 2.13 - Tanahashi model: determinants of service coverage (health sector)



Source: Tanahashi, 1978 "Health service coverage and its evaluation" Bulletin of the WHO 56(2): pp.295-303.

The framework is simple, logical and adaptable to the education sector (See Table 2.9 for an example). The quantification of the magnitude of the determinants can be assessed thanks to the methods presented in the guidelines, in particular in Chapters 2 and 4.

TABLE 2.9 - Adaptation of Tanahashi model to the education sector

Tanahashi model coverage	Health Model	Education bottleneck analysis adaptation
1. Availability	1. Availability of commodities	1. Availability of educational inputs considered critical (class rooms, textbooks, learning materials, etc.) to cover number of children that are supposed to go to school.
	2. Availability of human resources	2. Availability of human resources (teachers or qualified teachers) to cover number of children that are supposed to go to school.
2. Accessibility	3. Physical access	3. Physical access to school (distance of children from the school, physical access, financial barriers, etc.).
3. Acceptability	4. Initial utilisation	4. Initial utilisation Access Rate to Grade 1 that can be estimated thanks to methodologies presented earlier in the guidelines (using either household survey or EMIS data, see section 2 of the present chapter)
4. Contact / continued	5. Continued utilisation	5. Continuation of enrolment. Can be measured through survival rate or completion rate (see section 2 of the present chapter)
5. Effectiveness	6. Effective coverage – quality	6. Quality output: learning achievement

Source: UNICEF WCARO, Designing Pro-equities Strategies – Education Bottleneck Analysis and Costing for WCAR countries, Draft Guidance notes, September 2012

SECTION 4 INTERNAL EFFICIENCY[9]

The quantitative goals of education systems are not limited to increasing the number of children enrolled but also to ensure that children who begin a cycle complete it (do not dropout), and do so in the set number of years (do not repeat). Indeed, the pedagogical programmes of each cycle are developed in such a way as to progressively provide learners with a coherent and self-reinforcing set of knowledge and skills. The early abandon of a cycle is thus likely to result in the partial or total loss of the knowledge and skills acquired in the years effectively attended. The most widely mentioned example, including in these Guidelines, is that of sustainable literacy, acquired during primary education. Indeed, even if many children know how to read and write before the end of the cycle, it has been empirically demonstrated that a significant share of adults who did not complete the primary cycle lose their literacy after a number of years if they are not practicing.

Analysing the flow of pupils through a cycle and evaluating internal efficiency consists of comparing the number of children that access the first grade of the cycle with the number that reach the last grade in the set number of years (without repetition). The smaller the difference, the more continuous or efficient the system.

Dropout in the course of a cycle, and the repetition of grades prejudice internal efficiency, in the former case because the years of school financed school years of pupils who do not validate their cycle or fully achieve the set learning objectives, and in the latter because two school years must be financed instead of one to achieve the same learning outcome (See Box 2.3 below). Both situations represent suboptimal use or wastage of public and household resources.

4.1 REPETITION

Repetition can be measured through two indicators that are close yet different: the repetition rate and the share of repeaters.

Key Definitions

The Share of Repeaters is the percentage of repeaters in a grade or cycle:

$$\textit{Share of Repeaters} = \frac{\textit{Number of Repeaters}}{\textit{Total Enrolment}}$$

The Repetition Rate is the proportion of pupils enrolled in a given grade for a given school year who study in the same grade the following school year:

$$\textit{Repetition Rate} = \frac{\textit{Number of Repeaters in Grade i for Year t}}{\textit{Total Enrolment in Grade i for Year (t-1)}}$$

Generally, the two indicators are fairly close. In situations where enrolment increases significantly, the share of repeaters may be slightly lower than the repetition rate (given that the denominator is greater). The repetition rate is a measure that is more aligned with pedagogical practice: it measures the number of pupils that are refused promotion to the following grade. The share of repeaters presents the advantage of only requiring one year of data for its computation, and is therefore more immediate.

Example 2.12 illustrates the use of these indicators to describe repetition and its dynamics within each cycle and its evolution over recent years. International comparisons can also be drawn. Here the authors are careful to compare administrative data and household survey data, enriching the analysis and to ensure data reliability.

BOX 2.3
THE NEGATIVE IMPACT OF REPETITION ON SCHOOLING EFFICIENCY

International research on repetition, carried out over a decade, has reached four findings that question the value of too high repetition rates for education systems:

a) **The decision to oblige a student to repeat a year is not always fair.** A student's knowledge and skills are not the only explanation for repetition. Decisions often depend on subjective factors, such as the student's relative position in the class, the environment, the schooling conditions, and the teacher's qualifications (PASEC, 1999). In Côte d'Ivoire, for example, more than 30 percent of repeaters are not in the lower third of students at the national level, as measured by the standard PASEC assessment test.

b) **The impact of repetition on learning achievements is not empirically proven.** Macro-analyses show that the argument aimed at justifying students' repetition for reasons linked to the quality of education cannot be verified empirically (Mingat and Sosale, 2000). Good education systems (with a high level of student learning) can have a high or low repetition rate; there is no significant relationship between the students' learning achievement and the frequency of repetitions. The same is shown in studies at the school level (for instance in Benin, Chad, and Cameroon) which conclude that with equal resources and environment, schools where students have repeated the most grades do not have better results at the end of the cycle (Brossard, 2003; World Bank 2004, 2005). Finally, analyses at an individual level show that students (except the especially weak) who are made to repeat a year do not improve more by repeating than by moving on to the next grade (PASEC, 1999; PASEC 2004b).

c) **There is a significant negative effect on students who drop out.** Studies at country, school, and individual levels reinforce this point. At the macro level, Mingat and Sosale (2000) and Bernard, Simon, Vianou (2005) studies show that repetition increases dropout rates during the cycle, and this remains the main obstacle in reaching Universal Primary Enrolment (UPE). The families of students who repeat a year feel that the students are unsuccessful and do not benefit from being at school. As the opportunity costs always create an argument against school attendance, repetition encourages parents to take their children out of school. Mingat and Sosale estimate that one more percentage point of repeaters is associated with a 0.8 percentage point increase in the dropout rate. They also show that these negative effects are even more distinct among the population groups where the demand for schooling is already low (e.g., girls, children from underprivileged economic environments). The results of analyses at the school level support these findings. In Chad, with all other factors being equal, one more percentage point of repetition is associated with a 0.43 percent lower survival rate (World Bank, 2005). At the individual level, studies also confirm this trend. In Senegal, at a given student level, the decision to make a Grade 2 student repeat a year increases the risk of the student dropping out at the end of the year by 11 percent (PASEC, 2004).

d) **Costs are affected.** Repetition costs the system two years of study while only one year is validated. In other words, for a given budget constraint, repeating students occupy places that overload classes and may prevent other children from going to school. The link between the repetition rate and the STR is shown empirically (Mingat and Sosale, 2000 and Pôle de Dakar, 2002).

Source: EFA in Africa: Paving the Way for Action, 2005 UNESCO BREDA.

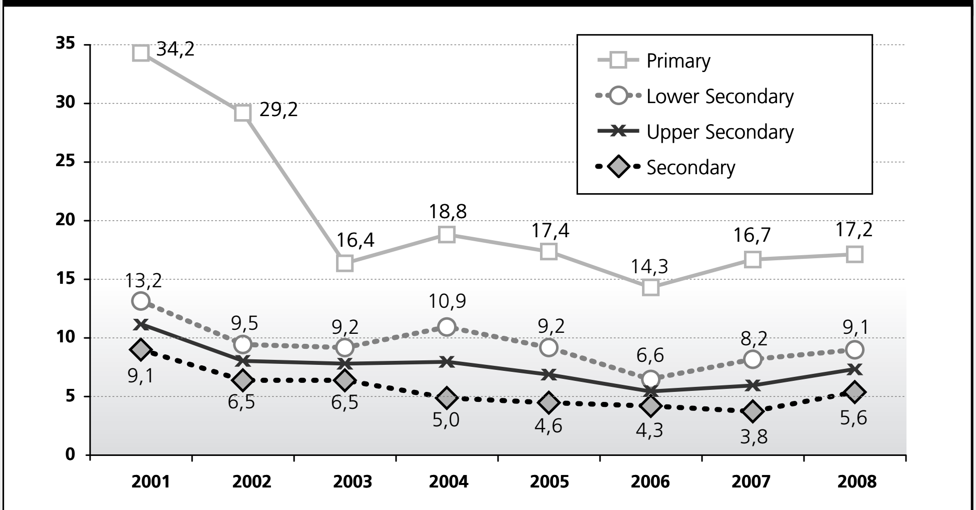
EXAMPLE 2.12

(Analysis of Repetition): Historical Repetition Trends for 2000-08 and International Perspective, Rwanda

Source: Adapted from the Rwanda CSR, 2010.

Repetition estimates are consolidated in Figure 2.14 and Table 2.10 below.

FIGURE 2.14 - Repetition Trends by Level, Rwanda, 2000/01-2008, Percent



Findings

In Rwanda, repetition is high in primary education, although it has decreased from 34 percent in 2000 to 17 percent in 2008. However, there is some evidence that administrative data understate the level of repetition, as some students may be recorded as new entrants when actually they have dropped out of school and return to the same grade the following year. This is particularly frequent in Primary 1.

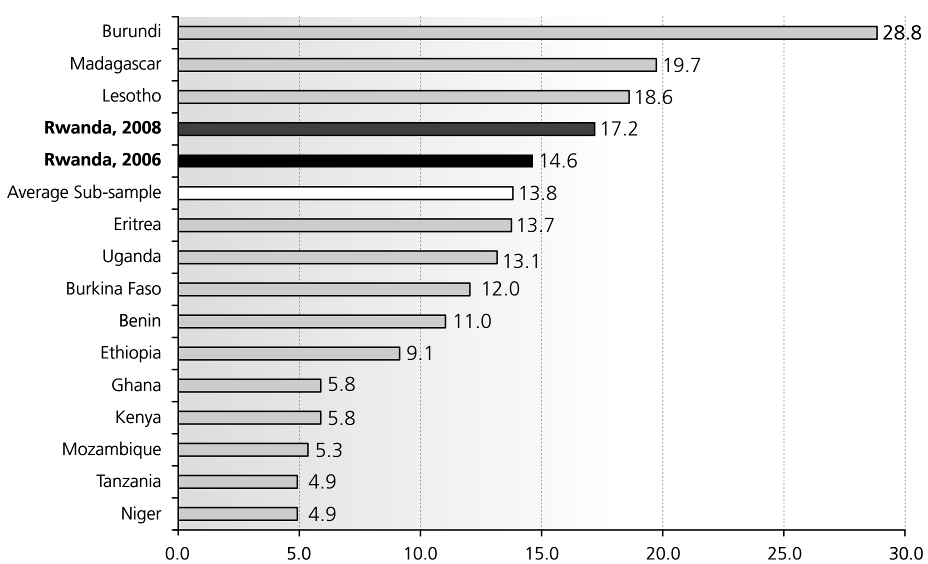
The pattern of repetition is similar from one grade to another (see Table 2.10), although the level of repetition rates is clearly higher for Primary 1. The repetition rate for Primary 6 is lower than for other grades, which is surprising when considering that students who fail the end-of-primary national examination may attempt to sit the exam again by repeating that grade. Apparently, this is not the case.

The lower rate may be explained by the fact that students who reach Primary 6 are among the best performing, and students prone to repeat have already dropped out. The abolition of the end-of-primary national examination in 2009 is ultimately expected to improve retention within the primary cycle, and smoothen the transition to general lower secondary education.

TABLE 2.10 - Repetition Trend for the Primary Cycle, by Grade, Rwanda, 2002-2008						
Percent	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**
2002	19.1	14.0	14.7	15.8	17.0	17.7
2005	19.1	16.1	17.3	18.3	18.7	15.0
2008	18.6	15.9	16.5	18.0	18.7	15.8
DHS 2005	*34.4*	*18.1*	*19.5*	*20.3*	*20.7*	*16.6*

Figure 2.15 below shows how Rwanda fares in comparison to other African countries in terms of repetition.

FIGURE 2.15 - Repetition Rates at Primary Schools in African Countries, circa 2006



Findings

The Rwandese primary education repetition rate was very close to the average registered for the subsample of African countries for 2006, but increased from 14.6 to 17.2 percent by 2008.

Beyond the cultural factors that often contribute to repetition, it is interesting to review the school and classroom characteristics that are most closely related to the practice. As for the analysis of access and retention, econometric models can be used to identify these factors and assist in the development of policies to reduce repetition, as per Example 2.13 below, drawn from the Chad CSR, 2007.

EXAMPLE **2.13**

(Analysis of Factors Associated With Repetition): Econometric Modelisation of School and Classroom Factors Related to Repetition, Chad, 2006

Source: Adapted and translated from the Chad CSR, 2007.

The multiple regression model is the best way to examine the correlation between schooling conditions and repetition, identifying which variables are the most correlated with repetition and are statistically significant. Table 2.11 presents the results of the estimations based on administrative school data.

TABLE 2.11 - Modelisation of Primary Cycle Repetition, Chad, 2007

	Model 1	Model 2
Constant	+ 0.306***	+ 0.025***
Context		
Urban (Ref. Rural)	- 0.019*	—
Type of School		
Private (Ref. Government)	- 0.080***	- 0.098***
Community (Ref. Government)	- 0.025***	- 0.021**
Type of Classroom		
Share of Permanent or Semi-Permanent Buildings	- 0.019**	- 0.024***
Teaching Conditions		
Share of pupils in multi-grade classes	+ 0.006ns	+ 0.007ns
Classroom Furnishing Index	- 0.016*	—
Number of textbooks (Reading and Math) per pupil	+ 0.010*	+ 0.011*
Teacher Characteristics		
Share of Women	- 0.045**	- 0.076***
Type of Qualification		
Share with lower secondary certificate (Ref. Share with primary leaving exam)	- 0.031***	
Share with baccalaureate (Ref. Share with primary leaving exam)	- 0.074***	
Teacher Status		
Share of assistant teachers (Ref. Share of teachers)		+ 0.055***
Share of community teachers (Ref. Share of teachers)		+ 0.036**
Age		
Share aged between 30 and 49 years (Ref. Share aged under 30 years)	- 0.003ns	- 0.006ns
Share aged 50 years or above (Ref. Share aged under 30 years)	- 0.018ns	+ 0.017ns
Share of the variation explained by the model (%)	**16.7**	**15.1**

Source: *Significant at the 1% level; ** Significant at the 5% level; *** Significant at the 10% level; ns Not significant.

Findings

Repetition varies little according to whether schools are urban or rural (the result is not very significant) but repetition is less frequent in private and community schools than in public ones. Repetition is slightly lower for schools with permanent buildings.

The results indicate that multi-grade classes are not statistically associated with repetition. Also, the availability of school furniture is of course critical to optimum teaching conditions, but its correlation with repetition is fairly limited.

Other findings from the econometric model include: (i) Female teachers (who are rare in Chad – 7 percent of the teaching staff, against 30 percent on average for SSA) are correlated with lower repetition; (ii) Repetition of pupils is less strongly associated with teachers with the baccalaureate than with those who hold lower qualifications.; (iii) repetition frequency is slightly lower among permanent teachers than among assistant teachers and community teachers.

4.2 INTERNAL EFFICIENCY COEFFICIENT

Without repetition, any cycle leaver or graduate should have spent the number of years completing the cycle equivalent to its theoretical duration. As mentioned, repetition involves spending more resources to achieve a given learning outcome, and dropout involves spending resources on individuals that will not derive the full benefit for themselves or society. Thus, the number of pupil-years[10] effectively consumed (the number of years of study completed by all pupils, including repeaters and dropouts) should be compared to the number of leavers or graduates, to establish the average investment in terms of years of education per cycle graduate.

The ratio between the theoretical duration of a cycle and the average number of pupil-years effectively invested provides the definition of the internal efficiency coefficient (IEC). It is comprised between 0 and 1, each representing hypothetical extremes: 0 represents a situation where no pupil completes the cycle, regardless of enrolment, repetition and dropout; 1 represents the ideal situation where all children complete the cycle in the set number of years (no repetition or dropout). A coefficient of 0.4 indicates that the theoretical duration of the cycle is just 40 percent of the effective average number of pupil-years required to complete the cycle. This indicates that 60 percent (= 1 - 0.4) of the pupil-years invested correspond to repetition and drop-out related inefficiency.

• Key Definition

The Internal Efficiency Coefficient (IEC) is the ratio between the theoretical number of pupil-years required to educate a pupil and the effective average number of pupil-years invested:

$$IEC = \frac{\text{Ideal Number of Pupil - Year}}{\text{Effective Number of Pupil - Year Invested}}$$

The share of the inefficiency related to dropout and the share related to repetition can be established through the computation of partial coefficients that use the number of pupil-years consumed net of repetition (dropout-related IEC), and the number of pupil-years consumed net of dropout (repetition-related IEC). This distinction enables one to establish the most important factor contributing to a given level of inefficiency. This is helpful information when developing effective education policy with respect to student flows.

It must be noted that to talk of inefficiency, dropout or repetition in terms of wastage is only acceptable if these phenomenon are excessive, as they can then be interpreted as a net loss for both the education system and the pupils. Repetition may however be marginally beneficial for some pupils (although it is counter-productive for the system). Also, in absolute terms, a child dropping out of a six-year cycle after five years is by far preferable to that person never having attended school. An IEC of 0.95 should therefore not lead to the conclusion that five percent of pupil-years are lost, because in truth they may well not be lost for everybody. In practice the computation of the IEC relies on the survival rate to the last grade of the cycle. The survival rate at a given grade is the product of the successive effective promotion rates to each grade until the given grade (See Section 2.1 for the definition of the effective promotion rate).

The IEC and the partial IECs are calculated as:[11]

$$\text{IEC} = \frac{\textit{Duration of the Cycle x Final Grade Survival Rate}}{\sum_{i=1}^{\textit{Final Grade}} \frac{\textit{Survival Rate to Grade } i}{\textit{1 - \% Repeaters for Grade } i}}$$

$$\text{IEC}_{\textit{Dropout}} = \frac{\textit{Duration of the Cycle x Final Grade Survival Rate}}{\sum_{i=1}^{\textit{Final Grade}} \textit{Survival Rate to Grade } i}$$

$$\text{IEC}_{\textit{Repetition}} = \text{IEC} / \text{IEC}_{\textit{Dropout}}$$

Where : *Survival Rate to Grade i* = $\prod_{2}^{i} PR_{i-1}^{i}$ and :

$$PR_{i-1}^{i} = \frac{\textit{Non - Repeaters at Grade } (i+1) \textit{ for School Year } (n+1)}{\textit{Non - Repeaters at Grade } i \textit{ for School Year } n}$$

The analysis of the IEC can be carried out in a comparative perspective, by education level, as in Example 2.14 below, and in historical or international perspectives.

EXAMPLE 2.14 (Internal Efficiency Coefficients): Total, Dropout-Related and Repetition-Related Internal Efficiency, Rwanda, 2002-2008

Source: Adapted from the Rwanda CSR, 2010.

Table 2.12 below provides an estimation of the internal efficiency of the primary and secondary cycles, summarised by the aggregate internal efficiency coefficient and its two related partial indicators. The latter provide insight into the degree of inefficiency and wastage attributable to perturbation in student flows due to dropout or repetition.

TABLE 2.12 - Internal Efficiency Coefficients in Primary and Secondary Education, Rwanda, 2002-2008

	2002	2008
Primary		
Internal Efficiency Coefficient	**56**	**39**
Dropout-Related (without Repetition)	73	52
Repetition-Related (without Dropout)	77	76
Student-Years Required to Produce One Graduate	*12.9*	*18.3*
Secondary		
Internal Efficiency Coefficient	**93**	**82**
Dropout-Related (without Repetition)	102	91
Repetition-Related (without Dropout)	91	91
Student-Years Required to Produce One Graduate	3.6	4

Findings

The 2008 primary level IEC is low at 39 percent, implying that 61 percent of public resources are wasted on repeated years or schooling-years prior to dropout. This means that the system effectively requires 18 student-years to produce one primary level graduate, instead of the planned six years (perfect efficiency). The situation has worsened since 2002/03, when the IEC was 56 percent. High dropout rates have the greatest adverse impact on primary education internal efficiency. Without dropout, the internal efficiency coefficient would have been 76 percent. Although efficiency is higher in secondary education, the IEC declined to 82 percent in 2008, compared with 91 percent in 2002/03. This can be attributed to dropout, as shown by the significant decline in the related partial indicator.

SECTION 5 OUT-OF-SCHOOL CHILDREN

The analysis of out-of-school children takes on a special dimension today, in a context marked by the progress in enrolment, but where a still significant share of children do not have access to full basic education. Achieving universal primary education will require analysing this issue to better understand its magnitude and characteristics, and formulate appropriate corrective education policies.

This section does not seek to provide an exhaustive approach to the analysis of out-of-school children. Teams in charge of the Education Sector Analysis may find a detailed analysis of the issue in the UNICEF/UIS, 2010 and World Bank, 2011 documents. Here it will suffice to present the tools that will enable the readers to answer two fundamental questions: (i) How many children are concerned? and (ii) Who are they?[12]

5.1 ESTIMATION OF THE SHARE AND NUMBER OF OUT-OF-SCHOOL

5.1.1 ESTIMATION OF THE SHARE AND TOTAL NUMBER OF OUT-OF-SCHOOL CHILDREN

Based on Household Survey Data

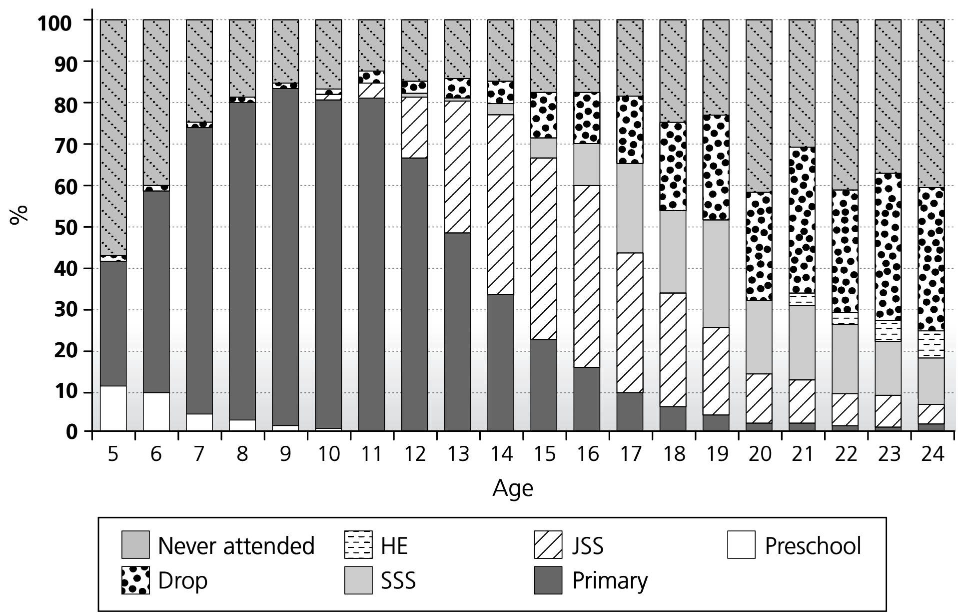
A first approach to the estimation of out-of-school children is to represent school-aged children's attendance status at the time of the survey (the group aged 5 to 24 years for instance). For each age, one will distinguish between the shares of children who: (i) never attended school; (ii) are attending a given cycle (from preschool to higher education); and (iii) have dropped out of school. Figure 2.16 below provides a visual illustration of this approach for Sierra Leone.

Figure 2.16 shows that close to 80 percent of children aged nine years are attending primary school, and close to 18 percent have never attended school. The share of those having dropped out is low, but increases with children's age.

For children of a given age group G (for instance those of basic education school age, 6 to 14 years) the number of out-of-school children (OOSC) is the product of the share of out-of-school children (those who never attended, have dropped out or are attending preprimary) of that age group and the school-aged population of that age group, which can be obtained from population census projections:

$OOSC_G$ = *Share of* $OOSC_G$ x *Number of Children of Age Group G*

FIGURE 2.16 - Children's attendance Status, by age, Sierra Leone, 2010



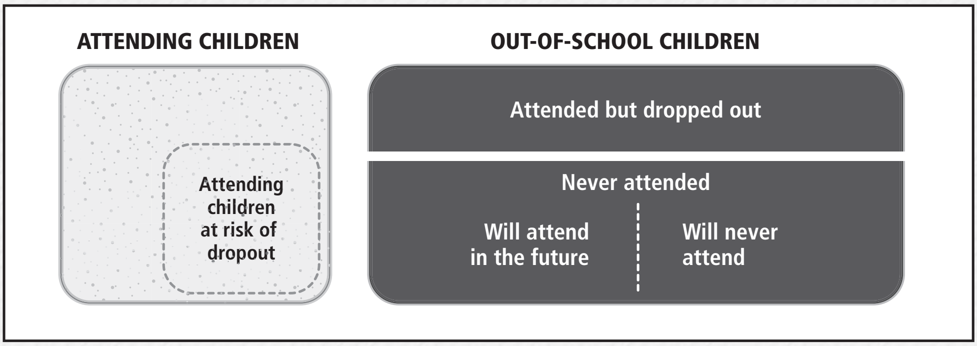
The number of children having dropped out can be computed by subtracting the number of children who have never attended school from the total number of OOSC.[13]

BOX 2.4
Explanation of Out-of-School

Definitions of out-of-school vary. That used here is inspired by the definition offered by UNICEF/UIS: An out-of-school child is any child of compulsory school age – generally of primary or basic education school age – who is not attending a formal primary or basic school.

This definition can be limited to cover only primary, lower secondary or upper secondary school-aged children. Thus, primary school-aged children attending preschool are considered as out-of-school, as well as children attending informal schools (as per the UNICEF/UIS definition). On the other hand, primary school-aged children attending secondary are not considered as out-of-school. This approach tends to overestimate out-of-school, but it ensures comparability of international estimations when administrative or household survey data does not always include preschool or informal enrolment.

Various methods have been developed to estimate the number of out-of-school children (See World Bank, 2011 and UNICEF/UIS, 2010). Although approaches to the computation differ, they all agree on in the need to distinguish among different types of unenrolled children. It is common to differentiate between those who have never attended, and those who have dropped out (See figure below). Further detail can be provided by: (i) differentiating between those who will never attend school from those who may attend later; and (ii) those at risk of dropout from those who are not. Although this category is not computed as out-of-school, it provides a quantitative estimation of the weight of school dropout. Identifying children at risk of dropout is also helpful to establish appropriate preventive policies.



This categorisation of out-of-school children enables the elaboration of more appropriate policy responses to the phenomenon, that will differ according to its nature (access or retention-related) and magnitude.

Based on Administrative School Data

The number of out-of-school children can also be computed with the help of administrative school data. This can be performed by directly subtracting the number of age group *G* children enrolled in a primary or secondary school (administrative school data) from the total number of children belonging to this age group (survey projection data):

$$OOSC_G = (\text{Number of Children of Age Group G}) - \text{Number of Enrolled Children of Age Group G})$$

The calculation of adjusted net enrolment rates (ANER) can also be used, where:[14]

$$ANER_{primary} = \frac{\text{Number of Primary School Aged Children Enrolled in Primary and Secondary}}{\text{Total Number of Primary School-Aged Children}}$$

This leads to:

Share of $OOSC_{Primary}$ *= 100% -* $ANER_{Primary}$

The number of out-of-school of primary school age can then be deduced:

Number of $OOSC_{Primary}$ *= Share of* $OOSC_{Primary}$ *x Number of Primary School Aged Children*

The quality of this analysis is however always limited by the quality of the single-age school administrative data available, which may be limited in countries where birth registration is not systematic.

5.1.2 ESTIMATION OF THE SHARE AND NUMBER OF OUT-OF-SCHOOL CHILDREN THAT WILL LIKELY NEVER ENROLL

Among the out-of-school children, a certain number may begin school at a later age, for various reasons that may include the distance to school or parents perception that children aged six or seven years are too young to attend school. The analysis will thus try to calculate a generation access rate, independent from the age at which children may access school. On the basis of household survey data, it is possible to determine the share of children having attended school at some point for each age, and deduce the number who are out of school now but will enter school later.[15]

The graphic representation of these shares enables the visual identification of the ages where the rate of school attendance is highest, and the age beyond which the odds of a child attending school are severely reduced. The share of children that will probably never attend school is obtained by subtracting this attendance rate for those children above the age identified from 100 percent. Generally, the cut-off age is found to be in the range of 10 to 13 years.

● Key Definition

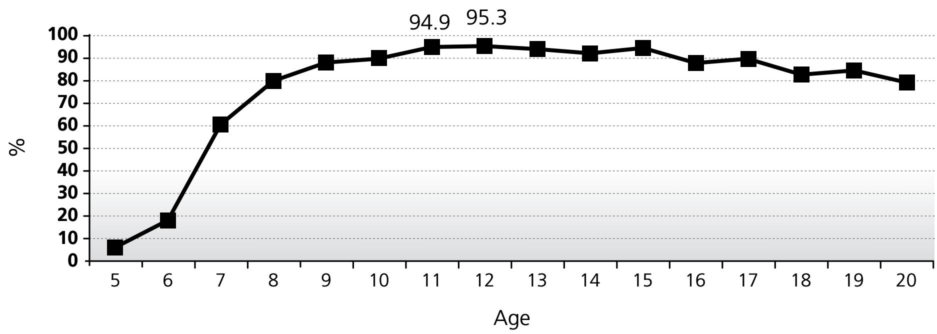
The generation access rate is the probability for an individual to access school, calculated from household survey data, as the maximum proportion, amongst age groups, of individuals having had access to school.

$$\text{Generation access rate} = \text{Probability for an individual to have access to school one day} = \frac{\textit{Number of Children Aged (T - 1) to (T +1) Having Attended School}}{\textit{Population Aged (T - 1) to (T + 1)}}$$

Where *T* is the age where school attendance has been the highest. The population of age *T* is used as a reference group for the calculation of the odds of attending school one day, but for reasons related to sample size, it is preferable to use the population group whose ages are comprised between (*T-1*) to (*T+1*). In the Tanzanian example (See Figure 2.17), the age for which school attendance is highest is 12 years, so the group aged 11 to 13 years is used for the computation.

A graphic illustration is given below, using the Tanzania example. The highest school attendance rate is for children aged 11 to 12 years, at 95 percent (see Figure 2.17 below). This share can be used as an estimation of the share of younger children who will access school at some point. For that age, the share of children who will probably never attend school is thus five percent (100 percent – 95 percent). Again, many children aged seven years (the official age of primary intake) are not yet attending (40 percent), but will probably attend school in the future.

FIGURE 2.17 - Share of Children Having Accessed School, Tanzania, 2006



Source: CSR Tanzania.

The share of children who will likely never access school is thus obtained by the following formula:

Share of Children who Will Never Attend School =
100% - Generation Access Rate =
100% - The Highest Probability of age - specific Attendance rate

The number of children of age group G who will likely never attend school is obtained by multiplying the share of children who will likely never attend school by the population of children of that age group (based on population census projections):

Number of OOSC of Age Group G who Will Likely Never Attend School =
Share of Children who Will Never Attend School x Population of Age Group G

5.1.3 ESTIMATION OF THE SHARE AND NUMBER OF CHILDREN AT RISK OF DROPOUT

Two approaches can be used to estimate the number of children that are at risk of dropout before completing their cycle: (i) The analyses carried out in section 3.2 of the factors affecting dropout can be used to deduce the dropout rate, which can in turn be applied to the enrolled population of that cycle to obtain the share that is at risk of dropout; or (ii) When available, household survey data covering attendance information for two consecutive years can be used to calculate the dropout rate by age between those two years, again to be applied to the number of children enrolled in that cycle.

5.2 WHO ARE THE OUT-OF-SCHOOL CHILDREN?

Just as it is important to estimate the magnitude of out-of-school children, so is it to establish who these children are, where they live and what the main obstacles to accessing school are. These characteristics will assist decision-makers in the design and targeting of appropriate policies.

Household surveys are a valuable source of information, enabling the development of profiles of out-of-school children including gender, area of residence, household income and employment status characteristics.[16] As with all access issues, disparities tend to be cumulative and self-reinforcing; only household survey data enables highlighting the multiple dimensions of the phenomenon and to shed appropriate light in view of policy making.

Example 2.15 below offers a global review of out-of-school children analysis, covering both: (i) the estimation of its magnitude (Section 5.1), differentiating between children who never attended school and those who dropped out; and (ii) the identification of the characteristics of the children involved in the phenomenon. This profiling exercise is carried out from two perspectives: (i) the share of out-of-school children that are girls, poor and so on; and (ii) the share of girls, the poor, rural children and so on that are out-of-school.

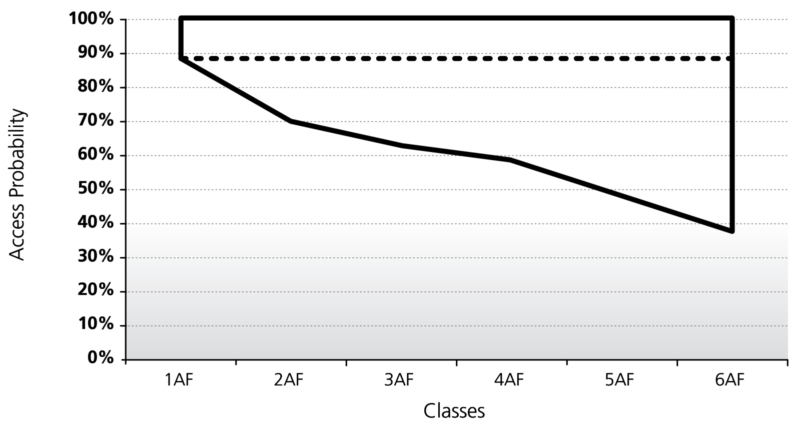
EXAMPLE 2.15

(Out-of-School Profiling): Magnitude of Out-of-School and Characteristics of Out-of-School Children, Mauritania, 2008

Source: Adapted and translated from the Mauritania CSR, 2010.

This example aims to provide empirical answers to two questions: (i) How many children of official school-age are out of school in Mauritania (how many have never attended, and how many attended at some point but ended their education prematurely before completing their cycle)? And (ii) What are the personal and social characteristics of out-of-school children? The probabilistic schooling profile presented in Figure 2.18 is based on the household living standards survey (EPCV, 2008), and covers Mauritanian out-of-school children aged 8 to 13 years.[17]

FIGURE 2.18 - Probabilistic Schooling Profile for Basic Education, Mauritania, 2008



Findings

The share of children of their generation who gained access to the first year of basic education (1AF) is estimated at 88 percent, whereas the share of children of their age group who accessed the last year of this cycle (6AF) is 37 percent.

The survey data has enabled the estimation of the number of out-of-school children. In 2008 it was 92,341, equivalent to a quarter of all children aged 8 to 13 years. This population group is comprised of two types of children: (i) those who never attended school, estimated at 24,488

TABLE 2.13 - Estimation of the Number of Out-of-School, Mauritania, 2008

	Area of Residence		Total
	Rural	Urban	
Total number of children aged 8 to 13 years	200,089	168,676	368,765
Number of out-of-school children aged 8 to 13 years	71,827	20,514	92,341
Number of children aged 8 to 13 years never attended	18,137	6,351	24,488
Number of children aged 8 to 13 years who dropped out	53,690	14,163	67,853
Percentage Out-of-School	***35.9***	***12.2***	***25.0***

or about a quarter of the out-of-school children; and (ii) those who attended at some point but dropped out prematurely, estimated at 67,853.

In order to achieve universal primary education the challenge is to ensure all 92,341 out-of-school children access school. In-depth profiles may be created to influence the development of policies which take into account the social and demographic diversity of the out-of school children.

These profiles may include a social, demographic and economic descriptions of out-of-school children to help overcome barriers to schooling, target the children concerned, and develop an inclusive education system. Table 2.14 below presents the share of out-of-school children according to sociodemographic characteristics, as well as the share of children with said characteristics that are out of school.

Findings
Out of the 368,765 children, 92,341 were out of school. The gender gap in out-of-school children is modest (53 percent are girls and 47 percent are boys). The gap in the probability of enrolment is more important in terms of area of residence or wealth quintile.

TABLE 2.14 - Characteristics of Out-of-School Children Aged 8 to 13 Years, Mauritania, 2008

Percent	Percentage Out-of-School, by Characteristic	Distribution of Out-of-School, by Characteristic
Area of Residence		
Rural	35.9	77.8
Urban	12.2	22.2
Gender		
Boys	22.9	46.8
Girls	27.3	53.2
Wealth Quintile		
Q1	39.0	37.4
Q2	29.3	27.5
Q3	23.6	19.7
Q4	13.6	10.2
Q5	10.0	5.2
Overall	25.0	100.0

The probability of being out-of-school is estimated at 12.2 percent for urban children, against 35.9 percent for those living in rural areas. Rural children represent 78 percent of out-of-school children, with only 22 percent living in cities. The challenge to achieve universal primary education will therefore largely depend on Mauritania's capacity to enroll a greater number of children in rural areas. If it is estimated that 92,341 school-aged children are out of school, 71,827 of them live in rural areas, and 20,514 live in cities.

NOTES

6 In some household surveys for instance, respondents are asked: "Is your child currently attending school?" which can be interpreted as relating to the physical location of the child at the time of the question. Respondents may answer "No" if the survey is carried out during school vacations (or the child is absent from school) even if the child is enrolled. Naturally, the enrolment rate computed on this basis will be lower than that computed on the basis of school data.

7 This chapter will later examine various measures of internal efficiency, including the scale of dropout and the number of years wasted in repetition.

8 Such perceptions may evolve along with a child's age as the result of: (i) increasing direct and opportunity costs of schooling (older children may be able to contribute more to the family production, or (ii) girls near puberty are thought to be more vulnerable, and so on); or (iii) decreasing expected returns on education (school quality may be deemed insufficient or inadequate, children with learning difficulties may be thought not to benefit, parents believe basic reading and arithmetic skills are sufficient and so on); or (iv) a combination of both.

9 While the scope of internal efficiency spreads over other dimensions (like the quality of learning, which is dealt with in Chapter 4), the analysis here will be limited to the aspects linked to student flows.

10 A pupil-year is defined as one year spent by one student in one grade.

11 There is an alternative method of IEC computation, called the method of reconstituted cohorts, that is dealt with in Annex 2.1.

12 A further important question relates to the obstacles to enrolment (See Sections 3.1 and 3.2 in this chapter). Education sector analysts may also wish to consider the policy options to mitigate the phenomenon available to decision-makers, as described in World Bank, 2011 and UNICEF/UIS, 2010.

13 Knowing one of the variables (the number of dropout-related OOSC or the number of unenrolment-related OOSC) enables the computation of the other by subtracting it from the total number of OOSC. For instance, the number of dropout-related OOSC = Total OOSC – Unenrolment-Related OOSC.

14 Household survey data can also be helpful here.

15 This data is provided from the responses to the question: "Has your child ever attended school?"

16 Specific surveys on child labor also provide valuable information on out-of-school children. Children's domestic or productive activities are often one of the causes for dropout, or a direct consequence of non enrolment (see UNICEF/UIS, 2010).

17 In the same way that the probability of Grade 1 primary access was estimated in Section 5.2.1, the probability of access to each grade can be estimated on the basis of the highest level of attendance noted in the access curve by age. The succession of these probabilistic access rates for each grade constitutes the probabilistic schooling profile.

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CHAPTER 3

COST AND FINANCING

› Chapter Objective:
To offer approaches to the analysis of:
(i) the structure of education financing (including by the government, donors and households), its distribution (by item, education level and type of school) and evolution over time, and (ii) the breakdown of spending, through recurrent unit costs, household contributions, and capital costs.

1. EVOLUTION OF EDUCATION EXPENDITURE AND ITS COMPOSITION

ISSUE

Does the country prioritise the education budget? How have priorities between different expenditure items and education levels evolved over recent years? Does the distribution of spending across sub-sectors reflect the education system's development priorities? What is the level of education funding from development partners and how dependent is the sector on international aid?

OBJECTIVES

- For the last 10 years, detail the amount and breakdown of education spending, differentiating between recurrent and capital (development) expenditure;
- For recent years, detail the distribution of spending by item and level;
- For the most recent year, consolidate personnel data from different sources, break down recurrent expenditure into salary and non-salary expenditure, by level, location and cost-center (central services, decentralised services, schools, and so on); and
- Review the evolution of education financing through international aid;

METHODS

- Consolidate overall public education and training expenditure;
- Select the most recent year for which expenditure data is available by level;
- Compare the different numbers and lists of personnel from various departments, distinguish between the sector personnel, personnel used by the system but on other ministries' payrolls, and personnel on the education payroll but practicing elsewhere, and then estimate salary expenditure by personnel type; and
- Compile a list of activities financed by partners through projects and budget support (education sector or global), at least for the chosen reference year.

SOURCES

- Detailed executed/actual budget data supplied by the budget division of the finance ministry, and/or the education ministries' financial affairs departments;
- School survey data, personnel data from the education ministries' human resource departments and payroll data from the finance ministry and the civil service commission;
- Consolidated school grants expense reports; and
- International aid data collected from development partners or the OECD/DAC.

2. ESTIMATION OF UNIT COSTS AND ANALYSIS OF THEIR COMPOSITION

ISSUE

What is the level of spending per student? What is the trade-off, intentional or not, between the number of pupils enrolled and the spending on each? What are the most expensive items of this spending? What scope exists to change unit costs?

OBJECTIVES

- Calculate public recurrent unit costs for each cycle;
- Evaluate the respective importance of the different factors of unit costs through a comparative approach; and
- Analyse disparities in teaching salaries by status and how attractive teaching salaries are compared to other civil servants' and private sector pay.

METHODS

- Use a macro approach that consists of dividing the amount of public recurrent expenditure for each cycle by the number of pupils enrolled in public or private subsidised schools; and
- Use a micro approach to detail the different factors of unit costs.

SOURCES

- As above; and
- For salaries: employment surveys, household surveys (where questionnaires detail individual income) and data on teacher attrition and loss.

3. ESTIMATION OF HOUSEHOLD CONTRIBUTIONS

ISSUE

What is the level of household contributions to education? What is the public-private cost-sharing for each cycle? Do private schooling costs penalise the enrolment of the poorest pupils, especially in basic education?

OBJECTIVES

- Estimate the level of household education spending and the share of household contributions to total education spending, by level;
- Study the variations in household spending by type of school, location, and parents' socioeconomic characteristics; and
- Analyse the sustainability of household education spending, in particular for the poorest.

METHODS

- Calculate average annual household spending by type of school, gender, area of residence and family income; and
- Compare, for each education level, the costs borne by households and those borne by public financing.

SOURCES

- Estimations based on household survey data (living standards surveys, household budget and consumer surveys and so on).

4. COMPARISON OF THE COST OF DIFFERENT TYPES OF SCHOOL CONSTRUCTION AND OTHER EQUIPMENT

ISSUE

How does the unit cost of the construction of an equipped classroom vary according to the building approach used? What are the unit costs of other types of construction and necessary key equipment (laboratories and so on)? Are these costs sustainable for the system's development? What is the importance of capital expenditure in comparison with recurrent expenditure?

OBJECTIVES

- Compare the cost of providing an equipped classroom according to the various building options available nationwide (those used by the state, by communities, by development partners and by NGOs);

▶

- Estimate the unit costs of other types of buildings and key equipment; and
- Compare annualised infrastructure costs with recurrent unit costs.

METHODS

- Review the types of construction, buildings, procurement methods and execution methods used by the state and its partners as exhaustively as possible, and compare their costs and comparative advantages;
- Calculate annualised infrastructure costs on the basis of their life-span, and compare with annual recurrent expenses, per classroom or per student; and
- Compare annualised costs with those of a comparable country.

SOURCES

- Construction departments of the education ministries and the ministry responsible for infrastructure and public works; and
- Data supplied by development partners who finance capital costs.

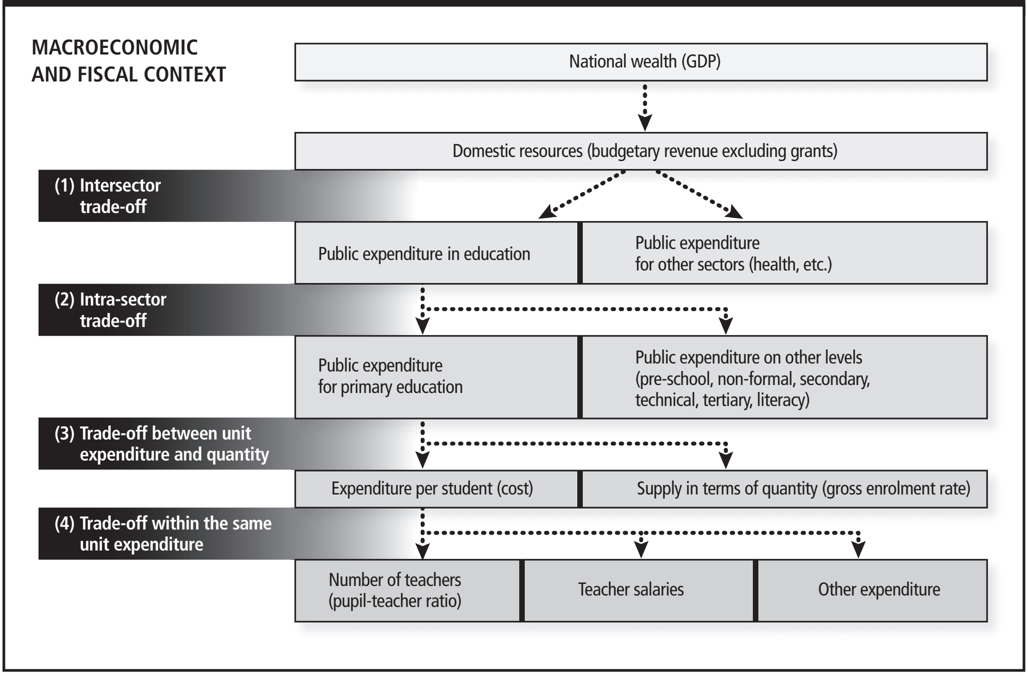
Introduction

This chapter explains how to survey and analyse all information pertaining to the resources mobilised for the education sector. Although the analysis focuses first and foremost on public financing, over which the state has most control, all funding sources are examined (public resources, international aid, private spending). The chapter also deals with the use that is made of these resources, and especially measures the cost per student (unit costs).

The chapter is divided into four sections: (i) The first analyses the evolution of the volume of public and external resources mobilised by the sector, from an aggregate perspective. It analyses the evolution of public education expenditure by education level and according to its different components (salaries, goods and services, scholarships and other welfare, operating costs). It then analyses, for the most recent year for which data are available, the detail of these expenditures by level and component; (ii) The second part deals with the estimation of education unit costs for each level, and evaluates the respective importance of the three main factors of unit costs (average teacher salary, the percentage of recurrent expenses other than teaching salaries and the pupil to teacher ratio), from national and comparative international perspectives. It also analyses disparities in teacher salary levels according to their status (civil servants, contract teachers, and community teachers, for instance); (iii) The third section examines the contribution of households to each cycle and their potential impact on enrolment; and (iv) Finally, the fourth section analyses the costs related to school construction and equipment.

Figure 3.1 summarises and illustrates the different financial trade-offs, voluntary or not, that are made in education expenditure. The first level (macroeconomic and fiscal context) has been dealt with in Chapter 1. The distribution of spending within and across sub-sectors is analysed in the first section of this chapter, and the last two levels are examined in section 2.

FIGURE 3.1 - Summary of the Different Levels of Financial Trade-offs



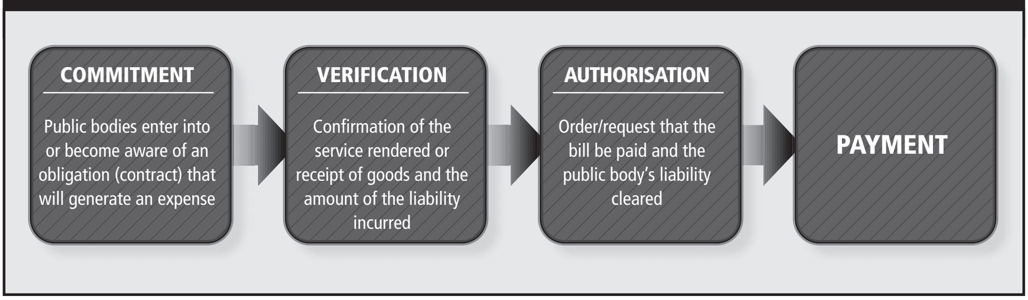
SECTION 1 PUBLIC EDUCATION EXPENDITURE

1.1 GOVERNMENT SPENDING

Public education expenditure can come from different sources. In some countries, various ministries are in charge of education services, by level (one is in charge of basic education for instance, another of secondary and a third of higher education) or by type (general education, higher education and TVET for instance). Some education or training programmes can be organised or financed by ministries responsible for specific areas (the ministries of health, agriculture, justice, or employment for instance). Furthermore, in decentralised contexts, some local institutions can be in charge of multisectoral budgets, of which a share may be allocated to the education sector. The aim of this section is thus to consolidate all public expenditure for education and training activities, independently of individual national arrangements, aiming to be exhaustive and to avoid duplication of accounts.

Also, despite the availability of official documents (finance laws, budgets), it is important in such an analysis to determine as precisely as possible what has effectively been spent. Finance laws or budgets indicate spending intent, and not effective spending. This may be lower due to governments' spending capacities or due to issues related to the collection of funds (taxes, duties and so on).[18] Effective spending can also be intentionally reduced with respect to the initial budget, when this is greater than expected, in which case a budget revision is generally voted. The analysis will therefore clearly distinguish between the voted budget and the executed budget, which accounts for what has effectively been spent and incorporates potential further expenditure associated with budget revisions. On the other hand, there is great tension in this exercise between the search for precision and the will to use the most recent data, as executed budget data is often only available for relatively old

FIGURE 3.2 - The Stages of Public Expenditure



periods (two or even three years back). To use committed expenditure data is a good compromise in such cases.

This analysis will examine, in addition to the level of education expenditure, some key indicators that reflect the importance of this expenditure in the national context. It will focus on two indicators in particular:[19]

- *Public recurrent education expenditure as a share of public recurrent expenditure, excluding debt service.* This indicator reflects the priority that is effectively given to education by governments within the expenditure over which it has control (for this reason debt service is excluded, being "compulsory"). This is often considered an indicator of effort towards the education sector; Box 3.1 presents the elements to keep in mind while calculating it.

- *Public recurrent education expenditure as a share of GDP.* This indicator places education expenditure in the context of national wealth. It is the share of national wealth spent by governments on education. This indicator can also be presented as education expenditure per capita as a share of GDP per capita, placing education expenditure in relation to the size of population and average income.

Key Definitions

Recurrent Education Expenditure as a Share of Public Recurrent Expenditure Excluding Debt Service is the relation of all recurrent education expenditure financed with national resources to total recurrent public expenditure excluding the service of debt:

$$\frac{\textit{Recurrent Public Education Expenditure}}{\textit{Recurrent Public Expenditure, Excluding Debt Service}}$$

Recurrent Education Expenditure as a Share of GDP is the ratio of total recurrent education expenditure to gross domestic product:

$$\frac{\textit{Recurrent Public Education Expenditure}}{\textit{Gross Domestic Product}}$$

Recurrent education expenditure may also be examined as a percentage of governments' domestic resources for instance, or total national education expenditure as a share of GDP.

All of these indicators have the advantage of being comparable in both temporal and international perspectives. Their evolution over recent years may therefore be examined, before comparing them to those of other countries in the region, or sharing similar development levels.

BOX 3.1
THE FINANCIAL EFFORT FOR EDUCATION

The financial effort made by countries for the funding of their education is often used by development partners to determine their own level of financial commitment. This financial effort is generally measured by the share of the education budget in the total national budget. It is thus important to properly define both numerator and denominator, in order not to distort this representation of the national effort.

- The budgets considered in the calculation are recurrent budgets. Investment budgets are often more volatile, which would create artificially great variations in the indicator value. They are also more often financed from development partners' programs, which don't represent the national effort.

- External funding should be excluded from both numerator and denominator, because they do not result from national decisions and effort. In practice, the denominator is thus the expenditures made from domestic resources, and does not includes external resources (grants and loans); all education projects and sector budget support financed by development partners will also be excluded from the numerator, the only exception is general budget support, for which it is difficult to dissociate the funds from domestic resources at the sector level. One may thus keep general budget support both in the recurrent education expenditures and in the domestic resources.

- As mentioned above, debt service is excluded from the domestic resources. Servicing public debt is mandatory for indebted developing countries, and the amount of resources that the state has decision power over is what is left when this service is paid.

The indicator is thus calculated as follows:

$$\textit{National Financial Effort for Education} = \frac{\textit{Recurrent Education Expenditures financed from domestic resources}}{\textit{Total Recurrent Expenditure financed from domestic resources, excluding debt service}}$$

Example 3.1 below, drawn from The Gambia CSR, 2011, presents the volume of education expenditure, both recurrent and capital, in a summary table, as well as recurrent education expenditure as a share of total recurrent expenditure, of national income and of GDP (See Section 1.4 for an analysis of international aid).[20] This example also presents the country's situation in the context of ECOWAS and the continent.

EXAMPLE 3.1

(Breakdown of Public Education Expenditure by Type and Source): Public Education Expenditure, The Gambia, 2001-09

Source: Adapted from The Gambia CSR, 2011.

The government assumes the majority of recurrent education expenditure, and donor contributions are devoted largely to development (capital) expenditure. For analytical purposes, spending on government scholarships to support girls' schooling in upper basic and senior secondary schools, generally included in development expenditure, has been considered within recurrent expenditure.

TABLE 3.1 - Breakdown of Education Financing, by Type and Source, The Gambia, 2001-09

	2001	2007	2008	2009
Level of Education Funding (Millions of Dalasis)				
Recurrent (Government spending)	142.5	341.2	426.8	479.7
Development (Capital)	84.2	249.8	416.9	416.3
Government Financing	5.7	14.7	29.9	69.3
Donor Financing	78.4	235.1	387.1	347.0
Total National Education Expenditure	148.2	355.9	456.7	549.0
Total	226.7	591.0	843.7	896.6
Recurrent Education Expenditure (Percent)				
As a Share of Total Government Recurrent Expenditure*	16.7	19.2	17.2	17.8
As a Share of Domestic Revenue (Excluding Grants)	14.4	9.8	12.2	12.0
As a Share of GDP	0.9	1.6	1.9	1.8
Donor Financing as a Share of the Total Education Budget	34.6	39.8	45.9	38.7
Total Government Expenditure as a Share of GDP	0.9	1.7	2.0	2.1

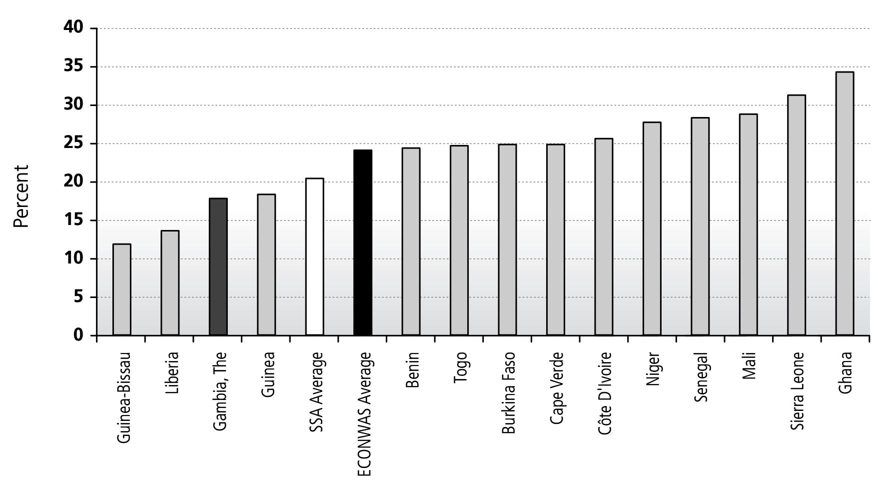
Note: * Government recurrent expenditure excludes the service of debt.

Findings

Total national education expenditure increased from 0.9 percent of GDP in 2001 to 2.1 percent of GDP in 2009. Recurrent education expenditure represents an average of 18 percent of recurrent government expenditure, excluding debt service. Most of public education expenditure has been devoted to recurrent costs, with negligible amounts being spent on investment. However, government capital spending has risen from 4 percent [=5.7/(5.7+142.5)] of total public expenditure in 2001 to 13 percent [=69.3/(69.3+479.7)] in 2009.

Figure 3.3 shows that in spending 17.8 of total recurrent expenditure excluding debt service on education in 2009, The Gambia ranks well below its neighbours in the ECOWAS sub-region; this percentage is only higher than those of post-conflict Guinea-Bissau and Liberia (See Figure 3.3), and is below the FTI benchmark of 20 percent. With a sub-regional average of 24 percent, there is scope for The Gambia to increase the priority given to education in public spending.

FIGURE 3.3 - Education Share of Public Recurrent Expenditure, The Gambia and ECOWAS Countries, 2009 or MRY



1.2 EVOLUTION OF PUBLIC EXPENDITURE BY TYPE OF SPENDING

The objective of this section is to analyse the distribution of education expenditure by type of spending. According to the structure of the budget, some budget lines may have to be consolidated or separated. National budgets are generally composed of two types of expenditure: recurrent and capital (also known as development or investment). Within recurrent expenditure, the budget lines devoted to personnel, goods and services must be isolated from the budget lines devoted to subsidies and transfers. Scholarships and other welfare spending are generally included in the budget line for transfers. Some personnel expenditure (contract or community teachers paid by the government) may also be included within the budget line for transfers; it is important that they too be isolated.

To summarise, the accounting logic that prevails in budget elaboration often leads the spending items that the analyst seeks to identify to be combined with others. Only a very mindful read of the budget enables these distinctions to be made. As a first step of analysis, attempts should be made to categorize spending items as follows:

- *Wages and Salaries:* All spending on the salaries, bonuses and expenses of education civil servants, both teaching and non-teaching (administrative, maintenance, security personnel and so on) as well as payments by the government (possibly at the decentralised level) to to civil servants, contract/volunteer/ community teachers and other non-teaching

education personnel. The allowances and social benefits received by such staff are also included in this category, such as retirement funds, health insurance and so on;
- *Goods and Services:* All spending on goods, excluding capital spending, as well as service contracts, subcontracting or consultancy expenses (distribution of pedagogical materials, external audits and so on);
- *Subsidies and Transfers:* All fund transfers and subsidies to independent education agencies and institutions (training institutes, universities and so on) as well as school grants;
- *Scholarships and Other Welfare:* All school feeding, university restaurant and boarding expenses, as well as the amounts allocated to student scholarships both at home and abroad.

The categories obtained will thus often differ from those presented in the budget. It will be necessary to ensure that they are clearly defined (and calculated in the same way for each year covered by the analysis), and that the total effectively coincides with the total education expenditure identified in Section 1.1. Annex 3.3 provides the concrete methodology for the consolidation of financial data.

Example 3.2 below, drawn from the Benin CSR, 2009, illustrates how these spending categories and their evolution can be analysed. It offers a presentation of the amounts spent per category, each of which is then analysed in terms of their share of total expenditure. It is apparent that the authors were unfortunately not able to isolate the remuneration of local contract teachers, paid by parent-teacher associations. This remuneration is therefore included in the transfer category, which limits the analysis somewhat. On the other hand, this problem having been identified, the figures and their evolution can be analysed in this perspective.

EXAMPLE 3.2 **(Breakdown of Public Education Expenditure by Nature): Public Education Expenditure, Benin, 1992-2006**

Source: Translated and Adapted from the Benin CSR, 2009.

TABLE 3.2 - Structure of Public Education Expenditure, by Nature, Benin, 1992-2006

Share of Total (%)	**1992**	**2000**	**2003**	**2004**	**2005**	**2006**
Recurrent Expenditure	*96.9*	*85.0*	*81.3*	*84.4*	*90.1*	*90.5*
Personnel	78.3	51.5	45.1	48.8	52.9	54.2
Goods and Services	8.1	14.1	13.7	11.6	9.7	9.7
Transfers	10.5	17.7	19.1	21.2	24.8	25.1
Equipment	0.0	1.7	3.4	2.7	2.7	1.5
Capital Expenditure	*3.1*	*15.0*	*18.7*	*15.6*	*9.9*	*9.5*
National	1.2	5.6	13.1	7.4	5.4	3.7
International	1.9	9.4	5.6	8.3	4.5	5.8
Total	100	100	100	100	100	100

Note: * Not including the (minimal) expenditure of the literacy subsector.

Findings

Table 3.2 illustrates the extreme predominance of recurrent expenditure in total expenditure, as is the case in most education systems, with a share between 80 and 97 percent for the 1992 to 2006 period. The share of recurrent expenditure dropped in the 1990s before increasing from 2001 onwards. This increase is generally at the expense of capital expenditure, whose share of total expenditure dropped considerably, from 15.0 percent in 2000 to 9.5 percent in 2006.

The data also reveals that the share of personnel spending has not significantly increased since 2000, having reached 54.2 percent in 2006 from a level of 51.5 percent in 2000, despite the important evolution noted in enrolment (mentioned in Chapter 2 of the CSR). This finding does not reflect the reality however, given that the salaries of local contract teaching staff for preschool, primary, general secondary and technical and vocational secondary, recruited in part to respond to the expansion of the system, are paid on public resources transferred to parent-teacher associations (PTAs). In the past they had taken the initiative to recruit this type of teacher on their own resources. These resources, made available to PTAs and included in the transfer category, are the source of strong growth in the share of transfers since 2000, and the real cause of the structural change of the budget.

Finally, although the reduction of the share of spending devoted to socio-administrative equipment is less significant (1.5 percent in 2006 against 1.7 percent in 2000), the reduction of the share of spending devoted to goods and services (used in part for the purchase of pedagogical material) is notable, given that it was below 10 percent in 2005, against 14 percent in 2000.

In terms of capital spending, the share of investment spending supported by external funds (i.e. international) has evolved erratically: from 9.4 percent in 2000, it first dropped to 5.6 percent in 2003 before rising to 8.3 percent in 2004 and dropping anew to 5.8 percent in 2006. The evolution of the share of capital spending supported by national funds has not been quite as irregular. An increase from 5.6 percent in 2000 to 13.1 percent in 2003 was nevertheless followed by a drop, to reach 3.7 percent in 2006.

1.3 THE DISTRIBUTION OF SPENDING ACROSS SUB-SECTORS

Executed or committed budgets should be used here to distribute spending among the different education cycles according to their purpose (for instance, transfer spending to give primary community teachers a bonus should be accounted for as primary spending). In practice, this allocation is not always easy: for instance, budgets often consolidate primary and secondary administrative spending (or general secondary and technical training spending). Some spending items also cover different education levels by their very nature, such as the operational expenses of the planning or human resource departments of the education ministry, that provide services to all cycles covered by the ministry. Estimations are then carried out to distribute these common expenses among levels.[21] A breakdown formula must thus be determined. Usually, the distribution is carried out according to the pro rata of the payroll of active teachers or that of all school personnel, or in their absence, according to the pro rata of spending specifically pertaining to each level. This method is described in Annex 3.3.

The structure of the distribution of spending among different education levels provides an idea of the priority that governments give to each and enables the identification of potential desirable adjustments in the priorities, in particular as compared to the policy priorities intended.

In this analysis of the national situation, and of the distribution of expenditures across the locally defined cycles, it can also be helpful to compare the distribution of expenditure by level for the country of analysis with that of countries with similar contexts. However, as the length of the cycles is different in some countries, two approaches can be used to avoid comparative bias. The first compares the country of interest with others sharing the same education system structure (most francophone countries have a 6-4-3 structure for instance: six years of primary, four years of lower secondary and three years of upper secondary). The second is to erase the difference that may exist among countries in the duration of their education cycles by artificially harmonizing those durations through preliminary adjustments (See Annex 3.1).

Example 3.3, drawn from the Mali CSR, 2010, presents the distribution of public education expenditure by level and its evolution over recent years, before placing it in a regional context, in comparison with countries whose education system structures are similar.

1.4 DETAILED ANALYSIS OF PUBLIC RECURRENT EXPENDITURE FOR THE MOST RECENT YEAR

The aim of this section is to carry out a more detailed analysis of the data used in the previous section, for the most recent year for which data is available. This analysis will aim to provide additional information on the functional distribution of expenditure, distinguishing between different spending items (teaching and support personnel, pedagogical and service spending, scholarships and other welfare) for each level as well as between the various cost-centers responsible for their execution (schools, central and decentralised services, subsidised private schools and so on). This involves a fairly detailed analysis, whose coherence must be carefully checked. Experience shows that it is helpful to begin with a clear description of the distribution of the actively employed personnel, to then reconstitute the distribution between personnel expenditure and other non-salary spending, and that a preliminary cleaning and consolidation of the personnel data is often necessary.

EXAMPLE 3.3

(Distribution of Public Education Expenditure in Regional Context): Public Education Expenditure by Level, Mali, 2008

Source: Adapted from the Mali CSR, 2010 and the Mali CSR, 2007

Findings

The distribution of public education resources across sub-sectors has significantly evolved over the last 14 years, although somewhat erratically. The share of recurrent expenditure allocated to primary education grew from 27.4 percent in 1995 to 35.0 percent in 2004 and 36.5 percent in 2008. This however remains significantly below the 50 percent observed in many other countries (which is also the Global Partnership for Education benchmark). Other data (not shown in the table) shows that the share of expenditure devoted to lower secondary in 2008 (16.7 percent) is below that observed in 2004 (17.8 percent). On the other hand, the share allocated to upper secondary education has decreased from 16.4 percent in 2004 to 12.9 percent in 2008, and that of technical and vocational education has remained grossly stable, at 9.3 percent in 2004 and 9.9 percent in 2008. The reduction in the share allocated to upper secondary between 2004 and 2008, although benefitting primary education, has equally benefitted higher education, whose share grew from 16.3 percent in 2004 to 17.6 percent in 2008.

TABLE 3.3 - International Comparison of the Structure of Recurrent Education Expenditure, by Level (Francophone Countries of Sub-Saharan Africa)

Country	Year	Primary	General and Technical Secondary	Higher	Other (Pre-primary, Literacy, etc.)
Mali	(1995)	27.4	45.6	23.1	3.9
Mali	(2004)	35.0	43.5	16.3	5.2
Mali	**(2008)**	**36.5**	**39.5**	**17.6**	**6.5**
Benin	(2006)	53.6	23.5	19.7	3.2
Burkina Faso	(2006)	56.4	17.2	22.2	4.2
Burundi	(2004)	47.0	29.9	20.0	3.1
Congo	(2005)	25.8	39.0	29.8	5.4
Côte d'Ivoire	(2007)	42.7	34.6	20.9	1.8
Guinea	(2005)	37.5	30.8	26.4	5.3
Guinea Bissau	(2006)	56.7	26.9	11.1	5.3
Niger	(2008)	57.3	26.3	13.1	3.3
CAR	(2005)	49.0	25.0	21.0	5.0
Senegal	(2004)	43.9	27.7	27.8	0.6
Togo	(2007)	38.8	39.7	20.3	1.2
Average of 11 Countries		**46.2**	**29.1**	**21.1**	**3.5**

1.4.1 CONSOLIDATION OF THE PERSONNEL DATA

The analysis should begin with an inventory of the personnel. This is justified on the one hand by the importance of salary spending (usually at least two-thirds of the education budget) and on the other by the need to clean up and consolidate the data. Indeed, some staff may be paid on the education budget despite not performing any education system duties (staff that perform other roles or are transferred to other ministries, and ghost teachers/staff), or conversely, some staff may work in education while being paid on other ministries' budgets (sports trainers that are paid by the ministry of youth and sports, art teachers that are paid by the ministry of culture and so on). The analysis will be focused on those personnel paid by the state (or, if relevant, by decentralised public institutions). However, by the same logic, if some personnel paid by the state are posted in public or community school, they should be included in this analysis.

This process is carried out by comparing various data sources, including: (i) school statistics (school staff censuses); (ii) data from the human resource department of the education ministries (databases covering all personnel employed in the sector; in some countries, this may be limited to staff working in central and decentralised services); and (iii) finance ministry payroll data, or in some countries, that of the ministry of civil service.

The reconciliation of figures from different sources often represents an arduous but necessary task, as it is an indispensable basis for further analysis as well as for the estimation and definition of parameters of the financial simulation model for the sector's planning process. Once the personnel inventory is complete, it is important to reconcile the numbers with the related financial amounts. This must be carried out based on information on the distribution of personnel by qualification type and salary on the one hand, and information on average salary levels for each category on the other. It eventually enables the consolidation of the entire payroll for the sector. Annex 3.3 details the important steps for the consolidation of these data and the reconstitution of the payroll.

When the gaps between different data sources are significant, it is sometimes helpful to present the data obtained from each source, and the corrections and adjustments done.

1.4.2 DESCRIPTION OF EDUCATION PERSONNEL AND RELATED SALARY EXPENDITURE, BY LEVEL AND ROLE

Once the personnel data are consolidated, these personnel numbers and associated budgets can be presented. To that end, staff must be classified according to their job and not their status. It is common that teaching staff carry out administrative duties, in which case they should be treated as non-teaching staff for the purpose of the analysis. Personnel must therefore be broken down into those effectively responsible for teaching activities on one hand (in-class teachers also called "chalk in hand" teachers), and those who carry out administrative or support duties on the other. Distinction should be made by type of institution (schools, central or decentralised administrative services) and level.

Example 3.4 below, drawn from the Congo CSR, 2010, illustrates the kind of table that can be produced once the personnel numbers from various sources have been consolidated. This example also shows the relative importance of the respective payroll burdens, and presents the share of non-teaching staff in a regional perspective.

EXAMPLE 3.4

(Analysis of Personnel Expenditure): Public Education Personnel Expenditure, Congo, 2009

Source: Adapted and Translated from Congo CSR, 2010.

Table 3.4 presents the data for active staff working for the three education ministries. It incorporates the cost of personnel paid for on transfer budget lines such as volunteers or the personnel of the Marien Ngouabi University. The distinction between "chalk in hand" teachers and non-teaching staff is obtained by crossing function and posting information.

TABLE 3.4 - Education Sector Personnel and Related Salary Expenditure (Payroll in Millions of CFAF), Congo, 2009

	"Chalk in hand" Teachers	Non-Teaching Staff		Total	Payroll (in Millions of CFAF)			
		Schools	Services		Teachers	Other (Schools)	Other (Services)	Total
Preschool	243	298	435	976	254	348	588	1,191
Primary	*4,030*	*1,417*	*3,229*	*8,676*	*4,682*	*1,871*	*4,260*	*10,813*
Civil Servants and Contracted	3,211	1,374	3,193	7,778	4,199	1,845	4,237	10,281
Volunteers	819	43	36	898	484	25	23	532
Lower Secondary	*1,732*	*1,183*	*1,293*	*4,208*	*2,595*	*1,755*	*1,868*	*6,218*
Civil Servants and Contracted	1,463	1,158	1,268	3,889	2,357	1,733	1,845	5,935
Volunteers	269	25	25	319	238	22	23	283
Upper Secondary	*1,364*	*837*	*872*	*3,073*	*2,373*	*1,334*	*1,227*	*4,935*
Civil Servants and Contracted	1,164	821	864	2,849	2,161	1,317	1,219	4,697
Volunteers	200	16	8	224	213	17	8	238
Technical Education	*1,546*	*791*	*568*	*2,904*	*1,840*	*835*	*1,219*	*3,894*
Civil Servants and Contracted	879	791	568	2,237	1,425	835	1,219	3,479
Volunteers	667			667	415			415
Vocational Training Institutes	*174*	*147*	*82*	*404*	*252*	*135*	*177*	*564*
Civil Servants and Contracted	139	147	82	369	231	135	177	542
Volunteers	35			35	22	0		22
Teacher Training Colleges	100	47	52	199	156	88	111	355
Higher Education	600	536	105	1,241	6,358	3,359	187	9,904
TOTAL	**9,789**	**5,256**	**6,636**	**21,681**	**18,511**	**9,725**	**9,638**	**37,873**

Findings

Of the 15,045 staff working in Congolese government schools, 34.9 percent [5,256 / (9,789 + 5,256)] are employed in non-teaching posts. The share of non-teaching staff in the entire education system is significant (54.8 percent); 5,256 members of staff work in schools and 6,636 in support services. These figures vary from one education level to another. The share of non-teaching staff in schools is greatest for the preschool level (55 percent). It remains high for primary (26 percent), and especially for secondary (40.6 percent for lower secondary and 38.0 percent for upper secondary). When considering all the education system's personnel, the share of non-teaching staff reaches 53.5 percent at the primary level, 58.8 percent in lower secondary, and 55.6 percent in upper secondary. It is greatest at the preschool level, at 75 percent.

1.4.3 NON-SALARY EXPENDITURE AND THE CONSOLIDATION OF SPENDING BY LEVEL

Non-salary expenditure is examined in this section, and will be broken down as far as is practical to do so. Spending items such as pedagogical materials, textbooks, operational costs, scholarships and other welfare and so on should be differentiated. These items should then be consolidated with the salary expenditure reviewed in the previous subsection, to ensure that the total effectively amounts to the total recurrent education budget.

This consolidation will then be distributed among education levels, assigning the appropriate share of non-targeted administrative expenses to each. Coefficients will be used for this breakdown when spending cannot be assigned to a single level, usually the same as those used for the salaries related to services provided to multiple levels (See Annex 3.3). The structure of recurrent expenditure by education level will then be established, as per Example 3.5 below, distinguishing between its different components (teaching staff, non-teaching school staff, operational costs, administrative costs and scholarships and other welfare).

EXAMPLE 3.5

(Analysis of Non-Salary Expenditure): Public Expenditure by Function and Level, Benin, 2006

Source: Adapted and Translated from the Benin CSR, 2009.

TABLE 3.5 - Distribution of Public Recurrent Education Expenditure, by Function, Benin, 2006

	Percent	Literacy	Pre-school	Pri-mary	Teacher Training	General Secondary		TVET		Higher	All
						Lower	Upper	Level 1	Level 2		
MAIN	Government Teachers	—	61.7	52.9	46.4	27.9	41.0	14.6	19.4	19.3	**40.7**
	Community/temporary Teachers	—	3.9	5.6	—	25.5	18.3	3.2	3.1	—	**7.5**
	University Research	—	—	—	—	—	—	—	—	2.6	**0.5**
	Subtotal	**0.0**	**65.6**	**58.5**	**46.4**	**53.4**	**59.3**	**17.8**	**22.5**	**21.9**	**48.7**
AUX.	School Management	—	—	—	0.0	17.4	9.5	6.7	3.6	3.3	**3.6**
	School Operational Costs	2.9	7.4	9.6	26.0	4.3	4.3	6.6	3.4	10.9	**8.8**
	Subtotal	**2.9**	**7.4**	**9.6**	**26.0**	**21.7**	**13.9**	**13.4**	**7.0**	**14.2**	**12.4**
GENERAL	Sector Administration (Central/Decentralised Service Personnel)	62.0	14.6	16.5	14.8	13.8	15.4	31.4	31.4	8.3	**15.3**
	Central/Decentralised Services' Operational Costs *	35.1	12.4	15.4	12.9	11.0	11.3	31.1	32.8	10.4	**13.3**
	National Scholarships, School Grants and University Works	—	—	—	—	—	—	5.2	4.9	38.5	**7.8**
	Scholarships abroad and Contributions to International Schools	—	—	—	—	—	—	—	—	6.7	**1.3**
	Subtotal	**97.1**	**27.0**	**31.9**	**27.6**	**24.9**	**26.8**	**68.8**	**70.5**	**63.9**	**38.9**
	TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: * Includes 7.9 percent for deconcentrated services, or 1.1 percent of recurrent education expenditure.

Three categories of spending are considered here: Main, Auxiliary and General. Main spending includes teaching staff expenditure, university research subsidies, and subsidies for the payment of temporary and local contract teachers. Auxiliary spending includes administrative staff expenditure, services, and pedagogical materials spending at the school level. In addition to this expenditure carried out directly by schools, the education sector incurs General expenses, which relate to the management and administration of the sector, both at the central level (ministries) and at the regional administration level. Student grants constitute a further item of General expenditure. Table 3.5 describes the functional distribution of these expenditure items according to this classification.

Findings

For the education system overall, close to half recurrent expenditure is devoted to its Main function (49 percent), 12 percent is devoted to Auxiliary spending and 39 percent to General expenses. The share devoted to the Main function is less today than it was at the end of the 1990s: for the primary cycle it has dropped from 73 percent (data not shown in the table) to 59 percent of recurrent expenditure; for general secondary from 86 percent (data not shown in the table) to 56 percent, and for higher education from 29 percent (data not shown in the table) to 22 percent. This relative drop has been more significant for the primary and secondary cycles.

This could be explained by the financial constraints that obliged the state to rely on teacher categories that are paid less than permanent government teachers (contract teachers) or those partially paid by the government (temporary and local contract teachers), to ensure that education is effective. The share devoted to inputs other than teacher salaries has thus increased, which suggests an evolution towards an improvement of the material conditions of study offered to students, as well as of the system's management. However, it is possible that the resources allocated to Main expenditure items are still low, given the supervision offered to students and/or the remuneration offered to teachers in light of the heterogeneity of their status.

Generally speaking, the average share of recurrent expenditure devoted to inputs other than teacher salaries is 52 percent [=100-(40.7+7.5)], although this varies from one level to another, from 34 percent [=100-(61.7+3.9)] for preschool to over 70 percent for TVET and higher education. It is difficult to make a normative judgment of these scales; international comparative data may help to appreciate the allocation. They show that the share of expenditure devoted to inputs other than teacher salaries is comparatively higher in Benin for the primary level, lower secondary and TVET. For primary in particular, the Fast Track Initiative benchmark of 33 percent is significantly surpassed (42 percent [=100-(52.9+5.6)]).

Expenditure other than teacher salaries is in fact mainly composed of General expenditures (over 75 percent, based on calculation using data of the table). General administration and operational expenditures (of central and decentralised services) each account for approximately 15 percent of recurrent education expenditure, although the share devoted to the operational costs of decentralised services is weak, despite such spending being helpful for inspections and the decentralised management of the system. The share of expenditure devoted to the operational costs of central services therefore appears to be considerably higher than that devoted to the operation of schools (13 percent on average for central services, against 9 percent for schools, or a ratio of 1.4 to 1). This situation is more apparent for TVET (recurrent and operational expenditure of central services are 7 times higher than those of schools) and the literacy subsector (12 times higher).

1.5 EXTERNAL FUNDING

The contribution of development partners to education is limited to the financing of investment expenditure in many countries, even if it is also used to fund recurrent expenditure in some cases.[22] Previously, data on international aid was widely dispersed, when this was provided through numerous projects. The evolution of aid disbursement arrangements, and the development of sector program support in particular (budget support that is more or less ear-marked for certain ministries or spending items), has increasingly led to amounts allocated appearing in beneficiary ministries' budgets. This facilitates their identification, but it is not systematic that national budgets provide full traceability of all activities financed by international aid. In this situation, a quick census of development partners enables the collection of information on the activities financed by level, the amounts committed and those effectively disbursed.

Furthermore, when a country receives global budget support, external resources are fungible with national resources and it becomes impossible to precisely determine the share of this funding that is allocated to the education sector. In this case, a commonly used proxy is that the same share of external support is devoted to education as that of the national resources. The figures offered in subsection 1.1 of this chapter would then be used. For instance, if 20 percent of the budget is allocated to education, it is estimated as a proxy that 20 percent of external budget support is also allocated to the sector.

Firstly the analysis will present the total amount of external funding received by the country for its education sector, and its importance in relation to national funding. Secondly, it will be worthwhile comparing the average value of the aid for education received by the country over recent years as a share of GDP with that received by other countries in the region, or those with similar levels of economic and education sector development, to estimate the degree of dependency of the sector on external funding and its degree of sustainability.

1.5.1 A NATIONAL PERSPECTIVE

At the national level, the analysis may focus on the total volume of aid, the diversity of donors and the type of expenditure and activities supported by development partners, as per Example 3.6 below, drawn from the Malawi CSR, 2010. It may also comment on the quality of data, their source, coherence and the reliability of the collection approach. To assist this collection process, a questionnaire model to be shared with development partners is offered in Annex 3.2.

EXAMPLE 3.6

(Analysis of External Aid - National): Donor Financing for the Education Sector, Malawi, 2005/06-2007/08

Source: Adapted from the Malawi CSR, 2010.

In order to get information on donor activities in the education sector, the analysis used data from a survey conducted by DFID.

TABLE 3.6 - Donor Financing and Extra-Budgetary Grants to Education

Millions de MK	Objective of Assistance	Committed 05/06	Disbursed 05/06	Committed 06/07	Disbursed 06/07	Committed 07/08
General	General	3,973	1,650	2,619	2,224	2,113
	TA and Other	396	243	387	270	460
Primary	Construction	608	599	916	739	1,618
	Curriculum and books	1,343	931	2,346	1,557	1,346
	PRESET	1,092	409	616	510	792
	School Feeding	1,335	1,261	1,428	1,406	1,685
Secondary	PRESET	40	40	33	30	290
Higher	Universities	30	30,45	—	—	—
TOTAL		**8,818**	**5,163**	**8,346**	**6,737**	**8,303**

Findings

Donor contributions play a critical role in the development budget of the government. Based on calculations using data from the table, on average, their contribution amounts to 86 percent of the total development budget. Over 60 percent of donor support to education goes towards construction in primary education. In both 2005/06 and 2006/07 about 63 percent was committed to the construction of primary schools (66 percent in 2007/08). The commitment towards secondary education is very low, even if it has increased from 1 percent of total donor financing in 2005/06 to 3 percent in 2007/08. This increase is due to the current African Development Bank project, which has focused on improvements in secondary education. Universities have received very little official development assistance in the recent past (1 percent in 2005/06 and none in 2006/07 and 2007/08).

1.5.2 AN INTERNATIONAL PERSPECTIVE

For the international comparison, OECD/DAC data should be used. The comparison may focus on the level of external funding for the education sector, either as a percentage of public education expenditure, or as a share of GDP. Example 3.7, drawn from the Mauritania CSR, 2010, presents an international comparison of external education funding.

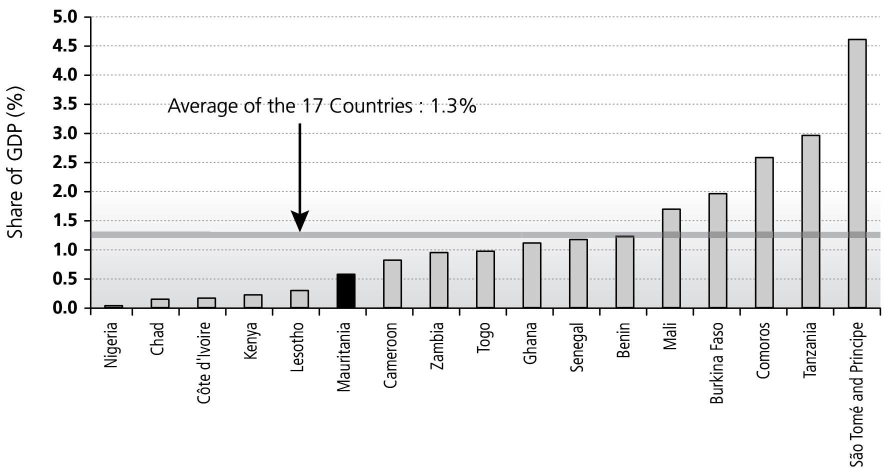
EXAMPLE 3.7

(Analysis of External Aid - International): International Comparison of External Funding of Education Systems, 2008 or MRY

Source: Adapted and Translated from the Mauritania CSR, 2010.

Figure 3.4 shows how Mauritania compares to other African countries of similar income levels, in terms of external aid.

FIGURE 3.4 - Comparison of the Contribution of External Funding to Education Expenditure, for Countries with GDP per Capita between US$500 and US$1,500, 2008 or MRY



Findings

In 2008, external funding represented 13.5 percent of total education sector expenditure and 0.6 percent of GDP in Mauritania, against 22.7 percent of total expenditure and 0.9 percent of GDP in 1995 (based on data not displayed in the figure). Mauritania's dependency on international aid for the education sector therefore appears to be relatively weak.

External funding's contribution to education expenditure varies between 0.03 percent of GDP (Nigeria) to 4.6 percent of GDP (São Tomé and Príncipe) for comparable countries. For Mauritania, external funding's contribution to education expenditure represented 0.6 percent of GDP in 2008, considerably below the average of African countries whose GDP per capita is between US$ 500 and US$ 1,500 (1.3 percent of GDP).

SECTION 2 PUBLIC EDUCATION RECURRENT UNIT COSTS

The information on total expenditure does not enable an understanding or assessment of education policy in as much as it is not related to the number of pupils the system caters for. To step from total expenditure to per student spending (unit costs) will thus enable a more detailed analysis of the structure of spending among education levels, but also for each level through the review of the distribution of spending among the various factors of recurrent unit costs.

2.1 MACRO ESTIMATION OF PUBLIC RECURRENT EXPENDITURE PER PUPIL

On the basis of aggregate expenditure by level and the number of pupils enrolled, unit costs (spending per student per year) can be computed. The types of spending considered here are those related to recurrent costs (teaching and non-teaching staff, pedagogical materials, administration, scholarships and other welfare and so on).

Unit cost UC_i for a given level $_i$ is obtained by dividing total recurrent expenditure RE_i for the level by the number of pupils enrolled at that level NP_i:

$$UC_i = \frac{RE_i}{NP_i}$$

It is most common to compute unit costs for government education, by dividing public recurrent expenditure for a given level by the number of pupils enrolled in government schools at that level. As much as possible, as this analysis focuses on the cost of public education, the possible subsidies to private or community schools, as well as the cost of publicly paid personnel posted in these schools, should be excluded from the public expenditures for the purpose of this analysis.

2.1.1 A NATIONAL PERSPECTIVE

A national perspective of unit costs will calculate unit costs by level and type of school, comparing unit costs for different levels. Example 3.8, drawn from the Côte d'Ivoire CSR, 2010, analyses the variation of public unit costs among different cycles.

EXAMPLE 3.8

(Analysis of Unit Costs by Cycle): Unit Costs and their Relative Value, by Level, Côte d'Ivoire, 2007

Source: Adapted and Translated from the Côte d'Ivoire CSR, 2010.

To facilitate the comparison, unit costs are indicated not only as monetary values, but also as a share of GDP per capita, and as multiples of the primary education unit cost. In using the unit cost for primary, where enrolment is highest, it is possible to highlight the level of disparities that exist in unit costs among levels and fields of study.

TABLE 3.7 - Public Unit Costs, by Level and Field of Study, Côte d'Ivoire, 2007

	Thousands of CFAF	% of GDP per Capita	Multiple of Primary education UC
Preschool	242	51	2.8
Primary	86	18	1.0
General Secondary	191	41	2.2
Lower	148	31	1.7
Upper	339	72	3.9
TVET	1,254	267	14.6
Classic Technical Education	2,428	517	28.2
1st Cycle	1,933	412	22.5
2nd Cycle	2,815	600	32.7
Modern Apprenticeships	1,699	362	19.8
Traditional Apprenticeships	425*	90	4.9
Higher Education at Home	786	168	9.1
University	607	129	7.1
Law and Economics	308	66	3.6
Arts and Humanities	331	71	3.8
Sciences	825	176	9.6
Medicine	2,741	584	31.9
Non-University ("*Grandes Ecoles*")	2,969	633	34.5
Training for Industry	5,530	1,178	64.3
Training for Services	3,613	770	42.0
Teacher Training	1,667	355	19.4
Higher Education Abroad	7,447	1,586	86.6

Note : * In the current context, this type of education does not absorb public resources; the figure provided here is an estimation of what an improved approach might cost with the support of public funding.

Findings

The data in Table 3.7 shows that public unit costs tend to increase with each successive education level and that they vary within each level according to the field of study or approach to training. Unit costs are CFAF 86,000 for primary, CFAF 191,000 for secondary (CFAF 148,000 for lower secondary and CFAF 339,000 for upper secondary), CFAF 1,254,000 for TVET and CFAF 786,000 for higher education.

Within TVET, the variety of fields of study is matched by diverse unit costs. In the Côte d'Ivoire context, these courses enlist fairly reduced numbers, hence explaining the high unit costs. It will *be difficult to anticipate any great expansion of such courses at such unit cost levels. On the other hand, apprenticeships are less expensive, in particular traditional apprenticeships that provide training opportunities to many youth. This last training option is likely to be improved to introduce modern technical elements that are currently lacking, at reasonable cost (See the table note).*

In terms of higher education, academic training offered by universities costs approximately five times less than vocational training offered in non-university institutions ("Grandes Ecoles"*). In Universities, education in arts, humanities, and social sciences is provided at at public unit cost that is similar to that of upper secondary. If the amounts spent on scholarships and on other social spending were deducted from this unit cost, the pedagogical unit cost would in fact be even lower on average than that of upper secondary. Furthermore, a student of medicine costs nine times more on average than a student of law or economics.*

Training for jobs in industry tends to cost significantly more than training for jobs in the tertiary sector (services). Finally, the annual cost of training an Ivorian student abroad is equivalent to just over twice the cost of training a student in a "Grande Ecole" *training for services, the cost of training 12 students in a national government university, or the cost of enrolling 87 pupils in primary government schools.*

2.1.2 A COMPARATIVE HISTORICAL PERSPECTIVE

A further option, as per Example 3.9 drawn from the Mauritania CSR, 2010, is to analyse the evolution of unit costs over recent years in both constant monetary terms and as a share of GDP per capita, which enables the evaluation of the sustainability of unit costs by measuring the burden of a year of education at a given level in reference to the average economic production of the country's inhabitants.

EXAMPLE 3.9 **(Historical Trends in Unit Costs): Evolution of Public Unit Costs by Level, Mauritania, 1998-2008**

Source: Adapted and Translated from the Mauritania CSR, 2010.

To carry out a direct estimation of education unit costs, the amount of public recurrent expenditure effectively disbursed for a given year and education level must be divided by the number of students enrolled at that level for the given year in public institutions. Table 3.8 shows the results by level for three years: 1998, 2004 and 2008. Unit costs are presented both in monetary terms (constant 2008 Ouguiyas) as well as in units of GDP per capita, for each of the three years considered.

Findings

Public recurrent expenditure per pupil enrolled in general education varies between UM 39,388 for basic education to UM 915,841 for the Ecole Normale Supérieure *(Secondary Education*

Teachers' training) in 2008. The historical perspective and the evolution of unit costs over the decade (1998-2008) shows that in real terms (constant 2008 Ouguiyas) unit costs increased for basic education (from UM 26,313 in 1998 to UM 39,388 in 2008) and both cycles of general secondary (from UM 94,511 on average in 1998 to UM 103,712 for the first cycle and UM 121,735 for the second in 2008). Unit costs dropped for technical education (from UM 299,300 in 1998 to UM 276,609 in 2008) and higher education (from UM 271,075 in 1998 to UM 238,917 in 2008). On the other hand, public unit costs for scholarship students abroad (including both grants and travel) increased considerably, from UM 500,700 in 1998 to UM 728,770 in 2008.

TABLE 3.8 - Evolution of Public Education Unit Costs, Mauritania, 1998-2008

<table>
<tr><th rowspan="2"></th><th>Number of Students</th><th colspan="3">Unit Costs (Constant 2008 Ouguiyas)</th><th colspan="3">Unit Costs (% of GDP per Capita)</th></tr>
<tr><th>2008</th><th>1998</th><th>2004</th><th>2008</th><th>1998</th><th>2004</th><th>2008</th></tr>
<tr><td>Preschool</td><td>2,948</td><td>—</td><td>—</td><td>51,764</td><td>—</td><td>—</td><td>18.1</td></tr>
<tr><td>Basic</td><td>427,804</td><td>26,313</td><td>28,828</td><td>39,388</td><td>11.4</td><td>11.3</td><td>13.7</td></tr>
<tr><td>Lower Secondary</td><td>51,984</td><td rowspan="2">94,511</td><td rowspan="2">92,534</td><td>103,712</td><td rowspan="2">40.9</td><td rowspan="2">36.2</td><td>36.2</td></tr>
<tr><td>Upper Secondary</td><td>22,914</td><td>121,735</td><td>42.5</td></tr>
<tr><td>Technical</td><td>3,983</td><td>299,300</td><td>334,297</td><td>276,609</td><td>129.0</td><td>131.0</td><td>96.5</td></tr>
<tr><td>Teacher Training</td><td>699</td><td rowspan="2">811,721</td><td rowspan="2">350,886</td><td>689,267</td><td rowspan="2">351.0</td><td rowspan="2">137.0</td><td>240.4</td></tr>
<tr><td>École Normale Supérieure</td><td>310</td><td>915,841</td><td>319.4</td></tr>
<tr><td>Higher (Home)</td><td>14,368</td><td>271,075</td><td>242,263</td><td>238,917</td><td>117.0</td><td>95.0</td><td>83.3</td></tr>
<tr><td>Higher (Abroad) *</td><td>2,303</td><td>500,700</td><td>383,951</td><td>728,770</td><td>217.0</td><td>150.0</td><td>254.2</td></tr>
</table>

Note: * Only scholarship students

2.1.3 AN INTERNATIONAL PERSPECTIVE

It is also interesting to put these unit costs in international perspective. Per student spending should be expressed as a percentage of GDP per capita. As in Example 3.10 drawn from the Burkina Faso CSR, 2010, not only the value of unit costs can be compared, but also their variation among education cycles.

EXAMPLE 3.10 **(Unit Costs in International Perspective): International Comparison of Unit Costs, 2006 or MRY**

Source: Adapted and Translated from the Burkina Faso CSR, 2010.

Table 3.9 enables the comparison of the structure of unit costs in Burkina Faso with that of a certain number of comparable countries.

Findings

From Table 3.9, compared to other countries, Burkina Faso's unit costs are particularly high for primary (51 percent higher than the average), for technical education (45 percent higher) and to a lesser extent for upper secondary (8 percent higher). The cost of lower secondary on the other hand appears to be particularly low compared to other countries, whose average is 26.1

TABLE 3.9 - International Comparison of Public Unit Costs by Level, 2006 or MRY					
Share of GDP per Capita	**Primary**	**Lower Secondary**	**Upper Secondary**	**TVET**	**Higher**
Burkina Faso - 2006	16.6	19.3	62.5	180.7	215.2
Burkina Faso - 1999	25.0	30.0	84.0	n.d.	550.0
Benin	13.1	10.9	31.9	120.7	133.5
Cameroon	7.1	31.6	37.1	61.0	83.0
Côte d'Ivoire	13.0	35.0	72.0	111.0	126.0
Guinea	8.7	13.4	15.7	121.0	220.0
Madagascar	11.0	26.7	64.4	83.0	190.0
Mali	11.1	26.5	117.1	202.6	192.9
Mauritania	12.0	39.6	33.8	188.0	120.0
Niger	20.0	49.0	157.0	n.d.	515.0
CAR	7.2	17.3	28.0	91.0	225.0
Senegal	10.7	14.7	70.3	95.0	257.0
Chad	7.0	26.8	35.8	192.1	412.1
Togo	11.0	22.0	34.1	104.0	215.0
Average of Comparable Countries	11.0	26.1	58.1	124.5	224.1
Burkina Faso / Average Ratio	1.51	0.74	1.08	1.45	0.96

percent of GDP per capita, or seven percentage points higher. Higher education is close to the average of comparable countries.

Another approach to the analysis of unit costs, without referring to national wealth, consists in comparing their structure and amount to those of primary education. This approach is adopted in Table 3.10, and consists in attributing the value of 1 to primary unit costs, and calculating the multiplier, relative to those primary unit costs, for each level. To obtain each multiplier, the unit cost for that level as per Table 3.9 (19.3 percent of GDP per capita for lower secondary in Burkina Faso in 2006, for instance) is divided by the unit cost for primary for the same year (16.6 percent of GDP per capita). Thus, 19.3 / 16.6 = 1.2. Lower secondary unit costs for Burkina Faso in 2006 are 1.2 times primary unit costs.

TABLE 3.10 - Structure of Unit Costs in Relation to Primary Unit Costs, Various African Countries, 2006 or MRY					
Multiplier	**Primary**	**Lower Sec.**	**Upper Sec.**	**TVET**	**Higher**
Burkina Faso	1	1.2	3.8	10.9	13.1
Benin	1	0.8	2.4	9.2	10.2
Cameroon	1	4.5	5.2	8.6	11.7
Côte d'Ivoire	1	2.7	5.5	8.5	9.7
Guinea	1	1.5	1.8	13.9	25.3
Madagascar	1	2.4	5.9	7.5	17.3
Mali	1	2.4	10.5	18.3	17.4
Mauritania	1	3.3	2.8	15.7	10.0
Niger	1	2.5	7.9	n.d.	25.8
CAR	1	2.4	3.9	12.6	31.3
Senegal	1	1.4	6.6	8.9	24.0
Chad	1	3.8	5.1	27.4	58.9
Togo	1	2.0	3.1	9.5	19.5
Average of Comparable Countries	1	2.38	5.29	11.33	20.39

Findings

It is apparent that differences in unit costs by level are slightly less significant in Burkina Faso than in other countries. Burkina Faso's upper secondary unit costs are 3.8 times primary unit costs (against 5.3 times on average) and unit costs for TVET are 10.9 times primary unit costs (against 11.3 times on average). The cost difference between primary and lower secondary is indeed considerably less in Burkina Faso than in the comparable countries (lower secondary per student costs are 1.2 times those of primary, against 2.4 times on average). This tends to confirm the relative weakness of lower secondary unit costs in Burkina Faso.

2.2 BREAKDOWN OF PUBLIC RECURRENT UNIT COSTS

Here the estimation of unit costs will be carried out on the basis of teaching conditions and average spending at the student level. These micro estimations of unit costs enable one to easily develop an analytical approach to the determinants of spending and to carry out straightforward simulations based on the anticipated future variations of these determinants.

2.2.1 FORMULA FOR THE BREAKDOWN OF UNIT COSTS

The breakdown of unit costs into its different components is based on the following formula (See Box 3.2). Unit costs are:

$$\frac{\text{Average Teacher Salary}}{\text{Pupil - Teacher Ratio}} + \frac{\text{Average Non - Teacher Salary}}{\text{Pupil - Non - Teaching Staff Ratio}} + \frac{\text{Operational Costs}}{\text{Enrolment}} + \frac{\text{Social Spending}}{\text{Enrolment}}$$

The components of unit costs for each level can be presented as an overview, as per Example 3.11 drawn from the Benin CSR, 2009, which enables a better understanding of their diversity.

BOX 3.2
BREAKDOWN OF RECURRENT UNIT COSTS

Total public recurrent expenditure *RE* for a given level is broken down between salary (*SE*) and non-salary (*NSE*) expenditure:
$RE = SE + NSE$

In turn, salary expenditure is composed of teaching salaries (RE_{TS}) and non-teaching salaries (RE_{NTS}), and non-salary expenditure is composed of operational costs (RE_{OC}) and social spending (RE_{SS}), so:
$RE = RE_{TS} + RE_{NTS} + RE_{OC} + RE_{SS}$

Furthermore, unit costs (*UC*) are the relation between total public recurrent expenditure (*RE*) and the number of pupils (N_P) enrolled in government schools (See Section 2.1). Unit costs are therefore the sum of these four expenditure types, by pupil:

$$UC = \frac{RE}{N_P} = \frac{RE_{TS}}{N_P} + \frac{RE_{NTS}}{N_P} + \frac{RE_{OC}}{N_P} + \frac{RE_{SS}}{N_P} = UC_{TS} + UC_{NTS} + UC_{OC} + UC_{SS}$$

Each of these unit costs can, in turn, be broken down into their respective components. If N_T and N_{NT} respectively designate the number of teaching and non-teaching staff for the chosen level and AS_T and AS_{NT} the average salaries for each:

$$UC_{TS} = \frac{N_T \text{ x } AS_T}{N_P} \text{ et } UN_{NTS} = \frac{N_{NT} \text{ x } AS_{NT}}{N_P}$$

Knowing that $\frac{N_T}{N_P} = \frac{1}{PTR}$, where the pupil to teacher ratio is $PTR = \frac{N_P}{N_T}$,

UC_{TS} can be estimated as the relationship between the average teaching salary AS_T and the *PTR*:

$$UC_{TS} = \frac{AS_T}{PTR}$$

Similarly, where PNTR is the pupil to non-teacher staff ratio:

$$UC_{NTS} = \frac{AS_{NT}}{PNTR}$$

Overall, the following global formula for unit costs is therefore reached:

$$UC = \frac{AS_T}{PTR} + \frac{AS_{NT}}{PNTR} + \frac{RE_{OC}}{N_P} + \frac{RE_{SS}}{N_P}$$

The first term of the formula can be refined by adding class size (*CS*), the weekly workload of pupils (in hours – H_P) and the weekly workload of teachers (H_T). In addition, the teacher replacement rate *RR* (the share of teachers needed to replace those absent due to illness, pregnancy and so on) can be added to the formula. Then the formula is adjusted as follows:

$$\frac{AS_T}{PTR} = \frac{AS_T}{CS} \text{ x } \frac{H_P}{H_T} \text{ x } (1 + RR)$$

EXAMPLE 3.11

(Breakdown of Unit Costs): Breakdown of Public Expenditure per Pupil, Benin, 2006

Source: Adapted and Translated from the Benin CSR, 2009.

Table 3.11 illustrates the breakdown of unit costs in Benin by level, for 2006. Although the data is relatively aggregated, it illustrates the factors that determine the structure and variation of unit costs from one level to another.

TABLE 3.11 - Breakdown of Public Recurrent Expenditure per Pupil in Government Schools, Benin, 2006

		Literacy	Preschool	Primary	Lower Secondary	Upper Secondary	TVET 1	TVET 2	Higher
SCHOOL LEVEL	**School Level (Unit cost)**	280	**50,734**	**26,793**	**24,182**	**72,501**	**108,949**	**112,205**	**158,579**
	Teaching Staff (Unit cost per pupil)		**45,592**	**23,019**	**16,841**	**58,487**	**57,933**	**84,223**	**84,907**
	Average Salary (Civil Servants)	-	1,920,836	1,525,660	1,829,128	2,506,084	1,742,008	2,373,604	3,952,291
	Share of Local Contract or Temporary Teachers (Full-Time Equivalent)	100	29.8	36.0	81.8	69.8	57.2	63.9	Nd
	PTR *	15.1	31.5 (45)	47.0 (73)	36.3 (200)	19.3 (64)	14.6 (34)	11.6 (32)	43 (47)
	Average Transfer by Local Contract Staff Member (Full-Time Equivalent) **	-	289,038	289,038	340,927	529,604	176,993	186,955	-
	Non-Teaching Staff (Unit cost per pupil)				**5.934**	**9,868**	**27,817**	**15,054**	**14,363**
	Average Salary (Civil Servants)	-	-	-	1,562,086	1,559,090	1,550,658	1,549,339	1,374,934
	Share of Local Contract Staff	-	-	-	15.6	18.7	61.6	46.3	48.9
	PTR *	-	-	-	231.0	138.5	25.3	61	48.9
	Average Transfer by Local Contract Staff Member (Full-Time Equivalent) **	-	-	-	340,927	529,604	176,993	186,955	-
	Operational Costs (Unit cost)	**280**	**5,142**	**3,774**	**1,407**	**4,147**	**23,200**	**12,928**	**59,308**
SECTOR-WIDE	**Sector-Wide (unit cost)**	**9,229**	**18,763**	**12,549**	**8,159**	**25,667**	**240,764**	**267,840**	**251,329**
	Salary Unit Costs	5,893	10,135	6,489	4,537	14,793	109,985	119,248	36,582
	Administrative Unit Costs	3,336	8,628	6,060	3,622	10,874	112,707	130,035	45,648
	Social Spending Unit Costs	-	-	-	-	-	18,073	18,557	169,100
	Percentage benefiting from scholarships	-	-	-	-	-	28.8***		33.6
	Average Scholarship per Beneficiary	-	-	-	-	-	63,811***		285,932
	Unit Costs of Other Social Spending	-	-	-	-	-	-		72,898
	TOTAL UNIT COST (RECURRENT)	**9,509**	**69,496**	**39,342**	**32,786**	**95,854**	**349,713**	**380,045**	**409,908**

Note: Only recurrent expenditure is considered. Figures are in CFAF unless otherwise indicated.

* Figures in parenthesis are ratio estimations assuming no teachers are temporary or on local contracts.

** This ratio is an average for all personnel (teaching or not) that is temporary or on local contracts, or their full-time equivalent. Government contributions to parent-teacher associations are divided by the number of such staff. The calculation takes the differences in the average subsidy amount into account according to the education level (one average is used for preschool and primary, and other averages for are used for lower and upper secondary). For TVET, the estimation is based on the distribution of expenditure carried out by the planning division of the subsector.

*** Estimated average for both levels combined.

Findings

The relatively high level of preschool unit costs in comparison to primary unit costs is mostly due to lower pupil to teacher ratios at this level. The relatively lower unit costs for lower secondary, in comparison to primary unit costs, are basically due to the predominance of less paid teachers.

The following sub-section focuses on the analysis and trade-offs associated with the pupil to teacher ratio (PTR). The other key component of the unit cost, namely the issue of teacher remuneration, because of its complexity and its importance in terms of policy and management, is examined in its own section 2.3.

2.2.2 PUPIL TO TEACHER RATIOS

Where PTRs and their impact on unit costs are concerned, a trade-off must be made between: (i) ensuring the best possible working conditions for both pupils and teachers, implying a low PTR; and (ii) offering education to the greatest number of children, which in a context of human and financial resource constraints, would imply higher PTRs. Two approaches can contribute to the debate: (i) as above, an international comparison of PTRs; and (ii) a review of the effect of PTRs on pupils' learning outcomes, which will be dealt with in Chapter 4.

Example 3.12 drawn from the Côte d'Ivoire CSR, 2010, analyses the evolution of the PTRs at each level over a decade, and compares them to those of other countries in the region.

EXAMPLE 3.12 **(Analysis of Pupil to Teacher Ratios): Pupil to Teacher Ratios, Côte d'Ivoire, 2007**
Source: Adapted and Translated from the Côte d'Ivoire CSR, 2010.

Table 3.12 places the PTRs for each level in international perspective.

TABLE 3.12 - Public Pupil to Teacher Ratio in International Perspective, Côte d'Ivoire, 2007

	Pupil to Teacher Ratio			
	Primary	**Lower Sec.**	**Upper Sec.**	**Higher**
Côte d'Ivoire - 2000	42	38	24	—
Côte d'Ivoire - 2007	**39**	**45**	**21**	**33**
Benin	54	38	17	30
Burkina Faso	55	86	26	39
Cameroon	63	31	29	28
Guinea	47	40	36	14
Madagascar	50	22	12	23
Mali	63	46	23	60
Mauritania	42	36	23	33
Niger	43	40	13	13
Chad	72	39	48	48
Togo	44	47	52	30
Average of the 10 Comparable Countries	**47**	**34**	**29**	**32**
Côte d'Ivoire / Comparable Countries	0.83	1.32	0.72	1.03

Findings

Côte d'Ivoire's position in terms of pupil to teacher ratios is quite striking compared to its neighbours, depending on the education level considered:

Paradoxically, recent events have not led to an increase in the primary PTR, rather to a decrease. Indeed, it has dropped from 42 to 1 in 2000 to 39 to 1 in 2007, in particular due to the recruitment of teachers paid by parents in the center and north east zones. The international perspective shows that Côte d'Ivoire's situation is relatively favourable, as the average of comparable countries is 47 to 1, and its PTR is close to the GPE benchmark of 40 to 1.

For general secondary, the PTR merits critical consideration, as class size has a direct impact on pedagogical approaches and the quality of teaching. PTR and class size are not independent of course, but the average class size is generally greater than the PTR as the number of hours of teaching that a pupil receives is usually greater than the number of teaching hours that each teacher provides, due to teachers' subject specialisations. For instance, for Côte d'Ivoire in 2007, the PTR for lower secondary is estimated at 45 to 1 on average, whereas class size is estimated to be of 66 pupils on average.

The comparative analysis of PTRs shows significantly different situations for the two secondary education cycles. Lower Secondary witnessed an increase of the indicator between 2000 and 2007, rising from 38 to 1 to 45 to 1 despite accounting for teachers paid by parents. Côte d'Ivoire's situation is unfavourable when compared to the average level of the indicator for comparable countries, of 34 to 1. Côte d'Ivoire's PTR for lower secondary would have to decrease by a third to reach the regional average. At upper secondary, the situation quite different, the indicator improved between 2000 and 2007, from 24 to 1 to 21 to 1, which is considerably better than the average of comparable countries (29 to 1).

For higher education, the average student to teacher ratio (33 to 1 on average, although significant variations exist according to the type of institution and field of study) are in line with the average of other countries.

2.3 ANALYSIS OF THE STATUS AND REMUNERATION OF TEACHERS

When carrying out the analysis of salaries, a fair balance must be found between two conflicting objectives: (i) to recruit and retain the qualified teachers that the system requires (with adequate academic levels and initial training), which implies offering sufficiently attractive work conditions, both in terms of salary and status; and (ii) to recruit a sufficient number of teachers to ensure the system's development, which implies a relatively low payroll burden in a context of scarce resources. There is no norm in the matter, but national and international comparisons help to assess whether different teachers' salaries are comparatively low or high. The following approaches provide an idea of the degree of flexibility at countries' disposal in terms of their teacher salary policies.

The comparative analysis of teachers' working conditions can be carried out from three different perspectives, dealt with successively: (i) according to different teacher status; (ii) in comparison with other national non-education staff; and (iii) in comparison with teaching staff from other countries.

These different approaches, illustrated by the examples drawn from the Mali CSR, 2010 and the Burkina Faso CSR, 2010 (see Examples 3.13 and 3.14), will aim to highlight issues related to the sustainability of salaries in a context of scarce resources and the competitivity of salaries for education systems that seek to attract more teaching and non-teaching staff.

Analysis by Teacher Status

Teacher salaries are compared according to their status, differentiating between civil servants, temporary or contract teachers and school directors with teaching responsibilities. Further distinctions can be made by level, grade, seniority and so on.

EXAMPLE 3.13

(Analysis of Teaching Salaries by Status): Comparison of Teacher Remuneration by Status and Cycle, Mali, 2008

Source: Adapted and Translated from the Mali CSR, 2010.

One of the characteristics of the Malian education system is the great variety of teaching status and remuneration levels, at every education level.

TABLE 3.13 - Distribution of Personnel and Average Remuneration, by Status and Level, Mali, 2008

Units of GDP per Capita	Basic 1		Basic 2		Secondary		TVET		University	
	% Staff	Average Salary	% Staff	Average Salary	% Staff	Average Salary	% Staff	Average Salary	% Staff	Average Salary
Civil Servants	20.9%	7.7	29.2%	7.8	43.4%	8.7	38.5%	8.0	79.4%	17.1
State Contract Staff	8.7%	5.7	7.9%	5.7	23.8%	5.5	23.8%	5.6	20.6%	7.4
Subtotal	**29.6%**	**7.1**	**37.1%**	**7.4**	**67.3%**	**7.7**	**62.2%**	**7.1**	**100.0%**	**15.1**
Local Contract Staff (HIPC Resources)	33.2%	4.4	37.6%	4.4	32.7%	5.5	37.8%	5.5		
Local Contract Staff (Local Resources)	2.8%	0.0	3.1%	0.0						
Community Teachers (Subsidised by HIPC Resources)	27.1%	0.8	9.6%	0.8						
Community Teachers (Unsubsidised)	3.7%	0.0	9.4%	0.0						
Student Teachers	3.6%	0.0*	3.2%	0.0						
Total	**100.0%**	**3.8**	**100.0%**	**4.4**	**100.0%**	**6.2**	**100.0%**	**6.5**	**100.0%**	**15.1**

Note: * Student teachers receive a scholarship to attend Schoolmaster Training Institutes, equivalent on average to 1.1 units of GDP per capita.

Findings

Generally speaking, average remuneration increases not only with each education level but also according to status. In basic education, civil servants represent 20.9 percent and 29.2 percent of the teaching staff of the first and second cycles, and respectively earn the equivalent of 7.7 and 7.9 units of GDP per capita. State contract teachers represent 8.7 percent and eight percent of teaching staff at these levels, and earn 5.7 units of GDP per capita on average. Local contract staff paid on HIPC funds are the main type of teaching staff, and earn an annual equivalent to 4.4 units of GDP per capita on average for the two basic education cycles, and 5.5 units of GDP per capita at the secondary level, be it general or technical. The basic level also relies on teachers paid by local authorities and community teachers that receive a government subsidy of CFAF 25,000 per month (over nine months, equivalent to 0.8 units of GDP per capita), community teachers paid for by families, and student teachers in their last year of training who receive an annual scholarship of 1.1 units of GDP per capita.

In secondary, teacher status and remuneration are also variable. The annual average salary ranges from 5.5 units of GDP per capita for teachers contracted by local authorities with HIPC funds, to 8.7 units of GDP per capita for civil servants.

It is however important to underline that the gaps in the remuneration of civil servant, state contract and local authority contract staff on HIPC funds are mainly due to seniority in the system, civil servants being those with most seniority. Indeed, over recent years, status-related remuneration gaps have been reduced and differences in salaries according to status for teachers with similar levels of seniority are extremely weak. On the other hand, subsidies given to community teachers are the same for all, regardless of their seniority.

Generally speaking, the share of civil servants in the teaching profession has dropped, especially at the lower levels of the education pyramid. Civil servants only represented 21 percent of first cycle basic education staff in 2008, against 34 percent in 2004 (data not shown in the table); 29 percent of second cycle basic education staff, against 51 percent in 2004 (data not shown in the table); 43 percent of secondary staff, against 55 percent in 2004 (data not shown in the table); and 38 percent of TVET staff, against 47 percent in 2004 (data not shown in the table). However, they still represent more than three-quarters of university teaching personnel.

Comparative National Analysis

Here the salaries of teaching staff are compared to those of civil servants working for other sectors and to private sector workers with similar qualifications. This analysis is generally performed on the basis of employment survey data or any other household survey data providing information on individuals' activities and income.

EXAMPLE 3.14

(Teaching Salaries in the National Context): National Comparison of Teacher Remuneration, Burkina Faso, 2003

Source: Adapted and Translated from the Burkina Faso CSR, 2010.

Over the coming years it will be necessary to recruit a substantial number of new teachers. This is because of: (i) current teaching conditions that are unsatisfactory (pupil to teacher ratios are too high); and (ii) the expectation of fast-growing enrolment in response to the universal primary education objective. Two elements must therefore be considered. Firstly, Burkina Faso must ensure that there is a sufficient pool of potential candidates with the required qualifications. Secondly, they must be offered adequate pay to make the profession attractive.

The analysis of the Burkina Faso household survey is instructive, as it offers a view of the national labour market and some of its characteristics, both in terms of occupation and remuneration. Table 3.14 provides information on these points for the population aged 25 to 35 years.

TABLE 3.14 - Occupation and Annual Income of Individuals Aged 25 to 35 years, by Number of Years of Training Received and Job Sector, Burkina Faso, 2003

	Number of Years of Training Received							
	0-9 Years		10-12 Years		13 Years		16 Years	
	Income (CFAF)	Number	Income (CFAF)	Number	Income (CFAF)	Number	Income (CFAF)	Number
Unemployed/Inactive	—	50,600	—	17,771	—	7,098	—	8,429
Formal Private Sector	511,112	51,194	714,096	12,988	885,320	4,701	2,123,651	3,398
Informal Private Sector	384,258	147,853	628,009	15,317	733,881	1,921	1,574,616	1,180
Civil Service	552,061	6,315	918,932	13,032	1,039,923	8,615	1,561,560	6,565
Of which Education Sector	680,567	641	769,837	11,674	827,818	6,110	1,227,226	5,435

Findings

In terms of employment, a significant number of individuals with 10 to 13 years of training (having completed between Grade 4 and Grade 7 of secondary) are inactive or unemployed. Of those with just 10 to 12 years of training (lower secondary leaving examination level), equivalent to the level required of assistant contract primary teachers, 30 percent [=17,771/(17,771+12,988+15,317+13,032)] are unemployed or inactive and 26 percent work in the informal sector. Furthermore, about 39 percent of individuals having completed 13 years of training (baccalaureate level) work in the civil service, 21 percent work in the formal private sector, and close to 32 percent are unemployed or inactive. It is interesting to note that the shares of individuals having completed 16 years of education working in the civil service (34 percent) and the private sector (23 percent) are comparatively lower, whereas 43 percent of them are unemployed.

This group of unemployed or inactive youth therefore constitutes a pool of future candidates for the teaching profession that should a priori *be sufficient.*

Table 3.14 also indicates that the level of income (from work only) is significantly better in the public sector than in the private sector for youth with a baccalaureate or less. The private sector however, be it formal or informal, appears to offer higher pay to youth having completed 16 years of study.

This analysis confirms that in Burkina Faso, the income of civil servant teachers without a baccalaureate is slightly better than for other private sector workers, although slightly lower than the income of other civil servants. The income declared by teachers having completed 13 years of education is only higher than that of youth with similar education working in the informal sector. Teachers having completed 16 years of study benefit from lower income levels than individuals working in other sectors, public or private.

These various factors suggest that: (i) numerous men and women have academic qualifications that are adequate to teach primary and secondary classes; and (ii) the income of civil servant teachers is lower than that of other civil servants on average, but is generally higher than the income of private sector workers having completed 13 years of education or less.

Comparative International Analysis

Here the average teacher salary, or the average salaries of the main categories of teachers, are compared to the average salaries of teachers in countries with similar levels of economic or educational development. This analysis often relies on the average salary expressed in units of GDP per capita, which places remuneration in the context of each country's average income level.

SECTION 3

HOUSEHOLD CONTRIBUTIONS TO EDUCATION

The issue of private education financing is an important one in as much as the achievement of universal primary education implies that the poor also gain access to education. However, even in education systems that are fully governmental, some expenses induced by schooling must still be supported by families, such as the purchase of textbooks of stationery, school transport, private tuition, school uniforms and so on (See Table 3.15). There is also an indirect cost for families, usually named by economists the opportunity cost or foregone earnings, which relates to the income lost as a result of enrolling children in school rather than having them work and contribute to the family income. These opportunity costs can constitute an obstacle to the enrolment of children from the poorest strata of society.

The objective of this section is to document the education expenses supported by families, estimating the average private unit cost of education by level, and how this may vary according to the type of school attended, gender and family income. This will later enable the comparison with public unit costs, from an equity perspective.

TABLE 3.15 - Types of Household Education Spending

	Direct Spending	Related Spending	Other Spending
Payments made to school	- School Fees - Administrative Charges - Contributions to Parent-Teacher Associations	- Boarding Fees - School Meals	
Expenditures by families	- Textbooks - Exercise Books - Other Materials and Supplies - Uniforms	- Room Rental - Food/snacks - School Transport	
Other Education Spending		- Private Tuition - Home Tutor - Apprenticeship Costs	- Artistic Training - Other Books - Newspapers, Magazines - Pocket money - Bicycle

For this estimation, household surveys with both education and spending components are generally used. Most such surveys provide information on each individual's enrolment status at the time of the survey, and when enrolled, on their level, class and type of school attended. The spending component of the questionnaire often provides information on enrolment and school fees, and the cost of books, school supplies, uniforms and sport-wear, school transport, school meals, private tuition, contributions to parent-teacher associations, extra-curricular activities and so on. This information is generally collected during the previous 12 months. Some household surveys have however a very wide comprehension of education expenditures when collecting data from parents, including for instance pocket money or an "other expenses" category with few restrictions. It can thus be useful to refer to the UNESCO Institute for Statistics guidebook for a more precise definition (the "Other expenses" column in Table 3.15 above gives examples of expenses that are too remote to be considered as education expenses).

3.1 PRIVATE UNIT COSTS BY EDUCATION LEVEL

Data is available for each enrolled child in some surveys, or as aggregate data for all of the households' enrolled children in others. When data is available per child, the estimation of average spending by child and level is obtained by crossing spending data with enrolment data. Data can also be provided according to the type of school attended, gender and household income.

When disaggregated data per child is available, the calculation of average spending per pupil at each education level is fairly simple. For each level, the sum of the amounts spent for each child enrolled at a given level (all households) is divided by the number of children concerned. This global amount must then take into account the survey's sampling procedure, to extrapolate the result obtained to the scale of the total population.

However, disaggregated data per child is not always available, or may contain errors or omissions due to the difficulty of retracing detailed past spending for each household member. In this instance, econometric models can be used to estimate the breakdown of total household education spending by spending item, pupil and education level, based on total household education spending and the number of children enrolled at each level. This is carried out with the help of linear regressions.

Total household education spending (*TS*) indicated in the survey is broken down according to the number N_i of children enrolled at each level *i*, where *i* is given a value for each level (1 for preschool, 2 for primary, 3 for lower secondary, 4 for upper secondary, 5 for TVET and 6 for higher education) and the private unit costs for each level (UC_i). Thus an equation is obtained for each household:

$$TS = (UC_1 + N_1) + (UC_2 \times N_2) + (UC_3 \times N_3) + (UC_4 \times N_4) + (UC_5 \times N_5) + (UC_6 \times N_6)$$

The econometric modelisation (linear regression without the constant term) of total spending as a function of the number of children enrolled at each level then enables the computation of the UC_i coefficients that constitute estimations of the average household spending per pupil at each level. Again, it is important to take into account the survey's sampling procedure, to extrapolate the result obtained to the scale of the total population.

The same approach can be applied to average spending by type of school and by pupils' socioeconomic characteristics (gender, income). This carries the advantage of providing a reasonable order of magnitude of average spending by level according to children's socioeconomic characteristics and type of school.

In some cases, the estimations (be they individual or aggregate) carried out for upper secondary, TVET and higher education must be used with caution given the low number of children enrolled at these levels that are surveyed, which constitutes a representativity issue.

EXAMPLE 3.15 **Estimation of Household Education Spending by Level, Congo, 2005**
Source: Adapted and Translated from the Congo CSR, 2010.

TABLE 3.16 - Estimation of Household Education Spending by Level, Congo, 2005

	Number of Pupils (Enrolment)	Household Spending	
		Per Pupil (UCi) (CFAF)	Aggregate (Millions of CFAF)
Preschool	23,320	85,250	1,983
Primary	611,679	6,946	4,249
Secondary	*223,770*	*28,567*	*6,392*
Lower	190,193	28,558	5,432
Upper	33,577	28,610	961
TVET	43,539	45,850	1,963
Higher	11,710	71,359	836
Total	**914,18**	—	**15,423**

Survey data provides total education spending per household. The econometric approach based on explaining total household education spending by the number of children enrolled at each level provides the annual average household spending for the schooling of a child for each level (See Table 3.16). On the basis of these private unit costs and of the actual enrolment by level, an estimation of the aggregate household education spending can then be obtained by level and overall.

Findings
Total Congolese household education spending is estimated at CFAF 15.4 billion for 2005. It is mainly composed of school fees and private tuition fees. Average private unit costs increase with each education level, with the exception of preschool (CFAF 85,250) which is very high due to the fact that most of the supply is private.

3.2 EDUCATION COST-SHARING BETWEEN THE GOVERNMENT AND FAMILIES

On the basis of the analysis of public unit costs carried out in Section 2 of this chapter and the estimation of private unit costs above, the balance between both can be reviewed from an equity perspective (See also Chapter 6). For instance, where the share of household contributions to the cost of higher education is low, the education system reinforces inequities, as this level benefits mainly the wealthiest families and individuals. Ideally, the share of costs supported by the government should be greatest at the lower education levels, which benefit the greatest number of children regardless of their wealth. This analysis also enables one to provide policy arguments in favour of budget reallocations, for instance when basic education is relatively over-funded by households. The question of private education may also be approached here.

EXAMPLE 3.16 (Public-Private Education Cost-Sharing): Cost-Sharing of Education Costs between the Government and Families, by Level, Mauritania, 2008

Source: Adapted and Translated from the Mauritania CSR, 2010.

Computing the share of the recurrent cost of education that is borne by households for each level is the first step of this analysis.

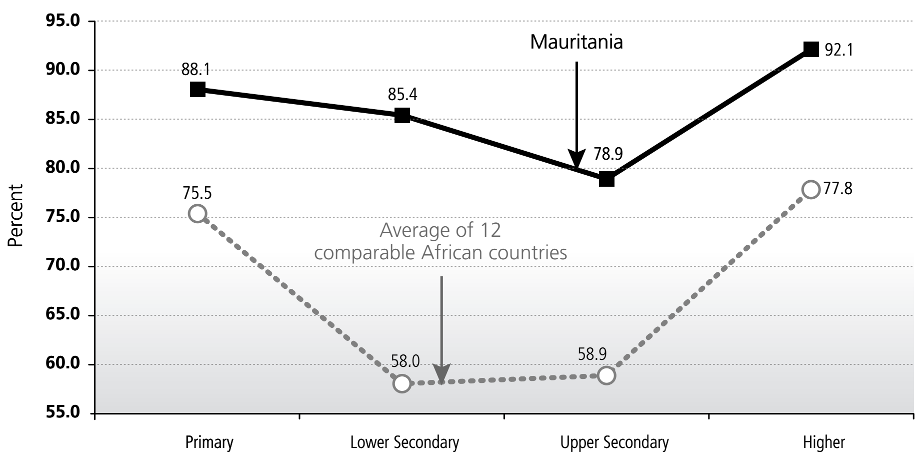
Findings
Total household education spending in Mauritania in 2008 was equivalent to 11.5 percent of the total recurrent cost of education on average (public expenditure and household spending). With the exception of preschool to which families contribute 72.3 percent, the greatest household contribution is to secondary (21.1 percent for upper secondary and 14.6 percent for lower secondary). Families contribute less to higher education (7.9 percent) and to primary education (11.9 percent).

TABLE 3.17 - Public-Private Cost-Sharing of Recurrent Education Expenditure, by Level, Mauritania, 2008

	Preschool	Primary	Lower Secondary	Upper Secondary	TVET	Higher	Total
Average Household Spending per Pupil (UM) (a)	27,050	4,803	13,963	24,039	18,475	20,016	—
Enrolment (b)	14,729	473,688	65,896	30,997	4,983	14,699	—
Household Spending (Millions of UM) (c) = (a) x (b)	398	2,275	920	745	92	294	4,327
Public Expenditure (Millions of UM) (d)	153	16,850	5,391	2,789	1,102	3,433	33,182
Total Recurrent Cost of Education (Millions of UM) (e) = (c) + (d)	551	19,126	6,311	3,535	1,194	3,727	37,509
Share Borne by Households (%) (c) / (e)	72.3%	11.9%	14.6%	21.1%	7.7%	7.9%	11.5%

Given the higher return on investment for higher education graduates and the predominance of wealthy students at this level, equity would have households contributing most to this level. The current distribution of public education expenditure is therefore unaligned with an equitable approach in that it penalises the poorest families through failing to offer them a quality basic education. As a second step, the share of the total cost of education that is borne by the government can be compared to the same proportion in comparable countries.

FIGURE 3.5 - International Comparison of the Share of Recurrent Education Expenditure Borne by Governments, by Level, Mauritania, 2004-08



Findings

It is worthy of note that the Mauritanian government contributes more to every level of education (as a share of the total cost borne by the government and families) than the average of 12 African countries for which data is available.

Table 3.17 and Figure 3.5 nevertheless highlight a relative inequity in education funding, as families contribute less to higher education. This should encourage the definition and implementation of a funding system for the higher education levels that points towards a cost-sharing system where households contribute more, in order to free-up more public resources for the lowest levels of education. Higher Education student loan mechanisms (that may be means-tested and reimbursable once students begin work) such as those practiced in South Africa should also be encouraged to facilitate such cost-sharing, as they would also offer children from more modest backgrounds the opportunity to access higher education.

3.3 BREAKDOWN OF AVERAGE PRIVATE UNIT COSTS BY SPENDING ITEM AND LEVEL

The following example, drawn from The Gambia CSR, 2010, illustrates the breakdown of household education spending by type of expense and level of education. This type of analysis is helpful to policy makers when they want to consider making a given education level free for families for instance, to inform them as to the type of costs that should be borne by government funding.

EXAMPLE 3.17 **(Breakdown of Private Unit Costs): Breakdown of Average Household Education Spending by Item, The Gambia, 2009**

Source: Adapted from The Gambia CSR, 2010.

Table 3.18 shows the shares allocated by households to a number of different categories of spending by level of education.

TABLE 3.18 - Distribution of Household Education Spending, The Gambia, 2009

Percent	School and Registration Fees	Uniforms & Sports Clothes	Textbooks & School Supplies	Transpor-tation	Exam Fees	Private Tuition	Other Expenses
Preschool	39	20	10	20	0	10	2
Lower Basic	48	16	10	10	1	10	4
Upper Basic	35	13	11	18	5	11	6
Senior Secondary	43	8	12	19	6	7	6
TVET	25	11	8	22	19	3	12
Higher	83	10	8	0	0	0	0
Average	43	14	11	14	3	10	5

Findings

Of the total of D 729 million that households spend annually on education in The Gambia, the largest shares cover school tuition and registration fees (43 percent), uniforms and sports clothes (14 percent) and transportation to and from school (14 percent). Other spending includes textbooks and other learning materials, private tuition, examination fees and contributions to parent teacher associations.

TABLE 3.19 - Cross-Country Comparison of the Distribution of Household Education Spending, by Type, 2009 or MRY

Percent	School Fees and Tuition	Textbooks/Other Materials	Other Education Expenses *
Benin	48.4	37.2	14.4
Burkina Faso	63.7	29.4	6.9
Cameroon	45.7	37.4	16.9
Côte d'Ivoire	36.3	40.1	23.6
Gambia, The	**53.2**	**10.6**	**36.2**
Madagascar	33.6	30.9	35.5
Malawi	59.0	18.2	22.8
Mauritania	37.8	37.2	25.0
Niger	48.9	38.2	12.9
Uganda	73.0	13.3	13.7
Sierra Leone	20.9	48.5	30.6
Tanzania	62.4	26.4	11.2
Togo	53.4	37.8	8.8
Average	**48.9**	**31.2**	**19.9**

Note: * Transport, exam fees, uniforms, contributions to parent-teachers associations, etc.

By reclassifying household education spending into three broad categories, namely tuition fees, textbooks and other school supplies and other expenditures, it is possible to better understand how Gambian households prioritise their expenditures in comparison with other countries.

Findings

Gambian households devote a lower share of their education resources to textbooks and other teaching materials (10.6 percent, against 31.2 percent on average), which is understandable given the government's free textbook scheme for lower, upper and senior secondary levels. In contrast, the share of Gambian household education spending devoted to other expenses, which include uniforms and transportation, is higher at 36.2 percent than the African average of 19.9 percent. In the context of rising poverty levels, many households are unable to afford to send their children to school, especially beyond the lower basic level.

SECTION 4 THE COST OF SCHOOL INFRASTRUCTURE

School buildings constitute a significant proportion of education capital expenditure. They merit special attention, in particular with a view to identifying opportunities to free-up budgetary resources through the use of more competitive building types or approaches and procurement methods. General education could be analysed in this perspective. TVET could also be included in the analysis as it usually involves the use of durable equipment that can be expensive.

The goal is to review institutional mechanisms, construction methods and their related costs, as per Example 3.18 below. Infrastructure costs may also be compared to recurrent unit costs, the cost of a teaching post, or analysed by annualising them.

EXAMPLE 3.18 **(Analysis of Building Costs): Primary and Secondary Education Construction Costs and Institutional Mechanisms, Benin 2011**

Source: Adapted and Translated from the Benin CSR, 2012.

In Benin, school infrastructure (and particularly classrooms built by the government with domestic resources) is built according to typical models adopted by the education ministries for both the primary and general secondary cycles. Two models are used for each of these levels, according to whether a storeroom and a school director's office are included. Practice at the primary level has led to modules being composed of three classrooms, each with a capacity of 50 pupils. At the secondary level, modules tend to include four classrooms, which may be complemented by a storeroom and a director's office. These modules are not strictly applied by all stakeholders that finance infrastructure; NGOs and some projects financed with external resources use other approaches, although with similar capacity.

The cost of building these modules varies according to how the construction is executed and the materials used, especially the roofing. Two main execution modes and two variants can be distinguished: execution by task-workers and execution by companies. The execution by task-workers is often used by communities or NGOs. It generally involves the participation of the beneficiaries with cash, in kind, or with unqualified labour. Communities recruit the workers and NGOs recruit public works technicians to control, supervise and direct the workers on the site. Although the cost of building with this method appears to be relatively low, it is important to underline that it escapes taxation and that the contribution of beneficiaries is often underestimated. The execution by companies involves central or decentralised authorities issuing an invitation to tender and signing a contract with the chosen provider. Companies undergo the control, follow-up and supervision of works on behalf of the administrations' technical services.[23]

Table 3.20 illustrates the average cost of a module comprising three classrooms, a storeroom and a director's office, according to the type of roof and source of funding.

The modules of the second IsDB project and of the public investment program are those built by the Beninese education ministries, so this analysis will focus mainly on these.

TABLE 3.20 - Cost of a School Module of Three Classrooms, a Storeroom and Director's Office, by Source of Funding, Benin, 2011

	Cost (Excluding VAT) Thousands of CFAF		Cost (Including Tax) Thousands of CFAF		Observations
	Minimum	Maximum	Minimum	Maximum	
Community-Driven Development Project	14,000	15,000	-	-	Tin Roof (Not subject to VAT)
PLAN BENIN (NGO)	14,000	15,400	-	-	Tin Roof (Not subject to VAT)
BORNEFONDEN (NGO)	14,500	15,400	-	-	Cement Roof (Not subject to VAT)
Second IsDB Education Project	23,700	35,600	24,297	36,497	Corrugated Iron or Aluminum Roof (Beninese funding subject to 14% VAT)
Public Investment Programme (National Funding)	16,000	16,800	18,880	19,824	Tin Roof

Findings

Globally, the cost of an equipped classroom with a capacity for 50 pupils varies according to the type of roof. A classroom with a corrugated iron or aluminum roof is approximately 70 percent more expensive than a classroom with a tin roof.

However, given that corrugated iron or aluminum roofs have a greater life-span, to be comparable, annualised costs must be computed. The next part of this analysis will compute the annualised cost per student of a furnished classroom, and compare that cost with the annual salary of a teacher.

Annualised costs are obtained through the following formula, where *AC* is the annualised cost, *CC* is the cost of a classroom at the time of construction, *n* is the life-expectancy of the classroom, and *i* is the interest that would be earned if the capital required to build the classroom was invested with a financial institution (for the purpose of this analysis, the rate of five percent is used):

$$AC = \frac{CC \times i \times (1+i)^{(n-1)}}{(1+i)^n - 1}$$

TABLE 3.21 - Annualised Cost of a Furnished Classroom, Based on the Type of Roof, Benin, 2011						
	Cost Including Tax (Millions of CFAF)	Life-span (Years)	Annualised Cost (Thousands of CFAF)		Annualised Cost per Pupil (Multiple of the Average Annual Teacher Salary)	
			By Classroom	By Pupil *	Primary	Lower Sec.
Corrugated Iron or Aluminum Roof	12,536	35	729,111	14,582	0.633	0.866
Tin Roof	7,324	20	559,701	11,194	0.486	0.665

Note: Considering class capacity of 50 pupils.

Findings

Even when taking the life-span into account in the computation of annualised costs, the tin roof option looks more cost-effective. As an example, in primary education the tin roof option costs the annual equivalent of 48.6 percent of the average annual teacher salary whereas the other option costs 63.3 percent.

NOTES

18 The public expenditure cycle (approval, commitment, payment and so on) is relatively complex and long, and some types of spending cannot be executed for purely technical reasons.

19 These indicators are furthermore part of the indicative framework of the Global Partnership for Education (previously the EFA FTI Fast Track Initiative).

20 In several Anglophone SSA countries, capital expenditure is often referred to as development expenditure in budget documents.

21 When one or several education levels have changed their ministerial affiliation various times over recent years, the evolution of the education ministries' institutional framework over the years covered by the analysis will enable the analyst to establish where to obtain the information required to reconstitute the spending for each education level.

22 Even when this is the case, such funding is often classified as investment expenditure in national budgets.

23 There are two variants to these execution modes: (i) execution by delegated public works agencies, which is similar to the execution by companies, and (ii) community-led development, which combines the approaches mentioned.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CHAPTER 4

QUALITY, SYSTEM CAPACITY AND MANAGEMENT

› Chapter Objective:
To offer approaches to the analysis of:
(i) learning outcomes and achievements and their evolution, offering a selection of measurement indicators; (ii) system capacity for converting resources into results, and of institutional arrangements and monitoring tools for results-based management;
(iii) the management of teacher recruitment, training and posting; and (iv) the management of other educational resources and of teaching time.

1. ASSESSMENT OF STUDENT LEARNING

ISSUE

Does the national education system transfer knowledge as expected? How do learning outcomes compare with those of other countries? How have learning outcomes evolved over recent years?

OBJECTIVES

- Study the progress in students' learning achievements; and
- Compare the average student learning with that of comparable countries.

METHODS

- Compare the average level of learning outcomes in time through the evolution of average success rates at national exams and national and international assessments; and
- For international comparisons, use the results of standardised assessments carried out by international programmes and compare the effectiveness of education systems in achieving sustainable literacy.

SOURCES

National exam results data, international assessments of learning outcomes data, and household survey data.

2. ANALYSIS OF SYSTEM CAPACITY

ISSUE

What is the education system capacity for converting resources into results? What reforms should be implemented to improve students' learning achievements in the most cost-efficient way? Do additional resources allocated to schools translate into increased learning outcomes? What tools and institutional processes exist to promote results-based management (institutional analysis)?

OBJECTIVES

- Evaluate the conversion of resources used by schools into learning outcomes by comparing unit costs and results;
- Identify school-level administrative practices and policies that are most effective in improving quality; analyse the cost-efficiency of different resource usage options in improving learning outcomes; and
- Carry-out institutional analysis. Evaluate the system's capacity to identify the efficient and inefficient schools and to use monitoring tools and incentive frameworks for results-based management.

METHODS

- Assess the existence of a correlation between the level of learning outcomes and the resources available to each school;
- Use econometric models that explain student and school success rates according to different school inputs to identify those factors the most associated with learning achievements. Carry out a cost-efficiency analysis by comparing the cost of different inputs with their estimated correlations with learning outcomes.
- Use institutional analysis qualitative tools to evaluate accountability mechanisms and incentive frameworks (school inspections, the involvement of school management committees and PTAs, the transparency of information on school performance and so on); and

- Assess the monitoring tools used to compare the performance of different schools and to implement an incentive framework and results-based management system.

SOURCES

School data, international standardised learning assessment, national exam results data, the financial data produced through the analysis described in Chapter 3, and interviews of stakeholders.

3. MANAGEMENT OF TEACHERS

ISSUE

What are teacher recruitment needs? What is the attrition rate? How adequate are national capacities in terms of basic and ongoing teacher training to respond to those needs? Is such training of quality? Is the distribution of teachers among schools aligned with the number of students? What is the level of teachers' job satisfaction? What social and politico-economic context factors affect the profession?

OBJECTIVES

- Estimate recruitment and training needs, and the system's capacity to meet them;
- Assess the quality of available training;
- Check if the teachers allocated to schools bear effective relation to the number of enrolled students and if certain regions or schools are disadvantaged in this respect; and
- Evaluate teachers' level of job satisfaction as well as the social context of the profession.

METHODS

- Calculate the number of untrained teachers (or those needing skills upgrades) as well as the number of new recruits to train, considering the attrition rate, and compare the figures obtained with the places available in teacher training institutes;
- Use quantitative and qualitative surveys to assess the effectiveness of teacher training courses;
- Analyse the consistency in teacher postings (and the allocation of other resources) among schools through the R^2 coefficient, plotting the number of students against the number of teachers and through the qualitative analysis of institutional procedures; and
- Use quantitative and qualitative surveys to assess teachers' job satisfaction and the profession's social context.

SOURCES

Teacher training institute data, school data (on students, teachers), administrative manuals and official teacher recruitment and posting procedures, sample surveys that assess teacher absenteeism and teaching/learning time, qualitative surveys of teachers' job satisfaction and consultation processes.

▶

4. MANAGEMENT OF OTHER RESOURCES AND OF TEACHING TIME

ISSUE

Is the distribution of other resources (subsidies, textbooks, equipment and so on) among regions and schools equitable? What is the actual annual teaching time and what are the factors contributing to its reduction?

OBJECTIVES

- Assess the extent to which the financial and physical resources allocated to schools bear effective relation to the number of enrolled students and if certain regions or schools are disadvantaged in this respect; and
- Estimate the extent and causes of loss of learning time.

METHODS

- Analyse the consistency in the allocation of educational resources among schools through the R^2 coefficient, plotting the number of students against the number of these resources and through the qualitative analysis of institutional procedures; and
- Use specific sample surveys to estimate effective teaching time and analyse the possible causes for the difference with the theoretical number of hours or days.

SOURCES

School data (on students, textbooks, subsidies and so on), administrative manuals, sample surveys that assess teaching/learning time.

Introduction

Increasing the number of enrolled children is crucial but insufficient. It is also necessary that children gain effective knowledge. At the primary level, EFA Goal 6 indeed enshrines this, with the aim of "*Improving all aspects of the quality of education.*" International research has also shown that the improvement of the quality of teaching is associated with economic growth.[24]

What is quality in education and how can it be measured? All too often the measurement of quality is assimilated with the resources used to achieve it, such as the student-teacher ratio or the level of teachers' qualifications. The choice of such approaches is generally explained by a lack of comparable information on learning achievements for different countries. However, even if this seems counter-intuitive, the empirical link between school resources and learning outcomes is usually weak.[25] Most studies at the micro or macro level indeed show that much as the level of resources has an impact, this is slighter than the effectiveness in the use of such resources in explaining differences in learning outcomes. It is therefore unsatisfactory to use resource indicators instead of results indicators when these are unavailable.

It is also tempting to use internal efficiency indicators (such as intra-cycle drop-out rates) to measure quality. Although such indicators are important to evaluate education systems in terms of student flows, they are inadequate to assess the level of students learning achievements at each education level: the relationship between dropout or repetition rates and learning achievements is not empirically proven. Indeed, the weakness of learning achievements is only one possible cause for dropout. The actual measurement of learning outcomes is therefore of particular importance.

Section 1 focuses on the assessment of learning outcomes, through a variety of tools, each aiming to assess the level of knowledge and skills acquired, although with different objectives and interpretations. Section 2 aims to analyse system capacity and to identify factors linked to improvement of learning outcomes, especially in terms of resources available in the schools. It proposes an indicator that measures the effectiveness of the use of educational inputs at the school level, presents a method for the identification and analysis of the factors having a verified relation with students' learning achievements, discusses how to identify the most cost-effective factors, and offers an approach to the qualitative analysis of institutional and pedagogical management mechanisms (institutional analysis). Section 3 then deals with the management of the teaching force, which constitutes the most central input, in its quantitative and qualitative aspects; of these resources. Finally, Section 4 examines methods of assessing the management of other educational resources and of the teaching time.

SECTION 1

ASSESSMENT OF STUDENT LEARNING

Four types of learning assessment may be used in the context of a sector analysis, and are complementary: (i) national examinations; (ii) national assessments; (iii) international standardised assessments; and (iv) household surveys.[26] Each category aims to assess the level of knowledge and skills acquired, although with different objectives and

TABLE 4.1 - Summary Description of Learning Outcomes Assessment Usually Available for Education Sector Analysis

Type	Coverage	Responsible Institution	Commonly Used Measure	Pros	Cons
National Examinations and Admissions Tests	Comprehensive	Education Ministry	Success Rate	- Enable historical comparisons * - Reflect curricula content - Usually available for all education levels, including TVET	- Only cover end-of-cycle grades - International comparisons are not possible - Data is rarely available at the student level
National Assessments	Comprehensive or Sample	Education Ministry	Assessment Score	- Enable to assess learning outcomes at any level/grade - Reflect curricula content - Data often available at the student level	- International comparisons are not possible - Performed irregularly
Standardised International Assessments	Sample	International Organisations and Education Ministry	Assessment Score	- Enable international comparisons through standardised tests	- Performed irregularly - Only partially reflect curricula content
Assessments of Literacy Levels through Household Surveys	Sample	National Statistical Institutes	Literacy Levels (can read "with difficulty," "fluently" or "cannot read") of individuals having followed school for X number of years during their youth	- Enable international comparisons in some circumstances	- Only measure literacy - Provide an approximate measure of the quality of education offered some time ago

Note: To ensure that data is historically comparable, ensure that the marking system does not change from year to year.

interpretations. Before providing examples of their respective uses, Table 4.1 presents a summary of their general characteristics as well as their pros and cons.

For all these assessments, when they are considered over several years, changes in results should be interpreted with caution, in particular when, like in many African countries, enrolments have increased sharply. Results can indeed show a decrease in learning outcomes, or at least a slower increase than expected. This can be the consequence of a a decline in the quality of the learning conditions (typically greater class sizes or lower availability of learning materials). But most of the time part of this decrease in results is linked to the fact that, as the coverage of the system improves, more vulnerable children, with less favourable socio-economic and family backgrounds, are now in school and part of the assessment. It will therefore be important to consider the evolution of measured learning outcomes in the context of the enrolment increases happening concurrently and to interpret these results accordingly.

Finally, it can be interesting to note that some tests are designed to assess students' specific knowledge or skill (criterion-referenced tests), while some others (norm-referenced test) are meant to capture the differences between students, based on their knowledge or skills. The former kind is often more useful as a regular assessment, to control students' learning against the curricula, while the latter, identifying stronger and weaker students, can be more powerful to identify factors underlying better results in some students.

1.1 NATIONAL EXAMINATIONS AND ADMISSIONS TESTS

National exams and admissions tests are designed to fulfill various functions: (i) evaluate the knowledge/skills acquired by students and thus monitor schools' learning achievements; (ii) validate each student's knowledge level and issue an appropriate qualification (for exams); and (iii) select the best students for admission to a given education level or course where places are limited (for admissions tests, although in some countries exams also fulfill this function).

Data on exams and admissions tests are a transversal measure of the level of learning achievements for each cycle, given that they are sat at the end of each. In the context of sector analysis, national exam and admissions test results (success rates) are not appropriate for the purpose of international comparisons, as school programmes and exam content vary from one country to another. On the other hand, they can be useful to provide historical perspectives. In that case, it is important to clearly establish that the level of difficulty of the papers and the severity of marking practices have not changed significantly, which is not often the case, especially when exams are also used as admission tests to the following cycle: the success rate is then determined by the number of seats available rather than the knowledge or skills of the students. Even when the exam is not used as an admission test, political pressures can push governments to alter their difficulty to improve the passing rates for instance.

Example 4.1 below, drawn from the Tanzania CSR, shows how to present and interpret the analysis of the evolution of secondary education exam success rates. The analysis includes the comparison of the results obtained by government school candidates and those sitting the exam as private candidates.

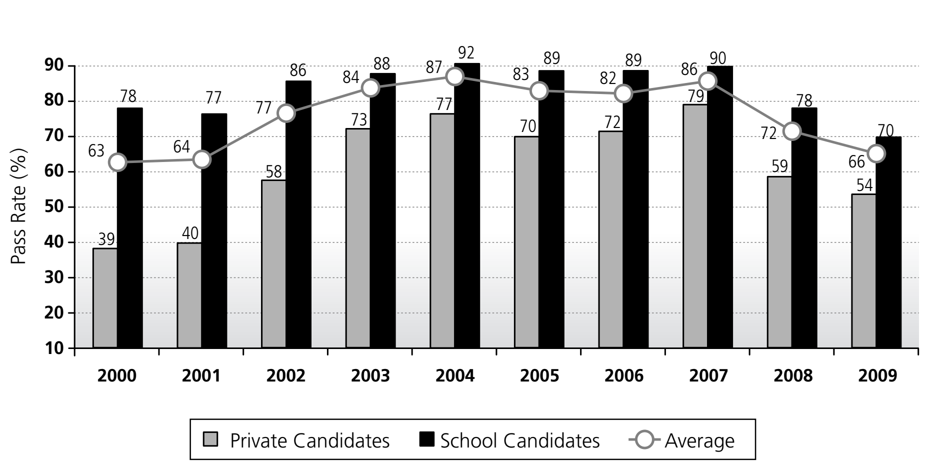
EXAMPLE 4.1

(Historical Analysis of Exam Results): Evolution of Certificate of Secondary Education Examination (CSEE) Results, Tanzania, 2000-09

Source: Adapted from Tanzania CSR, 2012.

The Certificate of Secondary Education Examination (CSEE) is administered at the end of O–Level (lower secondary). Candidates sit between seven and ten subjects, chosen among: Civic education, Kiswahili, English, Mathematics, Social sciences, Technical sciences, Natural sciences, Commercial or Home economics, and various foreign languages. The CSEE is also open to private candidates that register directly at the central level. CSEE candidates are awarded an overall grade called a Division. Divisions I, II, III and IV constitute a pass and Division 0 constitutes a fail. The Division given to a student depends on the number of passes (a pass refers to a grade from A to D in the subject) obtained in the seven better performed subjects. The CSEE pass rate therefore refers to the number of candidates who obtained a Division I, II, III or IV over the number of candidates who sat the exam.

FIGURE 4.1 - CSEE Pass Rates, by Type of Candidate, Tanzania, 2000-09



Findings

After an increase from 2000 to 2004, CSEE pass rates have shown signs of deterioration over the 2006 to 2009 period, falling under the 80 percent threshold in 2008, and reaching 66 percent in 2009. Private candidates' pass rates are particularly low, systematically lagging behind those of school candidates: in 2009, only 54 percent of private candidates passed. Although the proportion of school candidates who passed is better (70 percent), it is lower than in 2007 (90 percent). Several reasons might account for this drop: (i) the introduction of the new curriculum in 2005 that was probably not adequately mastered by teachers at the time, given that no systematic and comprehensive training was conducted; (ii) the lack of alignment of the exam questions with the new curriculum; (iii) the more heterogeneous student backgrounds, resulting from the expansion of the secondary level, potentially leading to greater access of students with learning difficulties; and (iv) tougher marking criteria, associated with the limited number of A-Level seats available.

1.2 NATIONAL LEARNING ASSESSMENTS

National assessments can be administered in two ways: (i) on the basis of a representative sample of students; or (ii) comprehensively, covering the entire population group to be evaluated. They enable the measurement of the average level achieved by the education system at a given level in one or several subjects (such as that of primary Grade 4 students or that of students aged 11 years) in the light of curriculum content. The assessment is based on students sitting a standardised test, evaluating knowledge/skill levels without having to wait for the end-of-cycle exam. They therefore shed light on students' mastery of curricula, and can inform policy makers of the results sufficiently early in the cycle to implement corrective measures where required.

As long as the level of difficulty of the tests does not vary significantly, two consecutive assessments conducted at the same grade can be used to provide a historical perspective of progress in learning outcomes. However, the frequency of such assessments varies from country to country; indeed they are often irregular, and do not offer a basis for international comparisons. The following example, drawn from the Mali CSR, presents the results of a national assessment of the learning achievements of primary Grade 2, Grade 4 and Grade 6 students in language and math. The assessment presents the advantage of providing the proportion of students achieving each level of knowledge, such as defined by the Education Ministry's pedagogical team. When presenting the analysis, it might be useful to introduce briefly (or at more length in an annex) the meaning of the minimum or reference levels referred to in this analysis, in order to provide the reader with a better understanding of the level of knowledge that is being measured.

EXAMPLE 4.2

(Analysis of Knowledge Acquired throughout a Cycle through National Assessments): Results of the Primary Cycle National Assessment, Mali, 2007

Source: Adapted from Mali CSR, 2012.

The National Centre for Education carried out an assessment of learning achievements in primary schools in 2007, for both language and communication, and mathematical and technological sciences. The assessment covered a representative sample of Grade 2, Grade 4 and Grade 6 students.

TABLE 4.2 - Average Scores and Knowledge Levels in Language and Math, Primary Grades 2, 4 and 6, Mali, 2007

	Average Scores			Levels of knowledge		
	Enrolment	**Average Scores (/100)**	**Standard Deviation**	**Below the Minimum Level**	**Minimum Level**	**Above the Minimum Level**
Language and Communication						
Grade 2	1,388	49.6	28.1	53.2%	11.1%	35.7%
Grade 4	1,438	47.8	25.4	57.0%	28.0%	15.0%
Grade 6	1,217	62.4	22.3	25.6%	46.6%	27.8%
Mathematical and Technological Sciences						
Grade 2	1,388	41.8	27.6	61.3%	27.8%	10.9%
Grade 4	1,438	45.5	24.5	54.9%	36.0%	9.0%
Grade 6	1,217	49.0	23.6	52.8%	34.2%	13.0%

Findings

The evaluation shows that a large share of students are in difficulty, especially in Grades 2 and 4 in language and communication, and in all three grades in mathematical and technological sciences. Furthermore, the levels achieved vary greatly among students. Results show that primary students' results are generally weak at the beginning of the cycle, but improve towards the end, probably because of weaker students dropping out. Indeed, Grade 6 students obtain better average results in both subjects than Grade 2 and 4 students, in as much as their average score is higher, and students' results are more homogenous.

1.3 INTERNATIONAL STANDARDISED LEARNING ASSESSMENTS

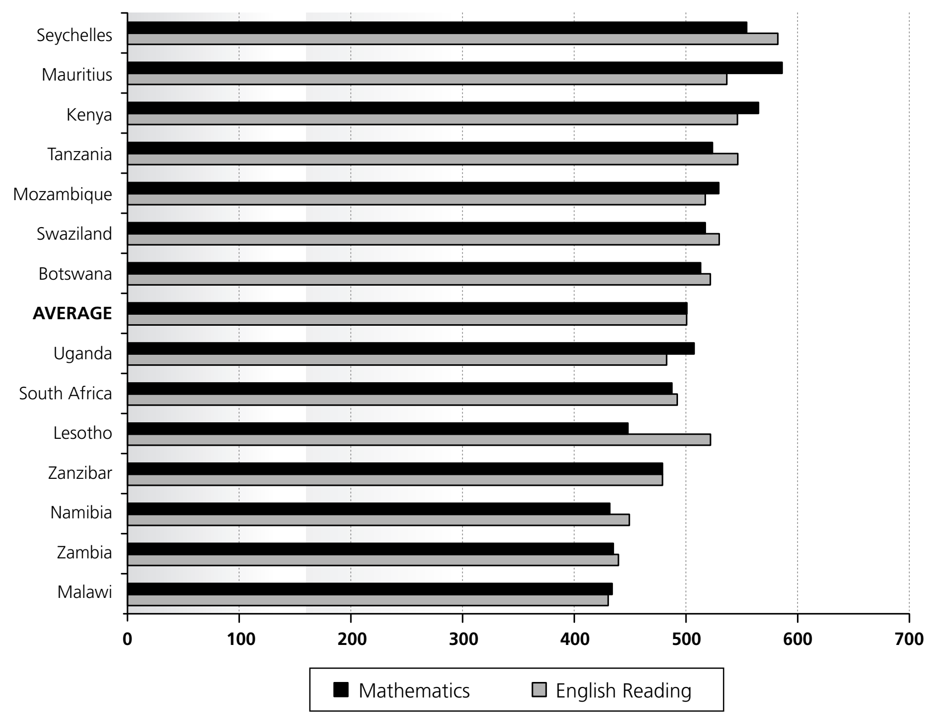
By definition, the advantage of international assessments is that they enable the comparison of students' results from one country to another. It is therefore very helpful to use such data in the context of sector analysis, to place the average level of knowledge/skills acquired by the children of the country of interest in an international perspective. These assessments are usually carried out on a representative sample of students. Their administration is generally assisted by international institutions in the context of multi-country programmes that use standardised tests in each participating country. The following example, drawn from the Malawi CSR, shows how to use SACMEQ data to analyse the average level of primary students in math and reading, within an international perspective.

EXAMPLE 4.3

(International Comparative Analysis of Learning Outcomes through International Assessments): Malawi and other Anglophone African Countries' Math and Reading Results, 2007

Source: Adapted from the Malawi CSR, 2010.

FIGURE 4.2 - SACMEQ Reading and Mathematics Scores, 2007



Findings

Compared to other countries, Malawi fares poorly, being at the bottom of all the SACMEQ countries in English reading and next to last in mathematics (Figure 4.2). Students were among the lowest achievers in the region, suggesting that Malawi provided the lowest quality of primary schooling.

CHAPTER 4

QUALITY, SYSTEM CAPACITY AND MANAGEMENT

At the global level, the Learning Metrics Task Force (LMTF), supported by the UNESCO Institute of Statistics (UIS) and Brookings Institute (Centre for Universal Education), has been established to improve the measurement of learning globally. The work of the taskforce has been underpinned by working groups of experts and global consultations and has identified seven domains for learning: i) Physical well-being; ii) Social and emotional; iii) Culture and the arts; iv) Literacy and communication; v) Learning approaches and cognition; vi) Numeracy and mathematics; and vii) Science and technology. The taskforce uses, as its starting point, the existing international and regional learning assessment programmes, namely: Early Grade Assessment (EGRA), Early Grade Math Assessment (EGMA), Literacy Boost, Annual Status of Education Report (ASER), UWEZO, Latin American Laboratory for Assessment / Laboratorio Latinoamericano de Evaluacion de la Calidad de la Educacion (LLECE), Progress in International Reading Literacy Study (PIRLS), Programme for International Student Assessment (PISA), Trends in International Mathematics and Science Study (TIMSS), Literacy Assessment Monitoring Programme (LAMP), the Programme for the Analysis of the Educational Systems of CONFEMEN Countries (PASEC) and the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ).[27] These international programmes vary according to the education level and the subject being evaluated. When a country has participated in such a programme more than once, the results can also be used to provide an historical perspective of students' results, having previously checked that the difficulty of the tests has not changed over time.

1.4 USING HOUSEHOLD SURVEYS AND LITERACY LEVELS AS A PROXY MEASURE OF QUALITY

In as much as: (i) literacy is a fundamental dimension of students' learning in basic education and (ii) household surveys can help establish a relationship between the level of literacy and the number of years of schooling completed during youth, it is possible to use such data to complement the analysis of country learning outcomes based on school exams and national and international assessments. Countries can then be compared on the basis of the probability of being literate for individuals having completed the same number of years of education, providing a further measure of effectiveness, or quality.

Many developing countries (in Africa especially) carry out large-scale household surveys (samples include 20,000 to 30,000 individuals) as well as Multiple Indicator Cluster Surveys (MICS, promoted by UNICEF), Demographic and Health Surveys (DHS), or Core Welfare Indicator Questionnaire (CWIQ) surveys. These surveys provide information on: (i) Individuals' literacy levels, and (ii) their schooling careers. Crossing these two data sets allows one to estimate the likelihood of literacy according to the number of years of schooling through econometric models, and thus reach a measure of the correlation of these years of education with sustainable literacy. Some surveys (MICS especially) provide even more detailed information on the level of reading skills ("reads fluently," "reads with difficulty," "cannot read at all") by having survey respondents take short tests.[28]

Given that the aim is to analyse the long-term sustainability of the literacy levels achieved, adults aged 22 to 44 years are generally used for the analysis, to establish if they have retained the reading skills acquired at school.[29] As for the analysis of the impact of education on social outcomes (See Chapter 5), econometric modelisation is the methodological tool to be used here, which enables an estimation of the net effect of the number of years of school on the level of literacy, while holding other factors constant (area of residence, age, income level and so on). The results of the econometric model can then be used to simulate the evolution of the probability of sustainable literacy according to the number of years of schooling completed, all other things being equal. Two complementary indicators can then be computed to facilitate international comparisons:

1) The simulated probability of literacy for individuals having completed just six years of schooling (the length of the primary cycle in most countries). This provides a measure of the *gross* long-term production of the cycle, meaning that it estimates the quality of the human capital at the end of the cycle, regardless of where individuals developed their literacy skills (in or out of school); and

2) The added value provided by the primary cycle is the difference in the probability of literacy for individuals with six years of schooling and those without any education. Indeed, in some countries individuals may be literate without having attended school, and thus a share of literacy (that varies from country to country) is the result of factors other than schooling. Comparing countries on the basis of the value added therefore enables one to underline the benefits the primary cycle provides, over and above other factors of development of human capital.

The limitations of these indicators are that: (i) they only contemplate one of the skills school programmes aim to impart, that pertaining to reading; (ii) they shed greater light on the quality of education systems in the past than in the present;[30] and (iii) they are sensitive to non-school contexts that may be more or less favourable to the retention of literacy skills according to the country.[31] However, while this means that the indicator will not only measure the effect of the education provided in school, it does inform on the whole learning process which happens in an individual's life, which is relevant to the goal of developing education and knowledge in general.

The following example, drawn from The Gambia CSR, shows how to present and interpret the results of such an analysis, based on MICS (2000) household survey data.

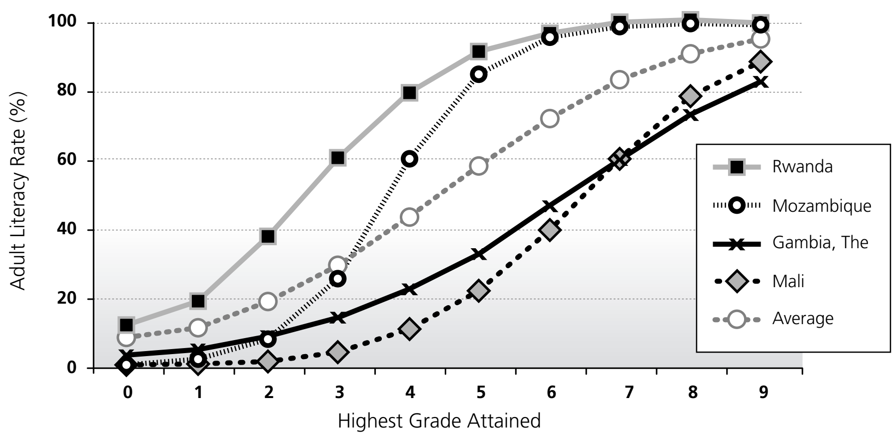
EXAMPLE 4.4

(Use of Literacy Rates to Assess Learning Outcomes): Adult Literacy Levels by Number of Years of Education, International Comparison, 2000-05

Source: Adapted from The Gambia CSR, 2011.

Literacy levels provide a first idea of the sustainable learning achievements an education system produces, considering that one of primary school's main objectives is to ensure that students become fully literate. In this context, the number of formal years of schooling needed to produce sustainably literate individuals can be used as a measure of the quality of the primary education system: the shorter the schooling required, the higher the quality of the system. A major constraint of the literacy analysis is that it is based on the ability of the adult population, and thus reflects the past quality of the education system, not present performance.

FIGURE 4.3 - Adult Literacy According to Schooling Completed, Selected Countries, 2000-05



Note: Adult literacy here refers to those adults who can read without difficulty. The average is of 32 SSA countries.

Findings

The current literacy analysis is based on the 2000 Multi Indicators Cluster Survey (MICS, 2000). It should be interpreted with caution as it is based on information as reported by interviewees (both men and women aged 15 years and above) about their literacy skills and abilities. It shows that after six years of schooling, barely 45 percent of the adult population were able to read without difficulty, a share considerably lower than the average of a sample of 32 Sub-Saharan African countries, of close to 70 percent (See Figure 4.3). This result highlights significant weaknesses in the past primary education system as far as basic learning outcomes are concerned. The result for Rwanda, with a literacy rate of 98 percent, shows that it is possible to achieve lifelong literacy for the vast majority of students through six years of primary education.

SECTION 2 ANALYSIS OF SYSTEM CAPACITY

Section 2 reviews the evaluation of the relationships between human and material resources on the one hand and improvement of learning outcomes on the other hand. Various questions arise: How effective is the conversion of resources into results? What inputs are most associated with learning outcomes? What resources are most cost-efficient in learning terms? What institutional and technical mechanisms and tools are available for results-based pedagogical management?

This section aims to provide some answers to these questions. It begins with the comparison of resources provided to schools with the results on the learning assessment presented above. It then explores methods for the identification and analysis of the factors associated with students' learning achievements, and discusses how to identify the most cost-effective factors. Finally, it presents an approach to the qualitative analysis of institutional and pedagogical management mechanisms as well as some results-based management monitoring tools (institutional analysis).

2.1 EVALUATION OF THE CONVERSION OF RESOURCES INTO RESULTS BY SCHOOLS

Like for so many aspects of an education system, the average results in the learning assessments presented in Section 1 tend to hide wide differences between regions, schools and students. Because one of the first reflexes is to attribute the weak results to a lack of resources, it is important to test this assumption against the data. In the context of a given country's education sector analysis, it is thus advisable to estimate the extent to which school results are correlated to the resources available to them.

A simple, and often naïve, way of approaching learning results consists of assuming that in an ideal education system, a school that receives more resources performs better (assuming that schools operate in similar contexts). According to this logic, a high degree of correlation would be expected between the level of learning achievements and resources for schools in similar contexts. The higher the correlation coefficient, the better the transformation of resources into results (efficiency). Conversely, a weak coefficient indicates that efficiency is weak and that the allocation of additional resources will not be sufficient to improve results, for which pedagogical management must also be improved.

The analytical approach consists of representing schools (in similar circumstances, for instance, schools in the same district or in districts with similar socio-economic characteristics) on a scatter plot chart, with the available resources on the x-axis, often measured by per student annual unit costs, and results on the y-axis, measured by a school's average score at a standardised assessment or its success rate at an exam.[32] Example 4.5 illustrates this method, based on the Guinean case.

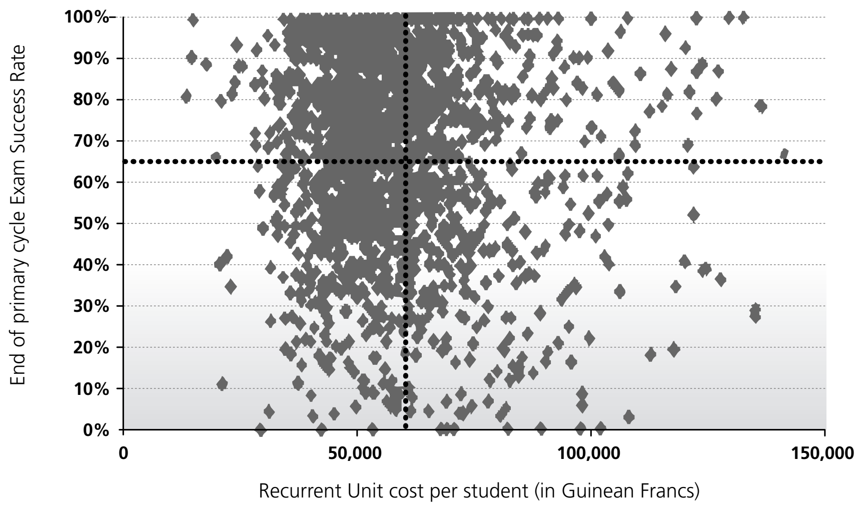
EXAMPLE 4.5

(Analysis of the Conversion of Resources into Results): School Performance and Resources, Guinea, 2003/04

Source: Adapted and translated from the Guinea CSR, 2005.

This graphical analysis presents the relationship between unit costs and the success rate at the primary school leaving exam on a school by school basis (See Figure 4.4 below).

FIGURE 4.4 - Unit Costs and Exam Success Rates, Government Schools, Guinea, 2003/04



Findings

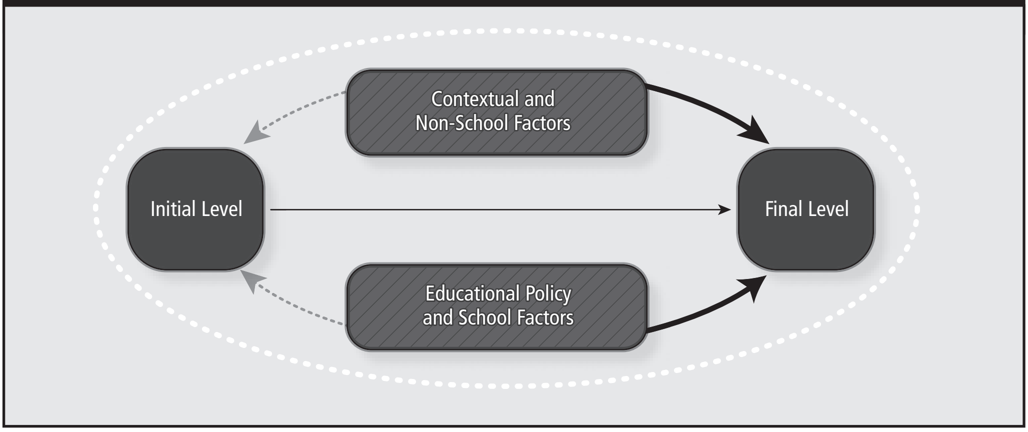
Figure 4.4 shows both: (i) a high degree of variation in unit costs among schools, from 35,000 Guinean Francs to over 100,000 Guinean Francs at the primary level; (ii) a similarly high degree of variation in exam success rates, that range from 0 percent to 100 percent; and last but not least that (iii) there is no apparent correlation between these two indicators: schools with higher unit costs do not always achieve better results, and those with the lowest results are not always the ones with least resources.

Such results tend to raise an alarm over the capacity of the system to transform resources (with a cost) into results (especially in terms of learning). There are in fact a number of reasons why the relationship between cost and results is very weak. For instance, the unit cost is often strongly driven by the teacher cost, and thus the pupil-teacher ratio in each school; the cost of other inputs is often marginal compared to the teacher cost, and their potential effect is often less visible on such a general overview. More importantly, a number of factors influencing learning achievements cannot be directly (or at least easily) associated with a cost (pedagogical approaches, instruction time…). This calls for a more in-depth analysis of these factors, and of the institutional and pedagogical mechanisms involved in the transformation of resources into results.

2.2 ANALYSIS OF THE FACTORS ASSOCIATED WITH LEARNING OUTCOMES

Several factors influence the learning process at the school level. Figure 4.5 shows a temporal model of the production of knowledge/skills and illustrates how diverse factors can influence students' results.

FIGURE 4.5 - The Causal Analysis of Learning Outcomes



Note: The solid line arrows represent the relationships that are often studied whereas the dotted line arrows represent those that are usually not.

In this figure, the factors of learning outcomes are split into two categories: contextual (or non-school) factors, and educational policy (or school) factors.[33]

1) Contextual or non-school factors are those that relate to the environment beyond school and upon which education policy-makers have little power to act in the short term, including children's personal characteristics, their family context, or the social status of their parents. Although such factors can be highly associated with learning outcomes, and social policies addressing them do exist, they usually fall beyond the scope of education policy.

2) Educational policy and school factors do fall within the field of action of education policy makers on the other hand. They include school infrastructure, the learning materials, the professional characteristics and teaching modes, the monitoring of teaching staff and so on. These factors are usually presented as key determinants of learning outcomes, in as much as they affect the very heart of the learning process.

The arrows of Figure 4.5 illustrate relationships that may be current or historical. The arrows represent the process of how these factors affect learning outcomes. Students' earlier schooling and other historical factors appear as significant in the learning process at a given point in time. If the influence of this educational heritage is unquestionable, it is nevertheless difficult to obtain historical information on past school and non-school factors affecting students' learning process.

When some of the main factors affecting the learning process cannot be considered in the analysis, mistaken conclusions could be reached with respect to the effect of those factors that are considered. It is therefore necessary to use analysis techniques capable of simultaneously accounting for the main factors affecting the learning process and isolating their net impact, independently of the effect of other factors. In the literature, a variety of names are used to qualify this effect: the net impact, the net effect and so on. For simplicity's sake in this guide, the term *impact* is often used without the qualifying term net.

It is important to note that most methods generally used to identify factors which have an influence on learning outcomes are actually based on the analysis of the correlations between the occurrence of these factors and better, or lower, results. It is thus crucial to remember that this type of analysis is essentially descriptive, and that a lot of caution should be exercised when trying to attribute causality in these relationships: the analysis may show that such a factor is linked with higher results, but that factor may not be the cause of the better results; they can for instance both be the consequence of a common cause. Sub-section 2.2.2 indicates methods which allow for a better attribution of effects.

2.2.1 DESCRIPTIVE MODELS

The issue can be synthetically represented by the following equation, which presents learning outcomes as a function of a certain number of factors:
$Y = f(X_1, X_2, X_3, \ldots, X_k)$

Where:
- *Y* represents the level of learning measured by students results (test scores, exam success rates and so on); and
- Each X_k represents a factor whose association with learning outcomes is to be estimated (school status, teacher qualifications, the availability of textbooks, repetition and so on).

A measure of *Y* should then be chosen to represent learning outcomes, and the list of X_k factors to be included in the analysis should be drawn up. The relationship between each X_k factor and *Y*, materialised by the *f* function, can then be determined through econometric modelisation techniques (See Annex 0), and finally the correlation can be analysed to determine which of the X_k factors are statistically associated with *Y* and their respective levels of significance.
The equation is called the production function or the model of learning outcomes, or just the model.

The *Y* variable
The different measures of learning outcomes or indicators that can be used to represent *Y* were mentioned in Section 1 of this chapter. They mainly include:

- Student-level data: students' scores at a test or a standardised assessment; the average of students' results at an exam; exam success or failure rates and so on; and
- School-level data: averages obtained by schools at exams, tests or standardised assessments; schools' success rates for a given exam and so on.

The X_k variables
From whatever the factors that are included in the equation, the analysis of the determining factors will eventually isolate those factors that have a net impact from those that do not. The data related to the included factors are generally collected through survey questionnaires.[34] Generally speaking, this information includes:

- *Students' characteristics:* age, gender, ownership of textbooks, repetition status, parents' literacy, socioeconomic status of home, academic support provided at home (help with homework, participation in domestic chores and so on);
- *Teacher characteristics:* gender, academic qualifications, training received, degree of motivation and so on;
- *Type of pedagogical set-up:* type of class (single shift, double shift, multi-grade), class size, availability of teachers' pedagogical material, teaching practices, collaboration among teachers to resolve pedagogical issues and so on; and
- *School profile:* school status, school location, nature of the relationship between the

headmaster and teachers, involvement of parents in the management of the school and so on.

Just as a questionnaire is limited, it is not possible to include all the desired factors. Usually, interest determines which variables are given preference over others. To achieve a more global perspective of the range of questions that may be asked, education sector analysts may consult the questionnaires of assessments such as EGRA / EGMA (Early Grade Reading Assessment / Early Grade Mathematics Assessment), PASEC (Programme on the Analysis of Education Systems in CONFEMEN), or SACMEQ (Southern and Eastern Africa Consortium for Monitoring Educational Quality)[35]. School statistics annually collected by education ministries can also constitute a valuable source of information to determine which X_k factors to include in the model.

Explanation of the relationship between X_k and Y

To clarify the relationship between each X_k factor and Y it helps to consider that the f function is linear. The model can then also be described as:

$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + \ldots + a_kX_k$

The estimation of the coefficients through a linear regression allows estimating the "net impact" of each of their respective variables (all other variables being equal) that the analysis seeks to determine.

The technique to solve the equation and interpolate the results depends on the nature of the Y variable chosen (quantitative or qualitative). Annex 0 on the econometric method offers a presentation of the approach to the resolution of the equation and the interpolation of regression results.[36]

As mentioned earlier, it is often very difficult to reconstitute all the information relating to students' academic history that has an impact on their current achievements at school. There are four ways of dealing with this problem: (i) The first consists of considering that students' initial levels constitute an acceptable synthesis of their prior schooling factors (hence its distinctive inclusion in Figure 4.5); (ii) A second approach uses synthetic variables to represent prior education; (iii) A third approach accepts that it is impossible to include a realistic variable for prior schooling and conducts the analysis without one, although being careful to take this into consideration in the interpretation of results; and (iv) finally, the fourth approach uses alternative evaluation designs, such as the randomised impact evaluation (section 2.2.2).

Some learning assessments, such as those carried out by PASEC, organise tests for the same students twice a school year: one to establish their initial level at the beginning of the school year and a second, at the end of the school year, to measure their final level and establish the effective progress during the school year. The incorporation of the initial level as one of the explanatory variables in econometric models that modelise the final level then enables the measurement of the impact of school and non-school factors for the same initial level. Table 4.3 provides an example of such a modelisation, based on PASEC data, drawn from the Mali CSR, 2007.

EXAMPLE 4.6

(Econometric Modelisation of Prior Schooling Factors): Analysis of Prior Schooling Factors on the Basis of the Initial Level of Students' Learning Outcomes, Mali, 2006

Source: Adapted and Translated from the Mali CSR, 2007.

TABLE 4.3 - Modelisation of Grade 2 Learning Outcomes, Mali, 2006

	Model 1 (R^2=0.241)		Model 2 (R^2=0.242)	
	Coefficient	Sig.	Coefficient	Sig.
Student Variables				
Initial level	0.4258	***	0.4223	***
Female gender	- 0.0844	**	- 0.0780	*
Over-age	0.1241	**	0.1214	*
Repeated Grade 1	- 0.1915	***	- 0.1989	***
Repeated Grade 2	- 0.2373	***	- 0.2438	***
Teacher/Classroom Variables				
Teacher Variables				
Has the DEF (Basic Studies Diploma)	réf		réf	
Has a post-DEF qualification	- 0.3281	ns	- 0.3100	ns
Has less than a DEF qualification	- 0.3570	ns	- 0.3440	ns
Contract status (Ref: civil servant)	0.3034	**		
Basic training of 1 year or more			réf.	
Basic training of 1 year or less			0.3032	ns
Basic training of 1 to 3 months			0.3145	***
Received complementary training	0.0807	ns	0.0733	ns
Classroom variables				
Is Double-Shift	- 0.1997	ns	- 0.1836	ns
Is multi-grade	- 0.0634	ns	- 0.0657	ns
Class size	- 0.0017	ns	- 0.0020	ns
Is located in urban area	0.1125	ns	0.1346	ns
Constant	0.2181	ns	0.2212	ns

Note: *** Statistically significant at the 1% level; ** statistically significant at the 5% level;
* statistically significant at the 10% level; ns not significant.

Findings

A first observation of Table 4.3 is the weak degree of determination of the models, which, at the end of the day, only explain a small part of the fluctuations observed in the consolidated end-of-year test scores. The share of the variability of the scores that is "explained by the models" is 24 percent for Grade 2. Other explanatory factors of the level of student learning are thus still to be identified.

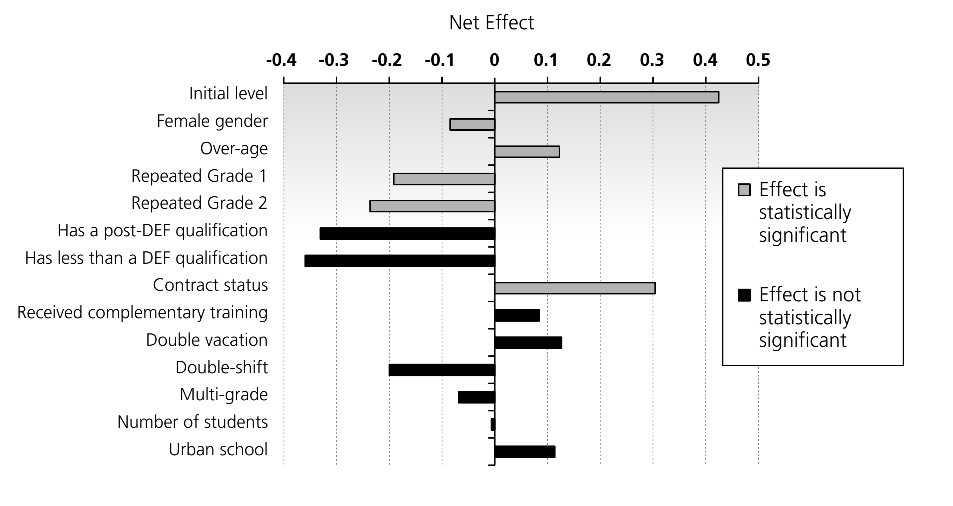
Pupils' initial level is the determining variable that has the greatest weight (the highest coefficient). Pupils with high initial levels are those who achieve the best final outcomes, all other things being equal. Among other individual characteristics, it is of note that girls' structural *progress is worse than that of boys (negative coefficient close to 10 percent). On the other hand, pupils older than the official school age progress with greater ease.*

The employment status and basic training of teachers cannot be considered simultaneously in the same model, the correlation between the two being too great. Both models considered differ therefore in including one or the other of these variables. Pupils whose teacher has contractual status make better progress (30 percent more) than those who are taught by civil servants (Model 1). When the status variable is replaced with one describing the basic vocational training, empirical results are just as clear: a short vocational training course (of one to three months) is preferable to longer training in as much as most pupils whose teacher has followed one such course make better progress (30 percent more) than pupils whose teacher followed longer training, or had none (Model 2).

Reflections on the status and level of initial training of teachers should not, however, be detached from those touching on issues such as teacher motivation, job stability and career advancement. Complementary training courses on the other hand, are far from producing the expected results: the results of pupils with teachers having followed one or several ongoing training courses are no better than those of pupils whose teachers followed none.

Figure 4.6 provides a graphic illustration of these findings.

FIGURE 4.6 - Net effect of factors linked to learning outcomes (Model 1)



The previous example is also an illustration of the danger of trying to attribute causality in results of such regressions. One can thus be tempted to interpret the negative coefficient of repetition in the model as a sign that repetition has a negative effect on learning outcome, and that reducing repetition would lead to improved results. However, it is much more likely that some students have difficulties in schools, for a range of unknown reasons, and that even after repeating, they remain weaker than other students. What is captured by the regression is two consequences (repetition and low results) of a same cause (weak student) rather than a causality effect.

The organisation of a test to measure the initial level of students' performance is expensive, both in terms of resources and time. In some circumstances, this may be plainly impossible because past data collected failed to consider the initial level of students' learning outcomes. This is particularly the case when an analysis is being performed where the level of learning is assessed only once at the end of the school year, either through the exam success rate or where data are not collected on a student by student level, but only at the school level.

Alternative approaches must therefore be explored. The most common practice consists of creating one or several synthesis variables for students' prior schooling. For instance, through the analysis of exam success rates, variables can be created to synthesise prior schooling by calculating an average of the school-level variables over three or four years. The modelisation of the factors affecting the quality of learning outcomes can be carried out at the school level with the help of these synthetic variables.[37] Annex 4.4 offers an example where the success rate at the primary leaving exam in Chad is modelised in this way.

BOX 4.1
RANDOMISED IMPACT EVALUATIONS

"Programmes and policies are designed to achieve a certain goal (or set of goals). Impact evaluations estimate programme effectiveness usually by comparing outcomes of those (individuals, communities, schools, etc) who participated in the programme against those who did not participate. The key challenge in impact evaluation is finding a group of people who did not participate, but closely resemble the participants, and in particular, the participants if they had not received the programme. Measuring outcomes in this comparison group is as close as we can get to measuring "how participants would have been otherwise." (termed, "the counterfactual"). Therefore, our estimate of impact is only as good as our comparison group is equivalent.

A Randomised Evaluation is a type of Impact Evaluation that uses random assignment to allocate resources, run programmes, or apply policies as part of the study design. Like all impact evaluations, the main purpose of randomised evaluations is to determine whether a programme has an impact, and more specifically, to quantify how large that impact is. Randomised evaluations are generally considered the most rigorous. They generate a statistically identical comparison group, and therefore produce the most accurate (unbiased) results."

Abstract from: http://www.povertyactionlab.org (accessed on 06/13/2012).

"Why Does Randomised Assignment Produce an Excellent Estimate of the Counterfactual?

As discussed previously, the ideal comparison group will be as similar as possible to the treatment group in all respects, except with respect to its enrolment in the programme that is being evaluated. The key is that when we randomly select units to assign them to the treatment and comparison groups, that randomised assignment process in itself will produce two groups that have a high probability of being statistically identical, as long as the number of potential participants to which we apply the randomised assignment process is sufficiently large. Specifically, with a large enough number of observations, the randomised assignment process will produce groups that have statistically equivalent averages for all their characteristics. In turn, those averages also tend toward the average of the population from which they are drawn."

Abstract from Gertler et al., Impact Evaluation in Practice, Word Bank, 2011.

2.2.2 ALTERNATIVE METHODS FOR THE IDENTIFICATION OF THE DETERMINANTS OF LEARNING OUTCOMES

Over recent years, alternative methods have been elaborated to improve the analysis of the relationships between factors and results, and sometimes try to establish an attribution of impact to some of these factors. Among the more renowned are the hierarchical econometric models (or multilevel models) and the experimental methods (in particular randomised impact evaluations). Each of these approaches has specific technical requirements, pros and cons:

- *Hierarchical or multilevel models:* such methods are linear regressions that aim to better estimate the model's coefficients. Indeed, as students are grouped together in classes, this method proposes to conduct a student-level analysis and cross the results with class-level ones (See Bryk and Raudenbush, 1992 for methodological details). Such methods enable one to estimate the impact of various factors simultaneously, but raise doubts with respect to the *all other things being equal* hypothesis when certain determining variables cannot be assorted with data and included in the econometric model being tested.

- *Experimental or randomised impact evaluation models:* the use of a random sample of schools (including a group that benefits from the action whose impact is to be assessed and a group that does not) enables one to ensure that the net impact of the action of interest is measured, all other things being equal, in as much as the two groups only differ in this one respect (the action being assessed). This approach does however carry the disadvantage, comparatively to the methods presented above, of only estimating the impact of one factor at a time (See Box 4.1; Asian Development Bank (2006); and Duflo et al. (2008) for further detail).[38] Where such impact assessments have been carried out in a country to measure the effect of a given policy or reform on learning achievements, it is worthwhile to use the results in the context of sector analysis.

2.3 THE ANALYSIS OF FACTORS' COST-EFFECTIVENESS

Section 2.2 has highlighted the fact that several factors can simultaneously have a significant impact on students' learning outcomes. However, given that education systems almost systematically face budgetary constraints, it is rarely possible to implement policies that address them all. It is therefore necessary to prioritise interventions to focus on some factors rather than others. Economists use cost-effectiveness analyses to establish a hierarchy of importance of the different factors and help policy-makers to implement more rational actions to achieve the expected results.

Mathematically, a factor A is considered to be more cost-effective than a factor B if the relation between the net impact of factor A and its unit cost is higher than the relation between the net impact of factor B and its unit cost.[39] To perform fair and precise comparisons, the unit costs of each factor must be harmonised to a same period of time, generally a school year. Example 4.7 illustrates the approach.

EXAMPLE 4.7 **(Analysis of the Cost-Effectiveness of Factors Affecting Quality)** ***Theoretical Illustration***

An evaluation of learning outcomes shows that the ownership of a math textbook favours the learning process and that the availability of a seat in class also has a net impact.

TABLE 4.4 - Comparative Analysis of the Cost-Effectiveness of Math Textbooks and Seats in Terms of Learning Outcomes

	Net Effect (% of Standard Deviation (SD) on results) (a)	**Annualised Unit Cost ('000s of currency unit- CU) (b)**	**Cost-Efficiency Ratio (a/b)**
Math Textbooks	15	1.2	12.5
Seat in Class	5	1	5

Findings

The net effect of owning a math textbook on school results is estimated to be 15 percent of a standard deviation. The cost of a textbook is estimated at CU 3,600. Given that the book has a useful lifespan of three years, the annualised cost is considered to be CU 1,200. The availability of a seat in class is estimated to have a net impact on school results equivalent to 5 percent of a standard deviation. The usual cost of a desk/chair unit for two students is CU 16,000, or CU 8,000 per student, and its lifespan is expected to be of eight years. Its annualised unit cost is therefore considered to be of CU 1,000.

Results show that math textbooks are more cost-effective than providing students with seats in class (the cost effectiveness ratio of 12.5 is higher for textbooks than that of seats, of 5).

When education ministries have sufficient resources, both math textbooks and class seats should be financed, as both inputs have a positive impact on school results. Where resources are limited however, and providing all students with both a textbook and a seat is not an option, a choice will have to be made: buying textbooks is more cost-efficient.

In the context of an education sector analysis, this type of finding could also be presented on a simple graph with the cost of each factor on the x-axis and the net effect of each factor on the y-axis. Such a graph could also easily include a greater number of factors while providing an intuitive interpretation of their respective impacts.

It is important in this analysis to be careful about the recommendations in terms of policies that one may be tempted to make. The impact of factors measured is a marginal impact, and the cost-effectiveness is calculated in reference to an average situation. There are however often some threshold effect which can be important, and some saturation effects. In the previous example for instance, the difference in learning outcomes between 3 or 2 students per bench might not be great, but if funding for seats were to be interrupted for many years and classes were to be without any seats, learning could be more noticeably affected. On the opposite, one would of course not want to purchase so many manuals that they are more numerous than students. One will therefore exercise caution in drawing conclusions and making recommendations.

2.4 INSTITUTIONAL ANALYSIS

Institutional analysis is used for assessing the capacity and efficiency of the administrative structures in charge of implementing education policies decided by policy makers. In countries where it is relevant, institutional analysis may be the subject of a full additional chapter of the education sector analysis. Administration institutional capacities depend on several factors that are worth analysing: i) skills and performance of staff; ii) performance of administrative structures ; iii) functioning of the public administration; and iv) political, economical and social context. Institutional analysis can be carried out by using different pieces of information: one-to-one or small groups interviews with education officers holding different kind of positions; official administrative texts (statutory and regulatory texts, Ministries of Education's organisation charts); staff database; and ad-hoc questionnaires to be used for evaluating existing staff profiles, training needs and functioning of the staff in charge of planning and management of education service delivery.

BOX 4.2
SUGGESTED QUESTIONS FOR THE APPRAISAL OF INSTITUTIONAL ACCOUNTABILITY MECHANISMS AND OF INCENTIVE FRAMEWORKS AND THE PRODUCTION, PUBLICATION AND USE OF RELIABLE PEDAGOGICAL MANAGEMENT DATA

Production of Management-Level Data

- Is there an information system that reliably collects annual data from each school (school database)?
- Is there a database of exam or learning assessment results? If so, are these data merged with the school database? Is data entered at the student level? Can each student be traced to their school?
- Did all the students tested sit the same exams (at the national or regional level)? Are marking policies and pass quotas identical for all students?
- Does the ministry compute comparable school-level indicators that synthesise school circumstances and context? Resources? Performance? Efficiency? (See Annex 4.6 that computes these indicators for The Gambia). If so, does the performance indicator take the relative difficulty of school contexts into account? (See Annex 4.7 describing the calculation of a school value-added indicator).

Diffusion of School Performance Data

- Is a statistical yearbook published each year? If so, who receives a copy?
- Are profiles or report card tools prepared (for schools, inspectorates, regions) including key indicators? (See Annex 4.8). If so, what information do they contain? Do they include comparative school data? Who is given a copy? Are they published where communities can access them?
- Is there another system to provide schools with improvement-oriented feedback on their performance? (See Annex 4.9 showing how information circulates in Cameroon). Is such feedback published where communities can access it?

Promotion of Stakeholders' Responsibilities and Accountability

- Have the expectations in terms of each stakeholder's contribution (regional directors, inspectors, pedagogical advisors, headmasters, teachers, school management committees, PTAs and so on) to improve quality been put in writing? If so, how many of the parties are aware of their responsibilities?
- Do incentives and disciplinary measures exist, according to whether parties respect their obligations or not? If so, are these measures effectively applied?
- What mechanisms exist to manage student and teacher absenteeism? Are these measures effectively applied?
- Where one exists, who chairs the school management committee? What responsibilities does the committee have in terms of improving quality? Do its members receive training to support the management of the school? Do local communities play a role in improving quality?

Inspection of and Support to Schools

- How often on average are schools visited for supervision or to receive advice?
- What criteria are applied to determine which schools to inspect/visit first? Are orders given for inspectors and pedagogical advisors to visit the least efficient and performing schools first? Are the most efficient schools visited to study their practices and share them as best practices with the least efficient schools?
- Are inspection reports made public? Are they shared with school management committees, communities, PTAs?
- Are the recommendations of inspectors and pedagogical advisors to the least performing schools followed by concrete actions to improve quality (training, exchanges with the best performing schools, support to children with special needs, measures to reduce student and teacher absenteeism and so on)?

Allocation of Resources and Incentive Frameworks

- Do schools receive an autonomous budget? If so, who decides how it is spent? Are such budgets used to finance school development/improvement plan?
- To what extent does the allocation of public resources to schools respond to equity considerations? Do schools in the most difficult contexts receive more resources?
- To what extent does the allocation of public resources to schools aim to encourage better performance? Do the best performing/most efficient schools receive more resources?

Additionally, in countries where the relation between resources and results is weak (see sub-section 2.2), the institutional analysis should assess the existence of institutional accountability mechanisms and tools that both give incentives and allow schools to best use the resources made available to them. In practice, the analysis can be carried out by studying existing statutory and regulatory texts and by interviewing panels of stakeholders including those responsible for the education system at different central and local levels, teachers, headmasters, supervisors, pedagogical advisors, PTA and union representatives. Box 4.2 provides a list of suggested questions for the evaluation.

SECTION 3 MANAGEMENT OF TEACHERS

Once an overall picture of quality has been drawn, and factors linked to quality have been identified, it is important to analyse the way key resources – and especially those identified as being linked to learning- are managed. Sometimes the analysis above will explicitly identify the level or nature of the teacher's training as a key factor of their students' learning outcomes; sometimes that information is not readily available for analysis, or the current or past quality of training is so low that differences are not significant. In any case, among the resources required to ensure an education of quality, teachers are the most important in as much as there is no teaching without teachers and that teachers constitute the first budget line of all education systems in terms of volume. Consequently, the analysis of the management of teachers (from the estimation of recruitment and training needs to their posting to specific schools, through the analysis of absenteeism and job satisfaction) constitutes the main priority of this section.[40] The analysis of the management and allocation of other resources will be dealt with in more summary fashion in the second part of this section.

3.1 QUANTITATIVE ASPECTS OF THE MANAGEMENT OF TEACHERS

3.1.1 RECRUITMENT

It is recommended to determine whether the recruitment process enables the hiring of the necessary number of teachers to achieve the education systems' planned goals, and the retention of the skills that are required for the job. The analytical approach proposed includes two steps:

◗ Step 1: Compare the annual rate of growth of teacher numbers over recent years with the growth rate required to meet demand

Information on the number of teachers actively teaching over recent years can be obtained through the planning services or human resource departments of the different ministries responsible for education. The national Civil Service Department may also have relevant data. Data from different sources should be crossed to review the coherence of statistics before computing the growth rates. Note that the work conducted in Chapter 3 to establish the importance of the salary mass in the education budget should constitute a good start with regards to the numbers and status of teachers.

In order to be able to make the comparison between existing numbers of teachers and projected needs, some hypotheses are required in order to establish these projected needs. These hypotheses are the results of elaborate sector planning work, involving the consideration of multiple aspects of the system. If a policy already exists on the matter, the numbers should be used. Otherwise (or even if it exists, in order to complement it), rapid calculations based on a couple of indicators allow for indicative numbers. The values for these indicators can be taken either from their current values or from benchmarks (the GPE indicative framework for instance). If possible, high and low scenarios can be drawn, which will produce a range of potential teacher needs. Box 4.3 presents the formulas used for the indicative estimation of the potential teacher needs.

BOX 4.3
ESTIMATION OF POTENTIAL FUTURE TEACHER NEEDS

The method for the estimation of potential future teacher needs differs slightly depending on whether each teacher is in charge of a class (typical situation in pre-primary and primary) or of a subject, for multiple classes (generally the case in secondary and higher education).

Pre-primary/Primary:

$$\textit{Number of teachers needed} = \frac{\textit{Projected number of students}}{\textit{Pupil - Teacher ratio}}$$

Secondary/Higher Education:

Number of teachers needed =

$$\frac{\textit{Projected number of students}}{\textit{Class size}} \times \begin{array}{c}\textit{Weekly number}\\ \textit{of hours for students}\end{array} \times \begin{array}{c}\textit{Weekly number}\\ \textit{of hours for teachers}\end{array}$$

Where: • the projected number of students can be estimated from the projected target population and the coverage objectives:

Projected number of students =
Projected Population of Corresponding Age x *Projected Gross Enrolment Ratio*

• the other indicators can be drawn from their current values or from international benchmarks.

On the basis of the historical data on number of teachers, it is possible to compute the growth rate of the number of teachers. See Annex 1.2 for a detailed description of this procedure. It is also helpful to disaggregate the growth rates obtained by type of teacher (government, contract, teacher-parents and so on) to analyse the specific dynamics of each.

On the basis of education systems' development objectives (particularly in terms of enrolment rates and student-teacher ratios), the same growth formula can be used to estimate the growth rates required to achieve their set objectives.[41] The comparison between the past growth rate and the rate required for future years provides an evaluation of the magnitude of the challenges faced (See Example 4.8 that provides an illustration of this approach based on Benin).

EXAMPLE 4.8

(Analysis of Required Growth in Teacher Numbers): Comparison of Past and Future Required Growth in Teacher Numbers, Benin, 2000-09

Source: Adapted and translated from the Diagnosis of the Teaching Issue in Benin, 2011.

TABLE 4.5 - Comparison of the Past Growth in Teacher Numbers with the Growth Required to Meet Future Demand, Government Schools, Benin, 2000-09

	Preschool	Primary	Secondary	Higher
Growth in Teacher Numbers*				
All Teachers (Government and Community)	22.9%	7.7%	9.3%	6.1%
Only Government Teachers (Permanent in the case of higher education)	0.4%	8.4%	-0.5%	7.9%
Growth Required to Meet Demand (2010-20)	9.1%	4.0%	12.1%	7.8%

Note : * 2005-09 for preschool; 2000-09 for primary; 2003-09 for secondary; 2002-08 for higher.

Findings

To meet education demand, the annual increase in number of teachers must be of about 9.1 percent for preschool, 4.0 percent for primary, 12.1 percent for general secondary and 7.8 percent for higher education. However, current rates of government recruitment are considerably lower, especially in preschool (just 0.4 percent per year) and secondary (number of teachers in fact drop by 0.5 percent per year). This indicates that teacher requirements will obviously not be met for these education levels under current recruitment trends. On the other hand, the situation is less pessimistic when considering the sector's entire teaching staff. This reveals the role that community teachers have played in satisfying staff requirements.

◗ Step 2: Establish what recruitment policies exist for different teacher types and examine how they are put into practice

The objective here is to examine what policies exist in terms of teacher selection. The suggested analytical approach is qualitative, and based on interviews (of the HR directors of the education ministries or of other bodies responsible for teacher recruitment) and the review of published rules and regulations. The purpose is to assess how key requirements such as academic qualifications, pre-service training, motivation and so on are taken into account in the recruitment process (See examples of questions to ask in Box 4.4 below). By nature, there are significant differences in the profiles of teachers recruited by the government and those selected by communities, that are helpful to get data about.[42]

BOX 4.4
SUGGESTED QUESTIONS FOR THE APPRAISAL OF RECRUITMENT POLICIES

1. What academic and professional qualifications are required of teacher candidates?
2. Is pre-service training compulsory?
3. Of what minimum duration?
4. What institutions are responsible for teacher recruitment (education ministries, the civil service commission, schools…)?
5. What is the process (registration with a professional association, application, admissions' exams…)?
6. How long is the period between recruitment and effectively starting to teach?
7. How frequent are recruitment campaigns?
8. Does teacher recruitment follow specific rules and regulations? Is a copy available to share?

3.1.2 TEACHERS ATTRITION

In addition to the additional numbers of teachers needed to cover the future needs, recruitment and training of teachers will also have to compensate for the teachers who will leave the profession; this phenomenon is called teacher attrition. The analytical approach to the estimation of teacher attrition involves the assessment of the number of teachers that abandon the profession, voluntarily or involuntarily, and the review of the causes. The attrition rate is estimated with the following formula where T_y designates the number of active teachers during year y and N_y the number of new recruits during year y:

$$\textit{Attrition rate for year } y = \frac{T_y - (T_{y+1} - N_{y+1})}{T_y}$$

This estimation can be carried out for several years, and the average over a 5 or 10 year period can be computed. It is important that all teachers are included in the computation, including those recruited by communities. Where possible, it is helpful to disaggregate the data and calculations by teacher type (civil servants, contract teachers, community teachers and so on), which will enable the identification of the categories of teachers that abandon the profession most. In that case, caution should be given to distinguish between the teacher really leaving the profession and those changing status (community teachers becoming contract teachers, or contract teachers becoming civil servants for instance).

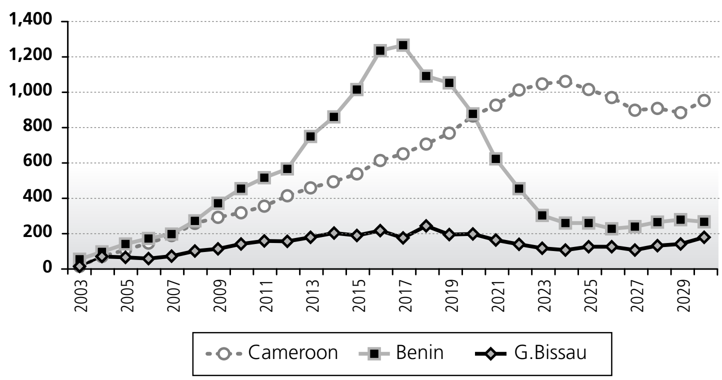
Once the rate of attrition is known, its causes, as well as the corrective measures implemented, should be analysed. Indeed, departures from the profession may have multiple causes, such as retirement, death, prolonged illness, professional mobility, or resignation. Retirement constitutes the most frequent cause of departure, which it is usually possible to estimate for planning reasons, especially to include the numbers in the estimation of the needs relating to new teacher recruitment and training. Indeed, by using the retirement conditions imposed on teachers in each country (such as the maximum teaching age of 60 years, or the maximum duration of service of 30 years), it is possible to project future retirement numbers based on age and seniority data. Example 4.9 illustrates this approach for three countries.

EXAMPLE 4.9

(Projection of Retirement-Related Attrition): Estimation of Retirement-Related Departures from the Teaching Profession in Cameroon, Benin and Guinea-Bissau, 2003-30

Source: Adapted from UNESCO-Pôle de Dakar, 2004.

FIGURE 4.7 - Projected Number of Retirement-Related Departures among Permanent and Contract Teachers, Cameroon, Benin and Guinea-Bissau, 2003-30



Findings

The number of teachers due to retire is set to increase in all three countries, exceeding 1,000 departures by year in Cameroon and Benin. The peak of departures will occur in 2017-18 for both Benin and Guinea-Bissau, with over 1,250 and 250 departures by year respectively. In Cameroon the peak will occur in 2024, with about 1,100 departures per year. These significant numbers will require a consequently greater recruitment effort on behalf of the respective governments to meet the UPE objective, but should also be taken into account over subsequent years, to maintain the required number of teachers.

The analysis may be completed through a qualitative approach that aims to review the measures undertaken to compensate for the expected teacher attrition. Interviews may be held with headmasters, school inspectors and education ministry HR directors (See Box 4.5 for suggested questions).

BOX 4.5
SUGGESTED QUESTIONS FOR THE APPRAISAL OF TEACHER ATTRITION

1. What procedures are usually followed in cases of teacher attrition?
2. Do institutional or statutory mechanisms exist that contemplate the replacement of teachers? If so, what are they?
3. How are these measures effectively applied?
4. How much time elapses between a teacher's departure from a school and their replacement?

3.1.3 TEACHER TRAINING

The purpose of this section is to establish education sectors' needs in terms of teacher training and to examine their capacity (both quantitative and qualitative) to supply them. In this perspective, the analytical approach should cover the following steps.

Step 1: Evaluate requirements in teacher training

This evaluation should cover both needs in terms of pre-service training (for the new recruits required for the system's development) and in terms of in-service training (for active teachers who were never trained or whose training is insufficient).

On the basis of the established required growth in teacher numbers (See Section 3.1.1 above) and the additional number of teachers that will be needed as a result of attrition

(See Section 3.1.2), it is possible to compute the overall requirement for new teachers in need of pre-service training (See Table 4.6).

TABLE 4.6 - Example of Projected Annual New Teacher Requirements Provided by an Education Ministry, 2010-20

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Annual Average
Preschool	232	224	236	248	258	268	276	242	273	284	242	**253**
Primary	2,014	2,131	2,248	2,358	2,457	2,546	2,988	3,117	3,454	3,676	3,913	**2,809**
Lower Sec.	1,036	1,624	1,829	2,060	2,880	3,020	3,439	3,155	3,484	3,940	4,456	**2,811**
Upper Sec.	343	359	385	414	452	868	783	670	730	841	927	**616**

In terms of ongoing training requirements, it is necessary to use data on the qualifications and training received by active teachers, often available from the planning services of the education ministries (See Table 4.7). The main requirement in terms of in-service training is based on the number of active teachers having received no pre-service training.

TABLE 4.7 - Example of an Extract of an Education Ministry's Teacher Database

Region	Catchment Area	School	Teacher Reg. Number	Teacher Qualification	Pre-service Teacher Training?
Region 1	CA 1	EPP1	1010111	O' Level	Yes
Region 1	CA 1	EPP2	1010112	A' Level	Yes
Region 1	CA 2	EPP5	1010113	O' Level	No
Region 1	CA 3	EPP51	1010116	A' Level + 1 year of Uni.	No
Region 2	CA 4	EPP61	1010119	O' Level	Yes
Region 2	CA 4	EPP62	1010120	O' Level	No
Region 2	CA 4	EPP63	1010121	O' Level	Yes

With the help of the information gathered, a synthetic table can be compiled (See Table 4.8).

TABLE 4.8 - Template for the Presentation of Annual Teacher Training Requirements

	Pre-Service	In-Service
Preschool		
Primary		
Lower Secondary		
Upper Secondary		
TVET		

◗ Step 2: Compare current teacher training institutes' capacities with projected system needs

This analysis enables one to estimate the gap between projected needs and the system's capacities to train teachers. This requires the collection of data on the physical capacity of teacher training institutes. To illustrate this approach, the example of Benin is used below.

EXAMPLE 4.10

(Analysis of Past Growth and Future Needs in Teaching Staff): Compared Analysis in Past Growth and Future Teaching Staff Requirements, Benin, 2009/10

Source: Adapted from the Diagnosis of the Teaching Issue in Benin, 2011.

Table 4.9 shows the global capacity of basic teacher training infrastructure, for teachers of preprimary, primary and lower secondary, where the greatest needs are felt.

TABLE 4.9 - Physical Capacities and Requirements in Pre-service Teacher Training, Government Teachers, Benin, 2009/10

	Basic Teacher Training Institutes	Usual Physical Capacity	Student-Teacher Numbers	Current Duration of Basic Training	Annual Output	Annual Need for Teacher Training
Preschool	01 ENI : • Allada	300	347	2 years	174	258
Primary	05 ENI : • Porto-Novo • Abomey • Djougou • Dogbo • Kandi	300 × 5 = **1,500**	2,157	2 years	1,079	2,107
General Secondary (Lower and Upper)	02 ENS : • Porto-Novo (Humanities) • Natitingou (Sciences)	225 (Only Natitingou)	109 (Only Natitingou)	3 years	75	2,209

Note: * ENI (École Nationale d'Instituteurs) and ENS (École Normale Supérieure) are common names for teacher training institutes in Francophone countries.

Findings

The total basic training capacity is for 300 teachers of the preschool level. Each of the primary teacher training institutes caters for that same number, providing a total of 1,500 seats for the primary level. However, the number of teacher trainees undergoing training in academic year 2009/10 largely exceeded these figures, which may well translate into poor training conditions and supervision rates. However, on the basis of these figures and considering the duration of the course, the number of teachers that could effectively be trained falls to about 175 for preprimary and about 1,080 for primary, whereas respective yearly needs in terms of basic training over the coming years are about 250 and 2,100. The gap between the training capacity and the system's needs therefore appears to be considerable for these two levels; it would increase further still if the private sub-sector was taken into account.

The same analytical approach leads to an even greater gap for lower secondary: the number of teachers that can receive training is just 75 per year; effective needs are 30 times higher. However, it should be noted here that secondary teacher training institutions have been closed since 1987 and whereas all primary training centers have gradually reopened from 2008 onwards, only the Natitingou center has reopened to cater for the secondary level, since 2009/10. Even with the full re-opening of the other two centers, the total number of places per year would barely stretch to 150 (= 75 x 2), far from the required level.

The same kind of analysis should be conducted for in-service training, comparing physical capacity with projected requirements.

3.2 QUALITATIVE ASPECTS OF THE MANAGEMENT OF TEACHERS

3.2.1 QUALITY OF TEACHER TRAINING

Three complementary approaches can be used to appraise the quality and effectiveness of the training received by teachers.

A first approach consists of using evaluations that relate teachers' professional training with students' learning outcomes. Education sector analysts can refer to Section 3 of this chapter that explains how econometric models can estimate the size of the correlations of different training courses with learning outcomes.

A second approach is to rely on data from the evaluation of teachers' pedagogical skills that are conducted in some countries, such as Guinea-Bissau, The Gambia or Mauritania. In Guinea-Bissau for instance, over 90 percent of teachers sat math and Portuguese tests in exam conditions, as well as having to complete a survey questionnaire (See Example 4.11).

Finally, *a third approach*, more qualitative and complementary to the first two, consists of conducting a series of interviews of the heads of teacher training institutes and/or the institutions that use their services (Divisions of examinations and admissions procedures, Divisions of pedagogical inspections and so on). Box 4.6 provides suggested questions for such interviews.

EXAMPLE 4.11

(Use of Competency Assessments to Evaluate the Quality of Teacher Training): Evaluation of Teachers' Skills through Skills Assessments, Guinea-Bissau, 2009

Source: Adapted from the Guinea-Bissau CSR, 2010.

The skills assessments used in Guinea-Bissau were of intermediate difficulty in order to appreciate the full range of teachers' competencies, considering the variety of teacher statuses. The results have enabled the establishment of a detailed database that distinguishes between basic knowledge and teaching skills (See Table 4.10).

TABLE 4.10 - Share of Teachers with Insufficient Skills, Guinea-Bissau, 2009

	Primary	Lower Secondary
Teaching of Portuguese	64.5%	41.7%
Teaching of Math	41.7%	22.6%
Teaching of Sciences	38.0%	17.7%
Pedagogy and General Teaching Skills	30.7%	22.2%
Multi-grade Class Management	12.4%	3.7%
Control and Teaching of Large Groups	5.4%	4.2%
Reinforcing Academic Skills	12.4%	17.2%

On the basis of this data, three teacher profiles have been established, covering both their academic and pedagogical skills (in Math and Portuguese):

- Teachers in great need of improved skills (Profile 1);
- Teachers with satisfactory skills (Profile 3); and
- Teachers considered average (Profile 2).

Crossing the overall skill levels in teaching Portuguese and those in teaching math enables one to draw up a map of teacher training needs (See Table 4.10 for an illustration of this at the primary level).

TABLE 4.11 - Map of Primary Teachers' Skill Gaps in Math and Portuguese, Guinea-Bissau, 2009

		MATHEMATICS		
		Profile 1	**Profile 2**	**Profile 3**
PORTUGUESE	**Profile 1**	9.9%	9.2%	1.4%
	Profile 2	11.7%	35.2%	10.5%
	Profile 3	1.2%	12.8%	8.2%

Findings

Table 4.11 shows that 9.9 percent of teachers (dark grey cell) combine skill deficits in both Portuguese and math, whereas 66.8 (=35.2+10.5+12.8+8.2) percent of teachers have average to good levels in both subjects (uncoloured cells). On the basis of this simple map a training programme and supporting tools can be elaborated.

The results of these analyses and surveys enable one to estimate the number of teachers that require further training and the number that must be added to the number of new untrained teachers to reach the overall demand for in-service training.

BOX 4.6
SUGGESTED QUESTIONS FOR THE APPRAISAL OF THE QUALITY OF TEACHER TRAINING

1	How are teacher training candidates chosen? How are they assessed during and at the end of the course to ensure they acquire the required skills?
2	Do candidates' knowledge/skill levels at admission enable them to follow the course efficiently?
3	Do the recruitment procedures attract candidates with the expected profiles?
4	Does the academic content of the courses enable candidates to acquire the required teaching skills? What should be improved in this respect?
5	Is the subject content aligned with the classes teachers are later expected to teach? Does it reflect curriculum reforms potentially underway, such as the BEAP (Basic Education in Africa Programme) and the CBA (Competency-Based Approach)?
6	What is the proportion of the course devoted to teaching practice?
7	Is the course duration optimal?
8	What is the best type of course organisation to effectively train a great number of teachers (Classes, CD-Roms, e-Learning)?
9	Do assessments cover all the facets of the course (academic knowledge, pedagogical skills and teaching practice)?
10	Do the assessments effectively ascertain that trainees have indeed acquired the skills required to teach?
11	Is the number of trainers sufficient? Do they have the necessary profile to train teachers in their respective areas?

3.2.2 TEACHER POSTINGS ACROSS SCHOOLS

The analysis of the consistency of the posting of teachers throughout a country is a fundamental management issue, that is linked to the principle of equity in learning conditions that would have the number of teachers in a school be proportional to the number of students. Thus, all schools with approximately the same number of students should have a comparable number of teachers.

In practice, there are a number of legitimate reasons for two schools with the same number of students to have different numbers of teachers. There may be positive discrimination policies, providing better schooling conditions (including more teachers) in schools operating in more difficult contexts. There may be some effect of the class sizes: without multigrade teaching, two classes of 20 students require two teachers, while 40 students in the same class may need only one teacher. More often however, some less controlled reasons explain the differences in teacher distribution, and when these differences are wide, they generally signal distribution phenomena that are not well controlled and are inequitable.

The analysis can be performed in two steps. The first consists of adopting a quantitative approach that determines the degree of consistency in the posting of teachers nationwide, by evaluating the relation between the number of students and the number of teachers by school. The second consists of a qualitative approach that researches the reasons of potential imbalances, analyzing the institutional procedures and technical tools for teacher posting, both in terms of rules and regulations and in terms of their effective application.

◗ Step 1: The quantitative analysis of the consistency of teacher posting among schools

In the context of the quantitative analysis, it is necessary to distinguish between two types of situation, where:

1) A single teacher is responsible for a class, as is generally the case for preschool and primary. Here the relation between the number of students and the number of teachers per school will be used; and

2) A teacher covers various classes or a class has various teachers, as is often the case for secondary, TVET and higher education. Here the total learning time (measured in hours of teaching service supplied) per school should be compared to the total number of hours needed for all students of the school.

The recommended approach consists of using school-level data on the number of students and the number of teachers (or the number of teaching hours for the cycles where students have several subject-specific teachers[43]), and plotting both on the same graph. To evaluate the consistency in the posting of teachers at the national level and to compare this with neighbouring countries, the R^2 determination coefficient is generally used. The value of this coefficient is between 0 and 1: the closer to 1, the greater the relationship between the number of students and the number of teachers. Conversely, R^2's complementary coefficient ($1-R^2$, usually called the degree of randomness) measures the share of teacher postings that are explained by factors other than the number of students in a school.[44] The greater the degree of randomness, the greater the inconsistencies in teacher posting.

R^2 can be easily determined through a graph created with the help of an Excel-type spreadsheet (See Annex 4.1). The interpretation of R^2 and $1-R^2$ can then be carried out in an historical perspective (analyzing how the coefficient has evolved over recent years) or in an international one. The following example, based on the Burkina Faso CSR, shows how to present and interpret such an analysis.

The same analyses can be carried out for each region to appraise the consistency in the posting of teachers inside each, especially when part of the teacher distribution process is done at the sub-national level. Furthermore, a complementary approach to the analysis of the consistency in teacher distributions consists of comparing the differences in the pupil to teacher ratios (PTR) for each region, district or other geographic unit.[45] This provides an additional and helpful perspective in terms of education sector management, given that it enables the identification of potential imbalances and their precise location.

Finally, it is advisable to compute the share of schools for each geographic sub-division that are under-endowed or over-endowed in comparison with the average PTR. For this, each school's PTR must be calculated and compared to the average to determine the respective shares.

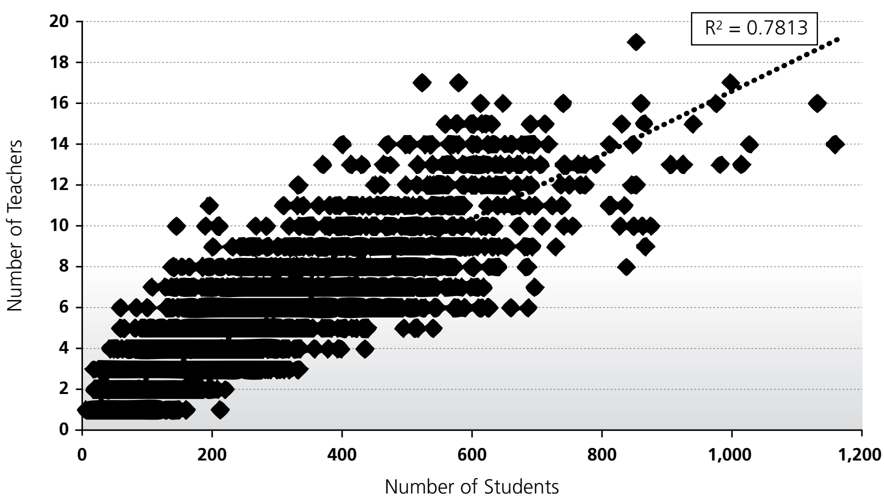
EXAMPLE 4.12

(Analysis of the Consistency of Teacher Postings): Consistency in the Posting of Primary Teachers, Burkina Faso, 2006/07

Source: Adapted from the Burkina Faso CSR, 2009.

The data used in this example are drawn from the education ministry planning service's 2006/07 statistical database. The distribution of teachers only covers government schools as these are the only ones financed by the state. Figure 4.8 gives a glimpse of the situation in 6,960 government primary schools in terms of enrolment (the x-axis) and teacher numbers (the y-axis).

FIGURE 4.8 - Consistency in the Allocation of Teachers among Government Primary Schools, Burkina Faso, 2006/07



Findings

Generally speaking, there is clearly a positive relationship between the two variables considered in Figure 4.8, meaning that the greater the number of children enrolled, the higher the number of teachers. However, there are considerable variations around the average. For instance, among schools with approximately 400 students, the number of teachers ranges from 4 to over 10. There are clearly some consistency issues in the distribution of teachers at the school level.

A complementary approach to assessing the situation in Burkina Faso consists of comparing it with other countries' situations. Table 4.12 shows the degree of randomness in the distribution of primary school teachers for a sample of African countries.

Findings

In Burkina Faso, the value of R^2 is 0.78. The degree of randomness in the teacher distribution process, measured by the 1- R^2 value, is thus 0.22. This indicates that approximately 22 percent of the teacher posting process among government primary schools is not related to the number of students but rather to other factors. Burkina Faso's situation is thus close to the sample average, of 25 percent. Scope for progress therefore exists in making the postings across the country more equitable and coherent. Guinea, which adopted a highly structured plan of teaching staff reposting a couple of years ago, may be considered as a leading example.

TABLE 4.12 - Degree of Randomness ($1-R^2$) in the Distribution of Primary Teachers, 24 African Countries

Country	Randomness (%)	Country	Randomness (%)
Burundi	51	**Burkina Faso**	**22**
Cameroon	45	Rwanda	21
Congo, The	40	Mauritania	20
Togo	37	Zambia	20
Malawi	34	Chad	20
Uganda	34	Niger	19
Côte d'Ivoire	33	Senegal	19
Ethiopia	29	Guinea-Bissau	16
Madagascar	28	Mozambique	15
Mali	27	Namibia	15
Gabon	26	Guinea	9
Central African Republic	24	São Tomé and Príncipe	3

◗ Step 2: Analysis of the process of teacher posting to schools

Potential consistency issues in teacher posting may have multiple causes that it will be helpful to review with care. Several factors may be combined, although broadly speaking they are of two kinds:

1) Lack of definition of administrative procedures, as set out in rules and regulations. Indeed, teacher distribution procedures may be more or less transparent, and the criteria

used for decisions may vary. The situation may be worsened by the lack of capacities of the unit responsible for the process; and

2) Lack of respect for the procedure, even when this is clearly defined and transparent. This case shows that administration is satisfactory but subject to contextual pressures. There are usually two stages in such cases: (i) the technical elaboration of a posting plan; and (ii) the review and validation of this plan. It is at this second stage that decisions are subject to environmental pressure, in the form of political intromission, or from teachers themselves, according to their personal preferences.

These two categories are simplifications and in truth a variety of situations will be encountered, resembling one or the other to some degree. The analysis of the situation must highlight the specificity of each country through personal interviews of the education ministry's HR directors or the officials responsible for the posting of teaching staff (See Box 4.7).

BOX 4.7
SUGGESTED QUESTIONS FOR THE APPRAISAL OF TEACHER POSTING PRACTICES

1 Are teacher postings determined according to specific procedures? Have these been published as a regulatory guide? What are the exact criteria?

2 Are these procedures effectively followed? If so, how?

3 What difficulties are encountered in the application of the procedures?

4 What services are responsible for teaching staff postings?

5 How are the officials responsible for staff postings recruited?

3.2.3 JOB SATISFACTION AND SOCIO-PROFESSIONAL CONTEXT

Job Satisfaction

The evaluation of teachers' job satisfaction requires specific tools and data. Some international assessments are helpful, such as the PASEC assessments that include a question about teachers' willingness to keep their job or their wish to change (See Box 4.8 below). Nevertheless, the analyst should keep in mind that such answers are self-reported. It is then recommended to cross-check those answers with all other available data source on the subject. Generally speaking, all available studies on teachers' job satisfaction and/or motivation should be used in the analysis.

BOX 4.8
PASEC QUESTIONS FOR THE APPRAISAL OF TEACHERS' JOB SATISFACTION

69 If you were to choose your profession again, which of the following fields would you choose
(Tick the appropriate box)

- ☐ Medical
- ☐ Legal
- ☐ Agricultural
- ☐ Administrative
- ☐ Technical
- ☐ Financial
- ☐ Commercial
- ☐ The same again

The Socio-Professional Context

The analysis of the socio-professional context in which teachers work enables the assessment of the mechanisms that exist for the discussion, debate and dialogue of educational issues. In this perspective, interviews can be conducted with social stakeholders (such as teacher union representatives, PTAs and so on) to touch on several thematic issues. Annex 4.2 presents a synthetic table of the various dimensions that can be dealt with, and Annex 4.3 offers an example of a questionnaire derived from this table and used in the context of the Benin diagnosis of the teaching issue.

Let's note, to conclude this section, that the World Bank, with its partners, has developed a set of frameworks related to various aspects of an education system, called SABER (Systems Approach for Better Education Results). One of those frameworks, related to teachers, is described in Box 4.9; some others, related for instance to EMIS, school autonomy and accountability, or finance, can prove useful for carrying out the insitutional analysis described in section 2.4 of this chapter.

BOX 4.9
SABER (SYSTEMS APPROACH FOR BETTER EDUCATION RESULTS) – TEACHERS

The World Bank, with its partners, has developed a framework of tools, indicators and benchmarks called SABER. SABER - Teachers documents teacher policies for public schools in developed and developing countries to inform policy choices and promote policy dialogue, globally.
The objective is to produce a systematised set of knowledge products from the experience of top-performing countries tackling different issues related to teacher policies (e.g., teacher training, incentives or accountability). SABER - Teachers aims at enhancing the ability of education analysts, planners and decision makers to draw on all of the knowledge that the Education Sector generates.

In practice, **SABER – Teachers:**

- **classifies and analyses education systems around the world according to 8 core teacher policy goals to which all education systems should aim.**
- **collects information on 10 core teacher policy areas in education systems around the world by administering a set of questionnaires to key informants and gathering both qualitative and quantitative data, validated by legal documents.**
- **shares knowledge products to provide maximum impact in driving teacher performance through an interactive website, print materials and workshops. Finally, SABER - Teachers hopes to be a knowledge connector, leading policy dialogue on teacher policies and embracing a collaborative approach to improve the quality of teaching.**

8 core teacher policy goals were selected because (i) they are related to either student or teacher performance through theory and/or evidence; (ii) they are priorities for resource allocation and; (iii) they are actionable (i.e., governments can have a direct influence on them through policy reforms).

Education systems are classified as being more or less advanced in each of these goals on four levels (Latent, Emerging, Established and Mature). This policy goal framework is used to produce Country Reports, which consist of tailored analyses for specific countries.

SABER - Teachers collects information on teacher policy areas by administering questionnaires among key informants in countries. Data are collected by a local consultant in each country. The local consultant uses a set of questionnaires which are designed to interview key informants and collect data on teacher policies. Local consultants are required to validate the data they submit by checking the information provided by key informants against the relevant laws and regulations that back them up.

The 10 core teacher policy areas are:

- Requirements to enter and remain in teaching
- Initial teacher preparation
- Recruitment and employment
- Teachers' workload and autonomy
- Professional development
- Compensation (salary and non-salary benefits)
- Retirement rules and benefits
- Monitoring and evaluation of teacher quality
- Teacher representation and voice
- School leadership

SECTION 4

THE MANAGEMENT OF OTHER RESOURCES AND OF TEACHING TIME

4.1 MANAGEMENT OF RESOURCES OTHER THAN TEACHERS

The most important analysis to carry out with respect to the management of other teaching inputs (material and pedagogical resources or financial subsidies) is the study of the consistency of their allocation among schools. As for the consistency in the posting of teachers (See Section 3.2.2), the analysis is based on the principle of equity in the learning conditions offered to children i.e. all resources allocated in proportion to schools' needs. In the absence of specific positive discrimination policies, these needs are assumed to correspond to the number of students (or teachers/class).

To illustrate, the methodology of analysis of the consistency in the allocation of textbooks is presented below, considering that the same tools and indicators can be used to analyse the consistency in the allocation of any other type of education input made available to schools.

As for the analysis of teacher postings, there are two complementary approaches to evaluate the degree of consistency in the allocation of textbooks: (i) The first consists of the comparison of the student-textbook ratios, by subject and geographical area (region, district, community or school). This enables one to reach a measure of the scale of the gaps with respect to the national average and to identify the schools/areas that are under-endowed or over-endowed; and (ii) The second uses the R^2 determination coefficient (and its complement the degree of randomness 1- R^2) to provide a measure of the degree of consistency between the number of textbooks and the number of students, on a school by school basis. The R^2 coefficient can be calculated both at the national level to measure the overall degree of consistency, but also for each geographic area, to compare the management performance of each. Annex 4.1 explains how to compute the R^2 coefficient with the help of a spreadsheet.

Note that, especially in contexts where the curricula have changed, this analysis should relate to, or at least distinguish, the number of manuals, or teacher guides, which are actually relevant to the current curriculum. It is also important to note that collecting data on learning materials often proves difficult. School censuses are often not very efficient in doing so, partly because of the incentives for schools to under-report their stocks in the hope of getting more materials. Even through school surveys, it is often difficult to distinguish between existing materials and those that students really have access to (in many cases, materials are deemed so precious that they are ironically kept away from children). Particular attention should be paid to the data, and caution should be exercised when analysing it.

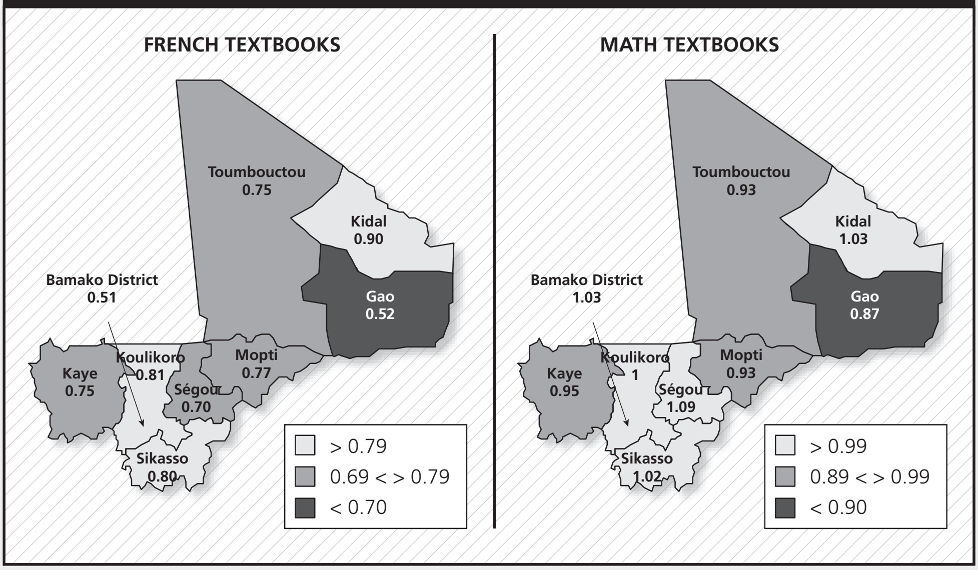
Example 4.13 is based on the analysis of the consistency of French and math textbook management in Mali, offering a practical illustration of the approach. This example has the further advantage of presenting the results in a mapped form, which is more intuitively understandable to policy-makers.

EXMPLE **4.13** **(Analysis of the Consistency in the Allocation of Other Educational Inputs): Analysis of the Consistency in the Allocation of Primary Textbooks, Mali, 2007/08**

Source: Adapted and translated from the Mali CSR, 2010.

Map 4.1 and Table 4.13 present the degree of divergence of the textbook to student ratio from the Malian national average, by region.

MAP 4.1 - Textbook-Student Ratio, Public and Community Primary Schools, Mali, 2007/08



Findings

In Malian primary schools, the average French textbook to student ratio (not shown on the map) is 0.73 (meaning that approximately 3 students share two books) whereas the average math *textbook to student ratio is 1 (each student has their own book). The maps show that in both cases, the regions of Timbuktu, Mopti and Kayes are roughly aligned with the national average, whereas Gao is significantly below it, indicating that the shortage of textbooks is relatively acute. For French, with a ratio of 0.52, two students must share a book in Gao, compared to Kidal that almost provides a book to every student (ratio of 0.90). Indeed, the regions of Kidal, Koulikoro and Sikasso's ratios are above the national average, indicating that their students are comparatively better endowed, in both subjects. The district of Bamako faces both an acute shortage of French books, in line with Gao, and a comparatively good endowment of math books, in line with Kidal. Overall, national disparities are significant.*

TABLE 4.13 - Degree of Randomness (1-R^2, %) in the Allocation of Textbooks in Government and Community Primary Schools, by Region, Mali, 2007-08

	French	Math
Mali	73.6	79.5
Region		
Bamako	95.0	93.6
Gao	92.4	94.3
Kayes	81.0	83.8
Kidal	29.4	36.4
Koulikoro	76.1	74.6
Mopti	73.8	80.7
Segou	77.1	87.7
Sikasso	58.7	69.4
Timbuctoo	70.3	74.5

Findings

Strong inter-regional disparities are evidenced by Table 4.13. Overall, the degrees of randomness in the allocation of textbooks are 73.6 percent for French and 79.5 percent for math, both of which are high and underline the broad scope to improve the management of the resources. A more detailed analysis shows that in the worst cases (Bamako and Gao), the randomness is almost total, and for most other regions it is high. Kidal is the exception, with degrees of randomness of 29.4 percent for French textbooks and 36.4 percent for math books; the region should be used as an example of textbook management by other regional education managers.

Finally, there is a method that provides a more precise analysis than the above, which consists of using the notion of useful textbooks. Indeed, students gain no benefit from having more than one textbook in a given subject, so the surplus can be withdrawn from the computation of the textbook to student ratios. This adjustment in the calculations requires the use of data by school and grade. The ratio of useful textbook to student is capped at 1 for a given grade and subject if the number of books effectively available is higher than the number of students enrolled at this grade. Table 4.14 presents a theoretical example of how to compute this ratio. The same adjustment can be made for teaching guide-books.

TABLE 4.14 - Computation of the Textbook-Student and Useful Textbook-Student Ratios, by Grade					
	Textbooks	**Students**	**Textbook-Student Ratio**	**Useful Textbooks**	**Useful Textbook-Student Ratio**
Grade 1	150	100	1.5	100	1
Grade 2	150	100	1.5	100	1
Grade 3	150	100	1.5	100	1
Grade 4	150	100	1.5	100	1
Grade 5	0	100	0	0	0
Grade 6	0	100	0	0	0
Total	**600**	**600**	**1**	**400**	**0.67**

4.2 MONITORING EFFECTIVE TEACHING TIME

The study of teacher absenteeism and more broadly of the loss of effective teaching time requires data that are often available at the school level but cannot be consolidated at the district, regional, or national level for a number of reasons. Given the negative impact that this phenomenon can have on education systems (reduced contact time, full curricula not covered, weak learning outcomes and so on); it is important to reinforce the collection and consolidation of such data.

There are many causes of loss of effective teaching time. Teacher absenteeism is one of them. But it is also not uncommon that school years are curtailed due to late starts (teacher posting decisions may be taken late, or effective postings may be delayed), because classes are suspended early to prepare for exams, or due to other reasons. When data permits, it is advisable to cover as many of these factors as possible.

Abadzi (2009) developed a good practice that education sector analysis teams are advised to follow: she developed an analytical model of instructional time loss (See Figure 4.9). On the basis of a survey conducted among a sample of classes using spontaneous observations (impromptu visits), it is possible to quantify the different causes of effective teaching time loss in reference to the official number of school programme hours.

FIGURE 4.9 - Abadzi's Model of Instructional Time Loss

- Intended class time as allotted by a government (e.g., 200 days or 1,000 teaching hours)
- Time remaining after school closures (strikes, in-service training, extra holidays, weather)
- Time remaining after teacher absenteeism and lateness
- Time remaining after student absenteeism
- Class time devoted to any learning task
- Learning time relevant to curriculum

Many of these factors need to be assessed during a school visit. For some of them (teacher absenteeism for instance), these visits have to be unannounced for the assessment to be reliable. Ideally, it would be the responsibility of the inspectorate to conduct these visits, as part of their mandate, and compile the information at a central level. However, for practical and sensibility reasons (these teacher assessments would be nominative), the information is not so readily available. Specific surveys can however be conducted, with explicit authorisations from the government and the inspectorate to conduct unannounced visits.

Example 4.13 presents an illustration of the application of this approach in the case of Mali, in the context of a research project supported by USAID.

EXAMPLE 4.14

(Abadzi's Model of Instructional Time Loss): Analysis of Lost Teaching Time, Mali, 2009/10

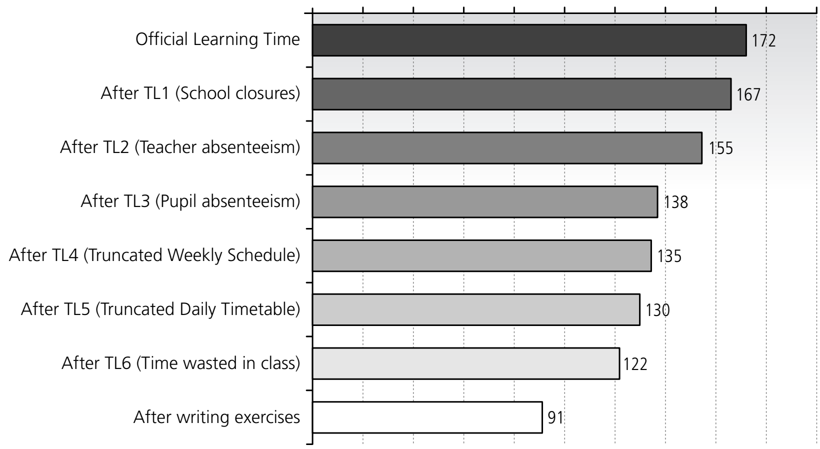
Source: Adapted from Effective Learning Time, 2010.

On the basis of a representative sample of a 100 schools and especially designed questionnaires, interviews were carried out in 2009/10 with headmasters, teachers and members of school management committees. Class observations were also performed, establishing in detail to what extent school days' time-tables were respected for the sample of selected schools. The results enabled the assembly of a pyramid of effective teaching time in which each factor contributing to the time lost is considered (See Figure 4.10).

Findings

Students lose an average of 4.9 days of teaching per year due to the official school calendar not being respected. This loss of effective teaching time is mainly due to the late start of the school year (1.2 days), to extended holidays (1.2 days) or to the early start of the summer vacation (1 day). On average, teachers are absent for 11.8 days per year. The most common reasons mentioned are strikes (3.5 days) and teacher training (3 days). Students themselves are absent

FIGURE 4.10 - Effective Learning Days, Mali, 2009/10



on average for 17 days per year (compared to 9.8 days in Ghana or 3.4 in Tunisia). According to parents, the main reasons are their participation in the family's domestic or productive activities.

Students receive 24.5 hours of classes per week instead of the 25.2 hours considered in the school programme. This is equivalent to a loss of 3.4 days of teaching time per year. The lack of adherence to the calendar approved by headmasters costs a further 4.4 days per year.

Teachers devote 93 percent of their class time to effective learning activities (as opposed to class management or other unrelated activities, data not shown on the graph). The 7 percent loss is equivalent to a further loss of 8.8 days over the school year. Overall, the effective learning time in Malian primary schools is 121.6 days on average, without considering the time devoted to writing exercises, or just 70.7 percent of the official education ministry programme.

Teacher absenteeism, although not always the greatest cause of loss of teaching time, is often worth analysing in greater detail, as it is important to the image of the teaching force amongst the education stakeholders (the government and the parents), and because it often results from system issues which can be addressed.

The analysis of teacher absenteeism can be performed in three steps:

◗ Step 1: Estimate the magnitude of teacher absenteeism

In the absence of consolidated data, the most commonly used sources of information to establish the scale of teacher absenteeism are public expenditure tracking surveys (PETS) or international learning assessments. PASEC assessments, for instance, include a question for teachers of the classes sampled where they must indicate the number of days of absence over the previous month, whatever the motive. Likewise, school directors are asked about the number of days their teaching staff were absent. The measure of absenteeism is thus generally based on simple statements, but crossing both sources enables one to determine whether the answers given are coherent and reliable.

EXAMPLE 4.15 (Typical Questions to Evaluate Teacher Absenteeism): Typical questions to assess teacher absenteeism, PASEC, SACMEQ and PETS

Question asked in the Teacher Survey of the PASEC assessment
72. Over the last four weeks, how many days have you been absent from school, excluding school and bank holidays. (Consider illness, strikes, training, attendance of conferences, pay-day, etc.) QM2_72 (Write the number) .... days
Question asked in the Headmaster Survey of the PASEC assessment
56. Over the last four weeks, how many days have your teachers been absent from school, excluding school and bank holidays (consider illness, strikes, training, attendance of conferences, pay-day, etc.) (Write the number) Grade 2 teachers .... days Grade 6 teachers .... days

Likewise, SACMEQ assessments contain similar questions on teacher absenteeism.

Question asked in the Headmaster Survey of the SACMEQ assessment

About how often does the school have to deal with the following behaviours of teachers?
Please tick the appropriate box for each statement. Indicate whether this is seen as a serious problem in your school, ticking the appropriate box in the final column.)

	Never	Sometimes	Often
32.01 Teachers arriving late at school	☐	☐	☐
32.02 Teacher absenteeism (i.e., unjustified absence)	☐	☐	☐

Finally, specific surveys such as PETS conducted in some countries also provide an appraisal of the magnitude of absenteeism.

Questions asked in the Tanzania PETS survey

Information about teachers in 2008	Comment
310. Number of teachers on government payroll which were absent more than 50% of the school year	Due to study leave or other
311. Number of teachers on government payroll May 2008	All teachers including those on leave but still being paid
312. Number of teachers reporting as present at school first week of May 2008	From school logbook, sum of the count of the number of teachers reporting each day

◗ Step 2: Identify the main causes of teacher absenteeism

Absenteeism has multiple causes and is not always the sole responsibility of the teachers. The phenomenon is affected by different factors, related to teacher, class or school characteristics, or to the school environment or management. The same data sources used to estimate the magnitude of teacher absenteeism may at times be used to identify its main causes. For instance, headmasters are requested to identify the three main causes of teacher absenteeism in PASEC assessments. This information can be statistically processed to give an idea of the main causes at the national level. To illustrate, Example 4.16 shows the results of this approach for Benin.

Nevertheless, the analyst should keep in mind that such information is just declarative. It is then recommended to cross-check those answers with all other available data sources on the subject. Generally speaking, all available studies on causes of teachers' absenteeism should be used in the analysis.

EXAMPLE 4.16 **(Analysis of the Causes of Teacher Absenteeism): The Main Causes of Teacher Absenteeism, Benin, 2004/05**

Source: Adapted from the Diagnosis of the Teaching Issue in Benin, 2011.

The use of the 2004/05 PASEC assessment data sheds some light on the causes of teacher absenteeism, from headmasters' perspectives.

TABLE 4.15 - Main Causes of Teacher Absenteeism, According to Headmasters, Benin, 2004-05

Causes of Absenteeism	Frequency
Teachers' health issues	58.3 %
Other activities	2.2 %
General lack of motivation	11.5 %
Distance of home from school	8.6 %
Difficult teaching conditions	2.2 %
Family visits	0.7 %
Family motives (death, marriage, birth, etc.)	25.9 %
Collection of pay check	33.8 %
Strikes	41.7 %
Follow-up of administrative issues	14.4 %

Findings

The most frequently mentioned causes of absenteeism are health issues, the collection of pay checks, family motives (including illness, death, marriages and births) and strikes. Of secondary importance, other reasons mentioned include the follow-up of administrative issues, a general lack of motivation, the distance from home to school and the involvement in another activity to complement the teaching salary.

◗ Step 3: Analyse the management of teacher absenteeism

Here the aim is to examine if education systems are equipped with effective mechanisms to reduce absences and replace absent teachers. A qualitative approach is recommended to enquire about the existence of such procedures, which may include teacher replacement or disciplinary action when teacher absences are abusive, and assess how such procedures are effectively applied. The required information may be gathered from school headmasters, school inspectors, pedagogical advisors, or education ministry HR directors (See Box 4.10 below for suggested interview questions).

BOX 4.10
SUGGESTED QUESTIONS FOR THE APPRAISAL OF TEACHER ABSENTEEISM MANAGEMENT

1 What is the usual procedure followed in cases of teacher absenteeism?

2 Do institutional or statutory measures exist for teacher replacement?

3 What correctional measures exist for abusive absenteeism?

4 Are these measures effectively applied? If not, why not?

Finally, it is noteworthy that the World Bank recently launched a new initiative, named Service Delivery Indicators which aims to measure, thanks to sample-based surveys, the quality of education service delivery and of learning environment in schools, including teachers' absenteeism and teachers' knowledge (see Box 4.11). In the case that such a survey has been done in the studied country, its findings are highly valuable and should be used as inputs in the analysis here.

BOX 4.11
THE SERVICE DELIVERY INDICATORS (SDI) INITIATIVE

The Service Delivery Indicators (education component) is a World Bank initiative to provide information to Government policy makers, civil society and citizens about the state of schools, and about the quality of service delivery therein.

The education indicators measure the effort and knowledge of teachers and the availability of key infrastructure and inputs in primary schools. They provide a snapshot of the learning environment and a key set of resources, including human resources, which need to be in place for pupils to learn. A strong focus is placed on the knowledge, skills and effort of teachers.

The goal of the indicators is to help policymakers, citizens, service providers, donors, and other stakeholders enhance the quality of services and improve development outcomes. Without regular and accurate information on the quality of services, it is difficult for citizens or politicians to assess how service providers are performing and to take corrective action.

The perspective adopted by the Service Delivery Indicators is that of citizens accessing a service. Hence, the indicators can be viewed as a service delivery report card on education. The indicators are designed to be objective, robust and actionable. The data is drawn from a dedicated survey of schools. All the indicators are based either on assessments or are derived from direct observation by trained enumerators. Where relevant, the focus is on early primary education, and grades three and four in particular, because of the importance of early childhood development.

To evaluate the feasibility of the Service Delivery Indicators, pilot surveys were implemented in Senegal and Tanzania in 2010. The first post-pilot survey was carried out in Kenya in 2012. The results from these studies demonstrate that the Indicators methodology is adequate for providing strategic information on the quality of service delivery, as experienced by the citizen, in a variety of contexts.

The core indicators are:

E1: Teacher absence from school
E2: Teacher absence from classroom
E3: Share of teachers with minimum knowledge
E4: Time spent teaching in the classroom
E5: Minimum teaching equipment available
E6: Pupil-teacher ratio
E7: Textbooks per pupil
E8: School infrastructure
E9: Share of school grants received

NOTES

24 Hanusek and Woessmann (2007) have shown that a one standard deviation increase in reading and math scores was associated with a 2 percentage point increase in the growth rate of GDP per capita. See UNESCO-BREDA (2005) for instance.

25 See UNESCO-BREDA (2005) for instance.

26 Class tests held by teachers are a fifth category, but their results are rarely tracked for analysis purposes and they do not comply with minimal standards to allow them to be used as a homogenous tool for the measurement of learning results throughout a country. See Merle (1996), De Landsheere (1980), or Rosenthal and Jacobson (1973) for instance.

27 SACMEQ uses standardised methods/tests that allow for geographic (both cross-country and national) and historical comparisons. Marking is adjusted to reach an average of 500. There are eight skill levels for each subject area. Levels are hierarchical and enable to assess the competencies that students have or have not acquired.

28 Some household surveys do not have respondents take a test but rely on their statement of their reading skills. In such cases it is important to place the results in perspective given that some individuals overestimate their reading skills. See Chapter 10 for a discussion on this.

29 The use of this age group holds the further advantage of being the one that is usually used in CSR type sector analysis, which means that data is often available for multiple countries, enabling international comparisons.

30 The likelihood of literacy is calculated on a sample of individuals who were educated over a broad range of years (aged 22 to 44 years). The approximate measure of the quality of education provided therefore pertains to an average over a couple of decades (individuals aged 44 years were schooled 30 years ago on average and those aged 22 years about 10 years ago).

31 Adult literacy levels do not only depend on the number of years of school completed. Other factors whose impact is difficult to measure also play a role in the achievement and retention of literacy. For instance, it is easier for individuals living in cities to maintain their literacy given their greater access to written information and their more frequent use of it on a day to day basis.

32 It is also possible to perform the same type of analysis by using other school results indicators, such as the retention rate or the repetition rate.

33 The border between these two groups is not watertight. Some factors such as school feeding programmes can be included in one or the other of the groups.

34 In international evaluations, there is generally a questionnaire for students, one for teachers and a third for headmasters.

35 The questionnaires can be obtained by contacting the teams in charge of the respective assessments through their web-pages: EGRA/EGMA on www.rti.org, PASEC on www.confemen.org and SACMEQ on www.sacmeq.org.

36 Details on the elaboration and estimation of econometric models can also be found in relevant statistical documents, such as Wonnacott and Wonnacott (1995), Bressoux (2008), Greene (2008), or Kennedy (2008).

37 This approach makes the assumption that students stayed in the same school over the last three or four years. Where data permit, the analysis can be limited to the students who attended the school over the previous three to four years.

38 In some cases the survey design does nevertheless measure the impacts of different ways of implementing a given policy or action.

39 This is effectively the a_k coefficient of factor X_k in the learning outcomes model.

40 The analysis of teacher remuneration is described in Chapter 3 on cost and financing.

41 It is however important to note that the required growth rate underestimates new recruitment needs that result from retirement, death, or other reasons (See Section 2.1.5 on attrition rates).

42 The recruitment of community teachers does not always follow an institutionalised procedure. However, the implementation of policies supporting community teachers in some countries does promote a structured approach (recruitment criteria, remuneration guidelines and so on) that it is helpful to analyse.

43 In that case it is helpful to carry out the analysis by subject.

44 This analysis can be performed considering all teachers, or distinguishing between government and other teachers when the information is available, which suggests how the involvement of other players (communities for instance) may improve the coherence of postings.

45 The student-teacher ratio is obtained by the straightforward division of the number of students by the number of teachers.

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CHAPTER 5

EXTERNAL EFFICIENCY

› Chapter Objective:
Analyse the extent to which education, and each level of education or training in particular, contributes to the achievement of national economic and human development goals.

1. ECONOMIC IMPACT OF EDUCATION

ISSUE

Does education improve the productivity and employability of school or higher education leavers? Does public investment in education and training contribute to growth and economic development?

OBJECTIVES

- Conduct a macroeconomic review of the extent to which the education system is aligned with labour market requirements, in quantity and quality;
- Conduct a microeconomic review of the employment status of school and higher education leavers in the workplace;
- Determine how skills and competencies are valued in the workplace and the relationship between remuneration and the level of education attained;
- Evaluate the return on investments in education and training at the individual and collective levels; and
- Determine the scope to optimise the economic impact of education.

METHODS

- Analyse labour market dynamics and structure in terms of the jobs available, by sector, sub-sector, type of institution, socioprofessional status and main job types;
- Determine the extent of unemployment among school and higher education leavers;
- Review the training-employment balance in recent years to determine the quantitative asymmetry between the supply of skills and the supply of jobs;
- Evaluate the needs for workers' qualifications and professionalisation;
- Evaluate the training-employment balance through the degree to which individual skills are valued in the positions occupied by workers;
- Evaluate the economic value given to education by the workplace; and
- Conduct a cost-benefit analysis by computing the private and social returns on investment in different education levels.

SOURCES

National employment statistics, reports and surveys, or the employment sections of household surveys; tracer studies; household consumer and income-type surveys; demographic population data; public and private education spending data (from Chapter 3) and investment climate assessments and surveys.

2. SOCIAL IMPACT OF EDUCATION

ISSUE

Does the education system adequately prepare individuals to contribute to national social and human development? To what extent does each education and training level contribute?

OBJECTIVES

- Evaluate the impact of different education levels on living standards;
- Examine the contribution of different education levels to improving health-related behaviours and outcomes;
- Examine the contribution of different education levels to social and civic behaviour; and
- Examine the contribution of different education levels to the management of fertility.

METHODS

For each area identified above, the approach consists of:

- Selecting appropriate indicators to describe the impact; and
- Studying the causal relationship between education and each indicator through linear econometric models and logistical regressions.

SOURCES

Household living conditions surveys; demographic and health surveys (DHS); multiple indicator cluster surveys (MICS); core welfare indicator questionnaires (CWIQ); poverty and social impact analyses (PSIA) and population census data.

Introduction

The usual benchmark of external efficiency is the use by individuals of the knowledge and skills acquired through their education during adulthood. The analysis seeks to measure the extent to which education contributes to individuals' social utility, as well as to measure the personal benefits of the training received. External efficiency is seldom analysed in the context of evaluations of education systems, often due to the unavailability or low quality of the required data.[46] The analysis of external efficiency is particularly important to plan the supply of postprimary training, to help direct public funding towards courses that enhance graduate employability and positively impact on national levels of human development.

The impacts of education can be divided into two types: economic and social. The economic dimension relates mainly to the relationship between education and the employability and productivity of school and higher education leavers, but also to the contribution of education to economic growth. The social dimension covers a plethora of aspects, including mortality, health, fertility, civic attitudes, environmental awareness and so on.[47]

TABLE 5.1 - The Four Analytical Dimensions of the External Efficiency of Education

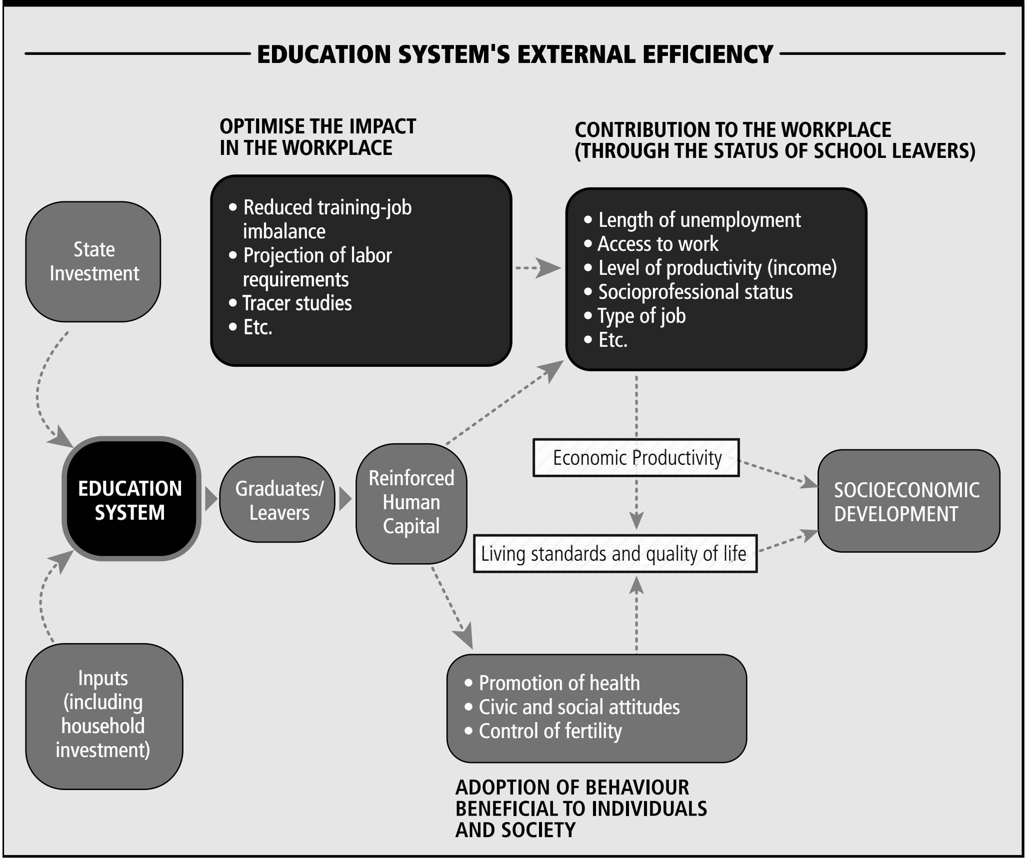
	Economic	**Social**
Individual	- Participation in the workplace - Work productivity - Income - Savings	Change in behaviours in terms of: - Reproduction (family planning and fertility, STD prevention, etc.) - Maternal, infant and child health - High-risk behaviours (alcohol and tobacco abuse, high-risk sexual behaviour) - Children's up-bringing - Civic attitudes and participation - Protection of the environment
Collective	- Economic growth - National production capacity (innovation and the adaptation or use of new knowledge) - Disparities - Government revenues (taxes) - International competitivity - Unemployment	- Demography (population growth, demographic transition, demographic dependency ratio) - Public health (life expectancy, vaccination coverage, mortality rates, etc.) - Adaptation and use of new technologies - Conservation of the environment for future generations - Social cohesion - Delinquency

Source: Authors.

These impacts, in both their economic and social dimensions, can be noted at both the individual level (more educated individuals tend to earn more) and the collective level (countries with a better educated workforce tend to have higher growth rates and better health indicators, for instance). The combination of these two types of impact (economic and social on the one hand and individual and collective on the other) provides a framework for the analysis (See Table 5.1).

The analysis of external efficiency can thus proceed according to a vertical reading of the table, reviewing the economic and social dimensions, or according to a horizontal reading, according to the individual and collective benefits of education. This guide adopts a vertical approach. Figure 5.1 takes a functional approach to the different issues raised by the measure of external efficiency. These issues will guide the analyses of this chapter[48].

FIGURE 5.1 - External Efficiency Issues



Source: Authors.

CHAPTER 5

EXTERNAL EFFICIENCY

SECTION 1 THE ECONOMIC IMPACT OF EDUCATION

The economic impact of education is mainly appraised through the workplace, which is where supply and demand for skills meet. The supply of skills comes from the active population (any person in employment or looking for work), who apply for jobs. The demand for skills comes from those institutions (public, private, formal, informal and so on) who offer jobs. The impact of education on the workplace should be appraised both from the supply side and the demand side, and especially through the interaction of the two.

Education and training should enhance the employability and productivity in work of school and higher education leavers. From the perspective of employers, education should enhance human capital and the productivity of companies.[49] Companies' main demand of education systems is to provide qualified labour, in sufficient quantity and of sufficient quality to meet their productive requirements. Some sectors of the economy may face a lack of qualified labour, whereas others may have declining labour needs that the education system nevertheless continues to provide for.

The evaluation of education's economic impact can therefore focus on: (i) the description of the labour market and its structure (Sections 1.1 and 1.2); (ii) an evaluation of employment status and the economic return on investment in education and training (Sections 1.3 and 1.4); and (iii) the balance between the training provided by the education system and the available jobs as well as the estimation of the future needs of the labour market (Sections 1.5 and 1.6).

1.1 DESCRIPTION OF THE LABOUR MARKET

The description of the main labour market indicators helps to illustrate the national context and employability status of school and higher education leavers (See Box 5.1).[50] Participation in the workplace is first and foremost described by the activity rate. This includes people unemployed but actively seeking work (ILO definition), measured by the unemployment rate. This, in turn, enables the computation of the employment rate. Some authors use a broader definition of unemployment to include discouraged job-seekers, unemployed individuals who are available to work but have ceased to look. It is often instructive to highlight the dependency ratio, defined as the number of unemployed to the number of employed. In 2007 in France for instance, there were 1.47 unemployed to every worker.

Other indicators are offered to describe employment issues. These include the visible underemployment rate (covering the share of the active population only working part-time

BOX 5.1
EMPLOYMENT INDICATORS

Internationally, the International Labour Organisation (ILO) considers that the working age population is that of individuals above 15 years. Indeed, legislation in many countries forbids access to the workplace to individuals not having completed their compulsory schooling (often not having completed the primary cycle). However, to be coherent with the fact that in many countries some children also work and that such activity is often in the informal sector (in the case of apprenticeships for instance), the working age population can be considered to be that of say 6 years and above or 10 years and above, depending on the country and the survey.

According to the ILO definitions, the working age population includes the employed, the unemployed (which together are the active population) and the economically inactive. The active population thus includes all working age individuals who either have a job (the employed population), or do not but are actively seeking one and available for work (the unemployed population). The job search may include any initiative undertaken by the unemployed over a given period: writing applications, joining a labour office, participating in competitions, knocking door-to-door and so on.

Computation of the Main Indicators

Working age population = Active population + Economically inactive population

Active population = Employed population + Unemployed population

$$\textit{Activity rate} = \frac{\textit{Active Population}}{\textit{Working age Population}}$$

$$\textit{Unemployment rate} = \frac{\textit{Unemployed Population}}{\textit{Active Population}}$$

$$\textit{Employment rate} = \frac{\textit{Employed population}}{\textit{Active population}} = 1 - \text{Unemployment rate}$$

$$\textit{Invisible under employment rate} = \frac{\textit{Persons in invisible under employment}}{\textit{Employed Population}}$$

$$\textit{Visible under employment rate} = \frac{\textit{Persons in visible under employment}}{\textit{Employed population}}$$

Source: http://www.ilo.org/global/statistics-and-databases/statistics-overview-and-topics/employment-and-unemployment/lang--en/index.htm although they would rather work full-time) and the invisible underemployment rate (the share of the active population who are underpaid (or over-qualified). These two groups constitute the underemployed population, and can be used to define the overall underemployment rate (both visible and invisible), by dividing the number of underemployed by the number of employed.

Almost all analyses carried out in developing countries find unemployment rates (ILO definition) to be very low, under five percent. Such rates do not generally reflect the employment issues faced by many countries. Indeed, with the development of the informal sector (accounting for most of the active population, about 90 percent), the difficulty faced by individuals relates to the conditions and quality of work, such as insufficient hours or wage. Therefore, labour market descriptions must especially focus on the underemployment indicators mentioned above, that shed greater light on these issues[51].

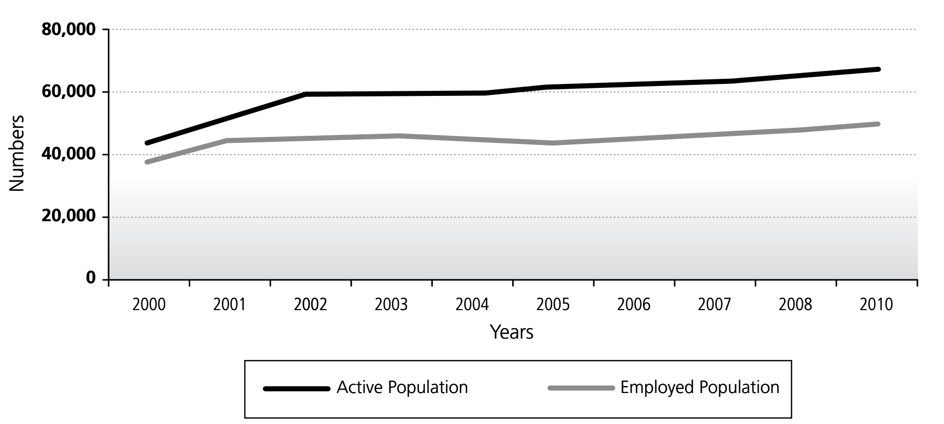
EXAMPLE 5.1

(Employment Indicators): Historical Perspective of the Usually Active and Employed Population, Sao Tomé and Principe, 2000-10

Source: Adapted and translated from the Sao Tomé and Principe CSR, 2012.

Figure 5.2 illustrates the comparative evolution of the usually active and employed populations of Sao Tomé and Principe between 2000 and 2010.

FIGURE 5.2 - Evolution of the Economically Active and Employed Population, Sao Tomé and Principe, 2000-10



Findings

Over the 2000-10 period, the usually active and the employed populations have both increased. However, there is a widening gap between both indicators over the decade, which reflects the ongoing rise of unemployment.

Household living conditions surveys and employment surveys[52] generally provide the variables required to compute the labour market indicators[53].

1.2 LABOUR MARKET STRUCTURE AND DYNAMICS

Beyond the overall employment context presented above, it is important to provide further details of labour market structure, sectors, activities and the status of the employed population.

1.2.1 BY SECTOR OF ACTIVITY

A sector of activity includes all companies or institutions involved in a same or similar type of activity. Sectors of activity are commonly divided into three groups: (i) the primary sector (agriculture, farming, fisheries); (ii) the secondary sector (industry and transformation); and the tertiary sector (business and services). However, AFRISTAT (the Economic and Statistical Observatory for Sub-Saharan Africa) proposes a distribution of activities by branch. The scope is broader, including over 300 different branches, which makes it more easily adaptable to different country contexts.[54]

Household surveys often provide information on the main activity of companies or institutions (be they production or service-oriented) that employ individuals work for, each being referenced according to the products or services offered. Table 5.2 provides an illustrative distribution of activities into nine sectors and 17 activity branches.

Where the data permit, it may be helpful to analyse the productivity of each activity branch, through the efficiency of workers or the historical evolution of their efficiency. In practical terms, the productivity of a branch is obtained as the ratio between the total production of that branch and the total number of hours of work performed by the population employed by it.

TABLE 5.2 - Economic Sectors, Sectors of Activity and Activity Branches		
3 Economic Sectors	**9 Activity Sectors**	**17 Activity Branches**
Primary Agriculture	Agriculture	Agriculture, hunting and forestry
		Fishing, fish farming and aquaculture
Secondary Industry	Mining	Extractive activities
	Production/ transformation	Manufacturing
		Production and distribution of electricity, gas and water
	Construction	Construction, building, public works
Tertiary Services	Business and sales	Business, car, motorcycle and other domestic appliance repair
	Transport	Transport, supporting transport and communication activities
	Services	Finance (banking, insurance, brokering)
		Hotels and restaurants
		Employment of home staff
		Estate agents, letting and business services
		Collective (e.g. drainage) or individual (e.g. hairdressing) services
	Administration	Public administration (excluding education, health or other individual services)
		Activities of extraterritorial organisations
	Education/Health	Education
		Health and social services

Source: Authors.

1.2.2 BY INSTITUTIONAL SECTOR (FORMAL/INFORMAL)

In the economies of developing countries, the labour market is often dual, including a formal sector (public and private) and a more loosely defined informal sector. Informality does not refer to the workers but the activity that they perform within the economic unit they work for. The identification of informal activities is generally based on the absence of one of two criteria: the legal status of the activity (whether the unit is a registered company), and whether the unit keeps written accounts.

The questions often included in surveys that enable the qualification of an activity as formal or informal are:

Who does the respondent usually work for? And: Is the company or institution the respondent usually works for or manages a:

- *Public administration*
- *Public or public-sector company*
- *Private company*
- *Charity, cooperative, church, NGO*
- *Household or individual?*

The three first items of the list are included in the formal sector and the last is generally considered as informal sector work. The forth category includes heterogeneous entities that may belong to either the formal or the informal sectors (as is the case of many charities and associations). If the survey asks: *Is the company or institution the respondent usually works for registered?* positive responses can be used to differentiate.

1.2.3 BY SOCIOPROFESSIONAL STATUS

The structure of the labour market can also be appraised according to the status of employees in their work. This is generally approached by differentiating between paid employment (salaried workers), that includes all workers who have a work contract, and self employment (independent workers), according to the ILO definition:[55]

Paid Employment

1. Senior professionals, engineers and such like;
2. Mid-level professionals, foremen;
3. Employees, technicians;
4. Semi-qualified employees; and
5. Manual labour.

Self Employment

6. Employers or managers: people who operate their own business, or independently practice a profession or trade, and hire one or more employees;
7. Own-account workers: people who operate their own business, or independently practice a profession or trade, but hire no employees;
8. Unpaid family workers: usually a person who works without pay in a family economic unit managed by a member of the family or relative and receives no remuneration either in the form of a wage or in kind; and
9. Apprentices: people who enter a company to gain work experience, with or without pay.

In household surveys, the question on the socioprofessional status of the employed population generally offers a multiple choice, based on the nine categories outlined above. For some analyses on paid employees specifically, it may be sufficient to consider the active population whose institutional sector is appropriate, as above[56].

1.2.4 ACCORDING TO ALL 3 DIMENSIONS: SECTOR ACTIVITY, FORMAL/INFORMAL AND SOCIOPROFESSIONAL STATUS

Combining the three dimensions of sector, degree of formality and employment status will provide a detailed overview of the labour market. The main reference adopted is usually the structure of the labour market by sector, followed by the degree of formality. Whereas formal sector workers are classed by socioprofessional category, informal sector workers can be classed by activity branch, differentiating between agriculture and non-agriculture work. The following example illustrates the approach based on the case of The Gambia.

EXAMPLE **5.2** **(Distribution of Employment): Type of Employment, by Sector, Socioprofessional Status and Age Group, The Gambia, 2008/09**

Source: Adapted from The Gambia CSR, 2011.

The following table shows the distribution of the population by employment status and type of job.

TABLE 5.3 - Structure of the Labour Market, The Gambia, 2009

Percent	15-59 Years	25-34 Years	35-59 Years
Formal Jobs	*8.6*	*11.3*	*12.9*
Government	4.4	5.4	7.4
Private	4.2	5.9	5.5
Informal Jobs	*60.1*	*67.2*	*73.2*
Agricultural	33.1	33.5	39.4
Non agricultural	27.0	33.7	33.8
Total Employed	**68.8**	**78.5**	**86.2**
Unemployed/Jobseekers	**5.1**	**6.2**	**2.4**
Student/Inactive	**26.1**	**15.3**	**11.4**
Total	*100.0*	*100.0*	*100.0*

Findings

Overall, 87 percent (not shown in the table) of the total Gambian population is active, including both the employed and the unemployed looking for a job. There is a slight difference of four percent between the two age groups considered, which is due to a greater proportion of younger Gambians being enrolled as students, thanks to the recent increase in access to higher levels of education.

A vast majority of the employed population aged 15 to 59 years is employed in informal jobs: only 13 percent (=8.6/68.8) have formal jobs, a proportion that tends to increase marginally with *age, reaching 15 percent (= 12.9/86.2) for those aged 35 to 59 years. This indicates that the formal sector has yet to take off in terms of job creation, further supported by the finding that the younger generation has more difficulty to find a formal job than the older one.*

Agriculture still accounts for 55 percent (=33.1/60.1) of informal employment on average, despite the fact that the younger population is increasingly working in other sectors, partially as a result of the progressive rural to urban shift of the informal sector. Informal agricultural employment effectively represents 46 percent (=39.4/86.2) of all jobs for the group aged 35 to 59 years, and 43 percent (=33.5/78.5) for the group aged 25 to 34 years. The adult unemployment rate (the share of those aged 15 to 59 years that are unemployed in the active population) is close to seven percent [=5.1/(5.1+68.8)]. It is noticeable that the younger generation has considerably greater difficulty in finding employment however: seven percent [=6.2/(6.2+78.5)] of active people report to be looking for a job, against only three percent [=2.4/(2.4+86.2)] of their older peers.

1.3 EMPLOYABILITY OF EDUCATION SYSTEM LEAVERS AND GRADUATES

The employability of education system leavers can be analysed from three perspectives: (i) access to work; (ii) the optimal use of employment potential (over-qualification); and (iii) remuneration[57].

1.3.1 ACCESS TO WORK BY HIGHEST EDUCATION LEVEL ATTAINED

This section analyses the status of youth in the workplace. It especially highlights the extent of unemployment according to the level of education attained by education system leavers or graduates. Example 5.3 illustrates the findings and their potential interpretation, based on the case of Burundi.

EXAMPLE 5.3

(Employability): Analysis of the Employment Status of Education System Leavers, Burundi, 2006

Source: Adapted and translated from the Burundi CSR, 2012.

Table 5.4 and Figure 5.3 below highlight the situation of the active population, respectively differentiating between generations and the level of education attained.

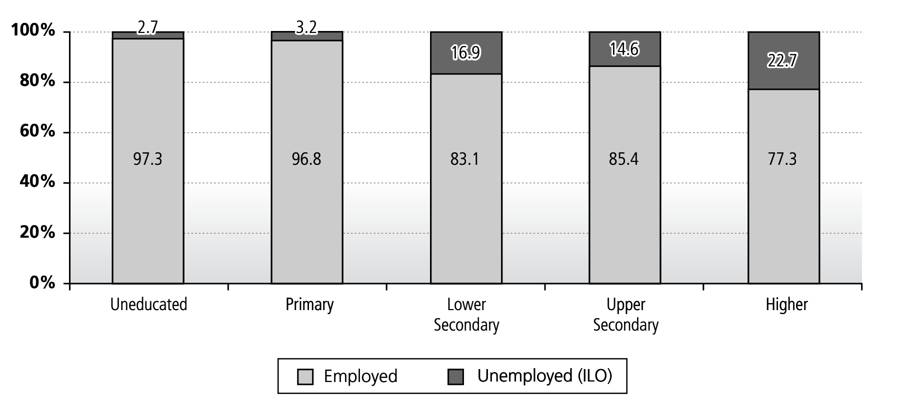
TABLE 5.4 - Employment Status of the Active Population, by Age Group, 2006

	15-34 Years	35-49 Years	50-64 Years
Employed	96.4 %	96.8 %	98.3 %
Unemployed (ILO definition)	3.6 %	3.2 %	1.7 %
Total	100.0 %	100.0 %	100.0 %

Findings

Unemployment is more marked among the younger generation. It rises from 1.7 percent for those aged 50 to 64 years, to 3.6 percent for those aged 15 to 34 years. As Figure 5.3 demonstrates, unemployment affects everybody, from those without education to university graduates, through school leavers of all levels. The uneducated are least affected, followed by primary school leavers. University graduates have the highest unemployment levels, followed by secondary school leavers (those having completed lower secondary especially).

FIGURE 5.3 - Unemployment, by Education Level, Burundi, 2006



Where the data permit, it is helpful to deepen the analysis of education system leavers by providing factual information on the quality of the positions held. The degree of instability and the level of informality are some of the main concerns of employed people in developing countries. Unstable jobs are characterised by the contract type. They include short-term contracts, apprenticeships, internships and temporary work, among others[58].

1.3.2 UNDER-EMPLOYMENT

An active individual is considered to be under-employed (or overqualified) if their level of training is higher than that usually required by the position held. In most countries, consensus exists with respect to the minimum level of education required for each specific professional category (See Table 5.5 below).

TABLE 5.5 - Normative Approach to the Qualifications Required by Employment Type		
	Effective Socioprofessional Status *	**Required Level of Education ****
1	Senior professionals, engineers or similar	Higher education (Masters level, or TVET equivalent)
2	Mid-level professionals, foremen	Higher education (Bachelor's level, or TVET equivalent)
3	Employees, technicians	Upper secondary (or TVET equivalent)
4	Semi-qualified employees	Lower secondary (even incomplete) (or TVET equivalent)
5	Manual labour, unqualified employees, informal sector workers	Primary (even incomplete)

Source : Authors.
Note: * As per household/employment surveys for the informal sector. ** An alternative classification would be primary (manual labour), secondary and TVET (semi- and qualified employees) and higher (mid- and senior level professionals). To be determined according to the country context.

Determining the degree to which individuals' qualifications and employment status are aligned according to the table above provides a first approach to the analysis of under-employment, based on a normative approach. A second complementary measure of under-employment or over-qualification can be used for the analysis, based on the relative value given to individuals by their respective salaries.[59] This guide recommends a combination of both. The income-based approach is helpful as individuals earning more than the average for their qualification level would be considered to be successfully employed even if they are technically overqualified for their position.

Thus the situation of a given individual can be described in a two-stage process:

(i) *Determination of the theoretical socioprofessional category*, based on the number of years of education (See Table 5.5 or use an alternative categorisation based on the national context); and

(ii) *Comparison of the effective and theoretical socioprofessional categories*, accounting for the level of income.

If the effective employment status is lower than that justified by the level of qualification, the individual will be considered potentially under-employed (overqualified). If, in addition to this, the individual's income is significantly lower than the mean for individuals of the same level of qualification, the individual will be considered to be effectively under-employed.

To illustrate, in seeking to determine whether a self-employed individual is under-employed (the approach is the same for a company owner or an apprentice) the employment status the person should reach is determined according to their qualifications, as per Table 5.5. The mean income for individuals of this status is then estimated. If the person's income is below this level, they are under-employed. So for instance, a higher education graduate working in the informal sector earns 150,000 CFA Francs per month. If the mean income of senior professionals in paid employment in the modern sector of the economy (jobs that most higher education graduates could expect to get) is 125,000 CFA Francs per month, the graduate would not be considered to be under-employed.

On the basis of these estimations, a table can be produced like Table 5.6 below, to detail the situation of education system leavers on the workplace in terms of their under-employment.

TABLE 5.6 - Under-Employment (Over Qualification) Rate, by Level of Education – Model Table

Level	Primary	Lower Secondary	Upper Secondary	TVET	Higher
Potential Under-Employment Rate					
Effective Under-Employment Rate					

Source: Authors.
Note: Education levels should reflect the national context. * The potential under-employment rate for primary school leavers, for instance, is the ratio between the number of employed primary school leavers that are potentially overqualified (according to the normative approach) and the total number of employed primary school leavers.

It is also common that no data is available on individuals' socioprofessional status, in which case over-qualification can be determined solely on the basis of income levels. An individual would then be considered overqualified if their income is below the mean earnings of individuals whose level of education is immediately below[60].

1.3.3 REMUNERATION BY EDUCATION LEVEL

Research has unequivocally determined the positive impact of education on income. Rather than insist on this finding, it will therefore be appropriate to determine how each additional level of education contributes to increasing income. To do this, a descriptive analysis should first be provided of individuals' income according to their education level, on the basis of household surveys' income data. Secondly, the analysis should use Mincer-type models to estimate the expected earnings according to each level of education, all else being equal (See Annex 5.1 for the computation approach). The analysis can then be rounded off by computing the return on investment for each education level (See Section 1.4).

EXAMPLE 5.4

(Income Performance of Education): Annual Average Income, by Education Level, The Gambia, 2009

Source: Adapted from The Gambia CSR, 2011.

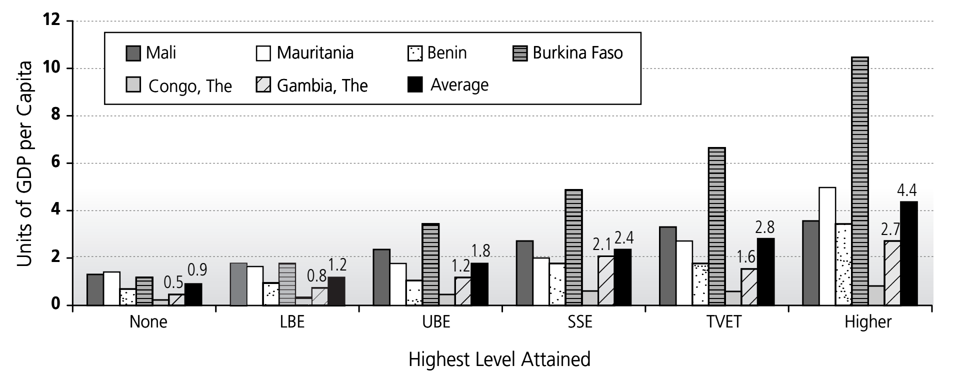
The following table and graph respectively provide average income according to the level of education and compare the income estimate for The Gambia with that of other countries.

TABLE 5.7 - Annual Average Expected and Projected Income, by Education Level, 2009

(Dalasis)	Average Annual Income of the Employed	Expected Income - with Risk of Unemployment	Income Mark'up over Previous Level (%)
No Education	8,301	8,178	-
Lower Basic Education (LBE)	11,893	11,242	37
Upper Basic Education (UBE)	21,088	18,354	63
Senior Secondary	33,291	25,646	40
TVET	37,364	31,940	25
Higher	59,276	51,555	* 101

Note: Includes individuals aged 15 to 59 years. * Higher education is compared with SSE.

FIGURE 5.4 - Average Income of the 25-34 Age Group, by Level of Education, Selected countries, 2006 or MRY



Findings

Unsurprisingly, annual income (regardless of whether unemployment risks are taken into account) increases according to the highest level of education completed. Average annual income ranges from D 8,301 for uneducated employed individuals to D 59,276 for those employed that have higher education. When the unemployed population is taken into account in addition to the employed population, the respective pay levels drop to D 8,178 and D 51,555 (See Table 5.7 above).

Higher education is the level that generates the most marginal earning power: university graduates earn just over twice the average income of individuals having completed secondary school. Attending upper basic also makes a significant difference in earning returns over attending lower basic; in the former case individuals earn 63 percent more on average than in the latter.

Gambian earnings are lower on average than those of other African countries for individuals with no education, basic education, technical training, or higher education (See Figure 5.4). In the case of TVET, the lower earning range (the lowest of all countries but one) nuances the comparatively good national performance in terms of employability. It is likely that TVET graduates have to accept jobs even when the salary proposed is far below their expectations. In other words, they tend to accept jobs below their qualifications. In the case of individuals with senior secondary school, earnings in The Gambia are similar to the average.

1.4 ECONOMIC RETURN OF DIFFERENT EDUCATION LEVELS

For economists, education is an investment on behalf of states or individuals based on the expectation of future benefits (collective or private). Investment in education, as for other types of investment, can thus be evaluated in terms of a rate of return. To provide decision makers with data to determine which levels of education are most worthy of investment, the rates of return should be computed for each level. By definition, the rate of return of a given education level is the ratio between the benefits expected to be derived from having pursued one's schooling to this level (measured by the expected additional marginal income) and the further cost (public or private) required to complete the level.

In sector analysis it is common to distinguish between the private rate of return (which only considers household investments in its computation) and the social rate of return (that considers all investments, public or private).[61] By definition, the private return on investment is the higher of the two, as they share the same numerator, but the denominator for the public return on investment is higher (See Annex 5.1).

In terms of findings, the comparison of the private rates of return by education level provides a measure of how attractive the prospect of pursuing studies to a given level may be (See Example 5.5, based on Benin). For instance, if general secondary schooling is highly subsidised with public resources and leavers generally earn more than their primary counterparts, the private return on investment for this level will be very high, which suggests that the motivation for individuals to pursue their secondary education would be high.

As it incorporates the public cost of education in its computation, the social return on investment must be interpreted differently. Assuming that individuals' salaries (especially those working in the private sector) reflect their productivity to some extent (meaning their contribution to economic growth), the social return on investment of a given level will provide a gross estimation of the economic relevance of investing public resources in the given education level.

Where salary data is available from two household surveys conducted at different points in time (5 or 10 years apart), it will be worthwhile analysing the evolution of rates of return over time, and comparing this evolution with that of enrolment. Naturally, it is expected that an increase in the supply of higher education graduates would be followed by a drop in the rate of return for this level (as their relative scarcity drops), unless there is a contemporaneous increase in economic demand (such as through the modern productive sector).

EXAMPLE 5.5

(Economic Return of Education): Analysis of the Rates of Return on Investment in Different Education Levels, Benin, 2006

Source: Adapted and translated from the Benin CSR, 2009.

Table 5.8 provides the private and social returns on investment in education, in 2006 in Benin.

TABLE 5.8 - Private and Social Return on Investment in Education, Benin, 2006

	Primary (Compared to No Education)	Lower Secondary (Compared to Primary)	TVET (Compared to Primary)	Upper Secondary (Compared to Lower Secondary)	Higher (Compared to Upper Secondary)
Private	3.7 %	1.3 %	1.6 %	8.5 %	4.8 %
Social	3.3 %	1.2 %	1.0 %	7.1 %	2.9 %

Findings

The private return on investment is particularly high for upper secondary (8.5 percent), primary (3.7 percent) and higher education (4.8 percent), and weaker for lower secondary and TVET (1.3 percent and 1.6 percent respectively). The most beneficial education cycles in terms of individual profit are thus the completion of primary (which adds great individual value compared to having no education) or long education careers (upper secondary and higher) that provide considerably better income potential than lower secondary or TVET, despite higher unemployment. There is thus a strong incentive in terms of individual profit to reach at least upper secondary, or higher education if possible.

Social returns on investment are lower in as much as they consider the same benefit as private rates of return (individuals' income from work) but higher costs, including the public cost of training as well as the private cost. They show that in terms of public investment, in the current context, the most beneficial level of education is upper secondary (return of 7.1 percent) followed by primary (3.3 percent) and higher education (2.9 percent). Lower secondary and TVET have considerably lower rates of return (1.2 percent and 1.0 percent respectively).

1.5 THE TRAINING-EMPLOYMENT BALANCE (MACRO APPROACH)

The alignment (or misalignment) of the supply and demand of work is generally illustrated by a country's employment and unemployment levels. This section aims to provide a methodological approach to understanding the potential sources of misalignments, evaluating whether education systems provide the labour market with a sufficient number of adequately trained workers.

Each year the workplace has a set level of demand for labour, and different cohorts of individuals enter the labour market. The diversity of profiles available is confronted with the diversity of positions. It is thus appropriate to question the degree to which education system leavers and graduates correspond (in volume and type) to companies' needs. The evaluation of any imbalances between the qualifications on offer and the skills required can provide decision makers with the information they need to manage student flows. Indeed, policies may choose to encourage or direct pupils towards the levels and types of training that are most in need in the workplace, and deter pupils from sectors for which there is a surplus supply of labour.

The tool most commonly used for the macro evaluation of this alignment is the training-employment balance sheet. To use this, the following information is required:

- *The number and distribution of jobs for two given time-periods:* This data can be estimated on the basis of household survey data, or obtained from the authorities that monitor employment or national statistical institutes. The data should enable, through the use of realistic assumptions, to estimate the average number of jobs available per year over the period.[62] Once adjusted for the unemployment rate, this then provides the average number of new active individuals in the workplace, per year.[63] In addition to the number of jobs, the use of data on the sector or branch of activity and socioprofessional status of workers will enrich the breakdown of the labour force.[64]

- *The average schooling profile over the period (See Chapter 2).*

This enables one to estimate the structure of the newly active population, by education level, by applying the percentages of the cohort for which each education level is the last to the considered group. Example 5.6 below provides an illustration of the use of the training-employment balance sheet based on data for Mali.

EXAMPLE 5.6

(Training-Employment Balance, by Formal/Informal): Alignment of Workplace Supply and Demand of Different Education Levels, Mali, 2009

Source: Adapted and translated from the Mali CSR, 2009.

Table 5.9 presents the training-employment balance sheet for Mali in 2009, to establish the imbalance between the supply of and demand for certain skills in the workplace.

TABLE 5.9 - Training-Employment Balance Sheet, Mali, 2009

<table>
<tr><th colspan="3">Distribution of School Leavers/Graduates</th><th colspan="4">Distribution of Jobs Available</th></tr>
<tr><th>Highest Level Attained</th><th>Number</th><th>Share</th><th>Sector</th><th>Profession</th><th>Number</th><th>Share</th></tr>
<tr><td>Higher</td><td>12,164</td><td>7%</td><td rowspan="3">Modern</td><td>Senior professionals</td><td>4,000</td><td>2%</td></tr>
<tr><td rowspan="2">Upper secondary and TVET (even if incomplete)</td><td rowspan="2">28,689</td><td rowspan="2">17%</td><td>Employees and qualified workers</td><td>25,500</td><td>15%</td></tr>
<tr><td>Other unqualified jobs</td><td>3,500</td><td>2%</td></tr>
<tr><td>Lower secondary (complete)</td><td>14,467</td><td>9%</td><td rowspan="4">Informal</td><td rowspan="3">Other informal jobs</td><td rowspan="3">55,000</td><td rowspan="3">33%</td></tr>
<tr><td>Lower secondary (imcomplete)</td><td>19,509</td><td>12%</td></tr>
<tr><td>Primary (complete)</td><td>14,238</td><td>9%</td></tr>
<tr><td>No education (or incomplete primary)</td><td>75,934</td><td>46%</td><td>Agriculture jobs or other unidentified</td><td>77,000</td><td>47%</td></tr>
<tr><td>Total of the cohort</td><td>165,000</td><td>100%</td><td colspan="2">All jobs available</td><td>165,000</td><td>100%</td></tr>
</table>

Findings

The labour market is characterised by the juxtaposition of two sectors: the modern sector and the unstructured sector, called the informal sector. Informal agricultural work is still predominant (numbers are in fact increasing) although it represents a dropping share of the total active population. On the other hand, the progression in the number of non-agriculture informal sector workers is related to the urban sector of the economy.

There is a considerable imbalance between individuals' training and the jobs available. Too many youth fail to reach the desirable minimum level of education to ensure their employment and break the poverty cycle – 46 percent of a given age group have never been to school or dropped out of primary – whereas too many youth are overqualified in terms of the absorption capacity of the modern sector labour market.

This imbalance creates situations of unemployment and over-qualification. Indeed, there are three times more youth leaving higher education every year than there are senior professional positions available, and 1.7 times more secondary school leavers than there are positions for employees and qualified labour. Furthermore, the number of active youth having never attended school (or having dropped out of primary) is about equivalent to the number of agriculture jobs. This is unfortunate from an economic standpoint in as much as the agriculture sector tends to need individuals having at least completed primary to improve their productivity. Indeed, a farmer who knows how to read, write and count, uses fertilisers and pesticides more often, and earns a better income and contributes more to economic growth as a result.

As illustrated by Example 5.7 below, the training-employment imbalance can also be appraised through the socioprofessional status of education leavers/graduates, according to their level.

EXAMPLE 5.7

(Training-Employment Balance, by Socioprofessional Status): Employment Status of Education Graduates/Leavers, by Level, Mali, 2006

Source: Adapted and translated from the Mali CSR, 2009.

Table 5.10 below highlights the distribution of the active population aged 25 to 34 years according to their level of education and employment status.

TABLE 5.10 - Distribution of the Active Population (25 to 34 Years), by Level of Education and Employment Status, Mali, 2006

	None	Basic 1	Basic 2	General and Technical Secondary	Higher	Total
Senior professionals	0 %	2 %	1 %	16 %	41 %	2 %
Employees, technicians	5 %	10 %	21 %	44 %	18 %	8 %
Manual labour	1 %	1 %	0 %	0 %	0 %	1 %
Farmers	70 %	39 %	19 %	7 %	0 %	60 %
Other informal	22 %	43 %	51 %	17 %	16 %	26 %
Unemployed	2 %	4 %	8 %	16 %	25 %	3 %
Total	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

Findings

Only 41 percent of higher education graduates work as senior professionals in the modern sector; the rest are either unemployed (25 percent) or have jobs that do not require the level of education they have usually attained thanks to mainly private resources. Unemployment is also high for secondary school leavers (16 percent) and their employability in the modern sector is low (16 percent are senior professionals and 44 percent are employees or technicians).

1.6 ANTICIPATION OF FUTURE LABOUR MARKET NEEDS

1.6.1 PROMISING SKILLS AND QUALIFICATIONS

The qualification for a job represents the know-how and knowledge required to perform the related tasks. An individual's qualifications are the result of the know-how and knowledge acquired either through training or by work experience.

If specialised surveys carried out with companies or on economic prospects are available, it will be helpful to explore them to determine which qualifications are the most promising (in terms of employment). In addition to such surveys, it may also be helpful to use household or employment survey data for two different years to obtain a historical perspective of trends in terms of the qualifications found most attractive by the labour market.[65] Example 5.8 below provides an illustration on the basis of Sao Tomé and Principe.

EXAMPLE 5.8

(Projection of the Demand for Skills, by Qualification Level): Determination of the most Promising Education Levels in Terms of Employment, Sao Tomé and Principe, 2010

Source: Adapted and translated from the Sao Tomé and Principe CSR, 2012.

Table 5.11 presents the structure and evolution of the positions available in Sao Tomé and Principe over the 2003-10 period.

TABLE 5.11 - Employed Population by Level of Qualification, Sao Tomé and Principe, 2010

	2003		2010		2003-2010 Evolution (%)
Highly Qualified	2,177	5%	3,742	8%	+72%
Average Qualifications	16,127	35%	17,251	35%	+7%
Little or No Qualifications	27,542	60%	28,528	58%	+4%
Employed Population	**45,846**	**100%**	**49,521**	**100%**	**+8%**

Findings

Two main conclusions can be drawn from the table: (i) the majority of available positions are for individuals with little or no qualifications (58 percent in 2010 against 60 percent in 2003), and is declining relatively slowly; and (ii) demand for highly qualified candidates has increased considerably. Even if only eight percent of jobs in 2010 required highly qualified workers, numbers have passed from 2,177 in 2003 to 3,742 in 2010, representing 72 percent growth over the period, a much higher rate than the average (overall, the demand for labour increased by only eight percent over the period).

Finally, tracer surveys measure the employment status of recent graduates, enabling one to complete the analysis through comparisons of the employability rates by stream, discipline and type of job.[66]

1.6.2 PROMISING SECTORS

In every country, as the economy evolves new professions appear and others dwindle or disappear, not least as a consequence of new information and communication technologies. Knowledge of the promising sectors and professions enables better planning of the sought training-employment balance. To do this, the structure of the labour force must be estimated, covering as many activity branches as possible. Then for each branch the number of positions available, both currently and for a previous period (generally four years earlier, depending on survey data availability), is estimated. Finally, the growth rate of employment is computed for each branch. This indicator enables the identification of the branches that create most new jobs and those that appear to be declining. The approach is illustrated by the case of Sao Tomé and Principe, in Example 5.9 below.

EXAMPLE 5.9

(Projection of Demand for Skills, by Sector): Determination of Promising Sectors in Terms of Employment, Sao Tomé and Principe, 2010

Source: Adapted and translated from the Sao Tomé and Principe CSR, 2012.

TABLE 5.12 - Positions Available, by Activity Branch, Sao Tomé and Principe, 2003-2010

	2003	2010	2003-10 Growth
Agriculture	13,393	13,074	-2 %
Industry	8,650	8,419	-3 %
Business	12,007	10,251	-15 %
Services	11,796	17,778	51 %
Employed population	**45,846**	**49,521**	**8 %**

Findings

The service sector is the most promising in terms of demand for labour, having shown growth above 50 percent over the 2003-10 period. The supply of TVET and higher education courses oriented towards this sector should no doubt be reinforced to face such demand and contribute to economic growth. (Service sector jobs relate to communication, transport, catering, maintenance and so on). On the other hand, employment in all other sectors is in decline, especially in the business sector where jobs have contracted by about 15 percent over the period.

1.6.3 TOOLS FOR THE REGULAR MONITORING OF THE TRAINING-EMPLOYMENT BALANCE

To complete the analysis, it is helpful to adopt a qualitative approach in reviewing the tools, initiatives, mechanisms and institutional arrangements that exist to monitor and manage the relationship between training and employment. The analysis should also appraise the efficiency of these tools and mechanisms. Among other comments, it will be interesting to note the existence of tools for the regular monitoring of education leavers' outcomes in the workplace (through career monitoring or tracer surveys). Annex 5.5 proposes a referential guide of questions and issues that can be dealt with during interviews with the key education sector players.

SECTION 2 THE SOCIAL IMPACT OF EDUCATION

Education also has positive non-economic externalities, as a factor of change in individuals' social behaviour. These effects can include aspects as diverse as health, reproductive behaviour, high-risk behaviour, or civic attitudes. The different effects can be evaluated at the household level according to four key dimensions: (i) the promotion of health; (ii) the control of fertility; (iii) civic commitment; and (vi) living conditions.

Measuring the social effects of education will here consist in appraising the impact of education on these four dimensions. This section consists of three parts. The first part deals with variables that are likely to be used to describe each of the four dimensions, based on the different surveys that are commonly conducted in developing countries. A practical illustration of how to evaluate the effects of different education levels on these dimensions is explained in the second part. Given that the approach is the same for all of the four dimensions, the illustration will just focus on one, the control of fertility. Finally, the third part consolidates the results for different education levels and their impact on the social behaviours considered.

2.1 THE CHOICE OF SOCIAL DEVELOPMENT VARIABLES

Whatever the dimension considered, three criteria should orient the choice of variables to characterise the different social impacts of education:

- *Diversity*, so that the choice of indicators covers all the facets considered;

- *Ownership*, so that the variables chosen reflect issues of national importance or coincide with the country's selected economic and social development indicators; and

- *Availability*, depending on the specific household surveys that have been carried out (CWIQ, DHS, MICS and so on) or the availability of data on more specialised population groups, especially where there is no operative routine data collection process, such as for birth registrations.[67]

2.1.1 VARIABLES DESCRIBING THE IMPACT OF EDUCATION ON HEALTH

The questions the analysis seeks to answer include: *To what extent do more educated individuals more frequently adopt behaviour that is likely to protect or improve their health and that of their children? Are they more likely to adopt healthy behaviour, use preventive treatment, or protect themselves against illnesses, including HIV/AIDS and malaria?*

In terms of maternal health, DHS, MICS, CWIQ and HIV/AIDS surveys usually provide data on: (i) the use of iron supplements during pregnancy; (ii) prenatal health care and checks; (iii) the assistance at birth of skilled health personnel; (iv) the use of impregnated mosquito nets; (v) the use of basic health services (before, during and after pregnancy); and (vi) women's level of knowledge of HIV/AIDS and how to avoid transmission.

Surveys usually provide the following useful information on the health of children (up to the age of five years): (i) vitamin A supplements; (ii) children's measurements at birth and nutritional status as they grow; and (iii) survival.

In terms of high-risk behaviour, the following might be considered: (i) use of tobacco; (ii) use of alcohol; (iii) having multiple sexual partners. These later data are sometimes also available for men, particularly in DHS surveys.

2.1.2 VARIABLES DESCRIBING THE IMPACT OF EDUCATION ON FERTILITY

Although many countries have begun (or indeed finished) their demographic transition[68] process, others continue to have difficulties in controlling demographic growth due to high fertility rates. The role of education in the process of controlling demographic growth is unanimously recognised.

In the framework of education sector analysis, the data usually available through household surveys enable the evaluation of the impact of education on: (i) women's age at first marriage; (ii) women's age at first intercourse; (iii) mothers' age at first childbirth; (iv) the spacing of births (measured by the ratio between the number of years between the first and last birth at the time of the survey and the number of births over the period); (v) knowledge and use of birth control methods, either traditional or modern; (vi) the number of live births; and (vii) the number of desired children. Some of these issues are also covered by surveys targeting men; if so, it is appropriate to analyse such results as well.

2.1.3 VARIABLES DESCRIBING THE IMPACT OF EDUCATION ON CIVIC AND SOCIAL COMMITMENT

Over recent years, the number of cases of conflict in developing countries has increased, particularly in Africa. Political tension, war, threats to the legitimacy of republican institutions and so on are more and more common. This underlines the need to examine the non-economic components of social well-being and progress in greater depth, which include social commitment, interest in politics and involvement in civil society. Education makes a positive contribution to these indicators.

On the basis of DHS/MICS survey data, the link between education and the following aspects can be studied:

(i) *Women's knowledge of their rights:* surveyed women are asked if they believe they can refuse to have sex with their husband when tired, if they believe they have the right to insist that their husband wear a condom if he has an STD, if they believe that husbands are entitled to beat their wives, and so on;

(ii) *Prevalence of birth registration:* Women are asked if their children's births have been registered;

(iii) *Female genital mutilation/excision practices:* In DHS/MICS surveys, women are asked if they have heard of excision, if they think the practice should be maintained/abandoned, and if they think it is a religious requirement;

(iv) *The level of interest in public affairs:* some questions enable the analyst to determine whether respondents listen to the radio, watch television or read a newspaper; and

(v) *Sensitisation on gender issues:* respondents are asked if they have a preference for the gender of their children, about the schooling of boys and girls, and so on.

Furthermore, 1-2-3-type surveys[69] include a module on democracy and governance. Such modules enable a quantified appraisal of governance both from the standpoint of the state's efficiency and from that of households' confidence in public institutions. For instance, the following questions may be asked: Ar*e you favourable to democracy? In your opinion, has democracy in your country improved since the early 1990s? Did you participate in the last elections/have you ever voted? Are you interested in politics? Do you discuss politics with your entourage? Do you participate in political or union demonstrations?*

2.1.4 VARIABLES DESCRIBING THE IMPACT OF EDUCATION ON LIVING CONDITIONS

Poverty is a multidimensional phenomenon that cannot be reduced to monetary resources (income). Poverty should consider the full living conditions of a household. Household surveys enable the collection of several data on living conditions, such as the type of accommodation, household spending (in some), dress, leisure, ownership of a phone and so on.

Through a factor analysis based on the information collected, it will be possible to construct a synthetic indicator of households' living conditions that will enable the classification of households on a wealth scale.[70] It is common to distinguish between five levels of wealth (called quintiles). The first two quintiles (40 percent of households) consist of those families living in the most difficult conditions (the poorest). The variable that determines the link between living conditions and education is thus the qualitative variable that reflects the fact that a household belongs to the first two quintiles, or not.

2.2 ESTIMATION OF THE NET EFFECTS OF EDUCATION[71]

For illustrative purposes, two fertility control variables will be chosen among those identified earlier to determine the social impact of education: the age of women at first childbirth and their knowledge of a modern contraceptive method. The same approach to the analysis can be applied to other areas to determine the effect of education on them, as well as the contribution of each education level to the overall impact.

2.2.1 IMPACT OF EDUCATION ON THE AGE AT FIRST CHILDBIRTH

The aim of the analysis is to: (i) estimate the evolution of women's age at first childbirth according to the number of years of education they have received, while holding the variables for other individual characteristics constant;[72] and; (ii) compare the relative contributions of each education level to the overall impact.

Given that the age at first childbirth variable is continuous, it is common practice to estimate the impact of the number of years of education on the variable through a linear model.[73] Linear models enable one to determine how age at first childbirth varies according to women's number of years of education, all other things being equal. The following theoretical example illustrates the approach.

EXAMPLE 5.10

(Social Impact of Education by Level – Linear Model): Impact of Each Education Level on Age at First Childbirth (Theoretical Approach)

Source: Authors.

Table 5.13 below presents the results of a linear econometric estimation according to a model explaining the age of women at first childbirth, based on: (i) the number of years of education effectively completed; and (ii) control variables (women's age, age squared, area of residence, level of income, level of income squared).[74]

TABLE 5.13 - Results of the Linear Econometric Estimation of Age at First Childbirth (Theoretical Example)

Variable (X_j)	Coefficient (b_j)	Significance
Number of Years of Education	0.02150	0.00%
Number of Years of Education Squared	0.02156	0.00%
Women's Age	0.33778	0.00%
Women's Age Squared	-0.00390	0.02%
Urban	-0.07835	0.00%
Level of Income	1.26378	0.00%
Level of Income Squared	-1.56285	0.01%
Constant	11.03507	0.10%

Note: Data are for illustrative purposes only.

As the model is linear, the average relationship between the variable to be explained and the explanatory variables is provided by the following equation:

$$Y = \sum_{i} b_j X_j$$

To simulate the net effect of the number of years of education (all other things being equal), the variable of interest is varied with respect to the number of years of education, whereas the other variables are held constant (equal to their average). Table 5.14 illustrates the different steps of the computation to perform in the simulation process.

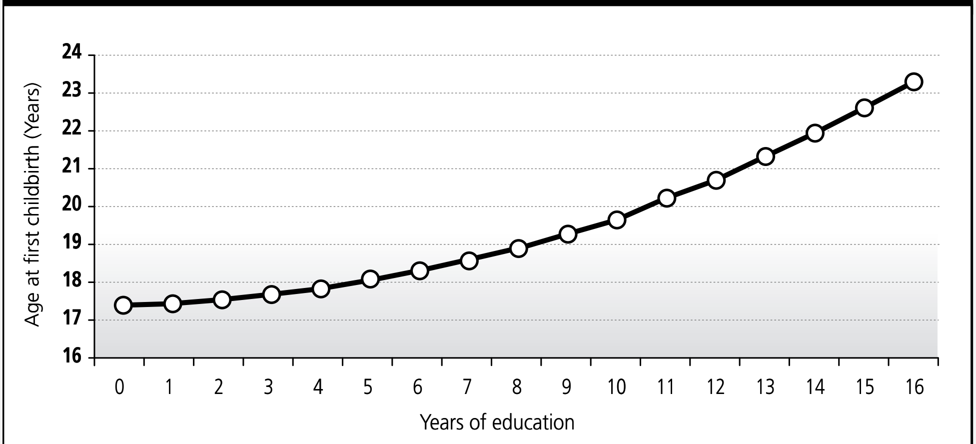
The results of the simulation enable one to draw the graph below that shows the evolution of the age at first childbirth according to the number of years of education for a woman whose characteristics are those of the average national woman (in terms of age, area of residence and level of income).

TABLE 5.14 - Simulation of the Age at First Childbirth According to the Number of Years of Education (Theoretical Example)

Variable (X_j)	Coefficient (b_j)	Average of X_j	Number of Years of Education (N)	0	2	4	6	8	10	13	16
Years of Education	0.021504	-	A = Coef. x N	0.000	0.043	0.086	0.129	0.172	0.215	0.280	0.344
Years of Education Squared	0.021562	-	B = Coef. x N^2	0.000	0.086	0.345	0.776	1.380	2.156	3.644	5.520
Age	0.337776	30.69258	C = Coef. x Avg.	10.367	10.36	10.36	10.36	10.36	10.36	10.36	10.36
Age Squared	-0.003898	1,018.0243	D = Coef. x Avg.	-3.968	-3.968	-3.968	-3.968	-3.968	-3.968	-3.968	-3.968
Urban	-0.078354	0.49441	E = Coef. x Avg.	-0.039	-0.039	-0.039	-0.039	-0.039	-0.039	-0.039	-0.039
Level of Income	1.263784	-0.00423	F = Coef. x Avg.	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Level of Income Squared	-1.562853	0.01078	G = Coef. x Avg.	-0.017	-0.017	-0.017	-0,017	-0.017	-0.017	-0.017	-0.017
Constant	11.035070	1	H = Coef. x Avg.	11.035	11.03	11.03	11,03	11.03	11.03	11.03	11.03
			Sum (Simulated Age at First Childbirth)	17.4	17.5	17.8	18.3	18.9	19.7	21.3	23.2

Note: Data are for illustrative purposes only.

FIGURE 5.5 - Evolution of Age at First Childbirth According to the Number of Years of Education (Theoretical Example)



Note: Data are for illustrative purposes only.

Findings

Education has a significant impact on the age at first childbirth, showing a quadratic relationship (the variable for the number of years of education squared is significant). The analysis of the last line of Table 5.14 shows that the effect of education is relatively weak during the primary cycle (six years), with a difference of 0.9 years (=18.3-17.4) between the first childbirth of uneducated women and those with 6 years of education. The impact is more substantial as of lower secondary

(1.4 years (=19.7-18.3) difference between the end of primary and the end of lower secondary), and remains significant through upper secondary and higher education. The average age at first childbirth increases by 1.6 years (=21.3-19.7) for women with upper secondary (compared to those with lower secondary) and by 1.9 years (= 23.2-21.3) for women with higher education (compared to those with upper secondary).

After simulating the evolution of the age at first childbirth according to the number of years of education, the estimation of the contribution of each level is obtained on the basis of the added value of each education level with respect to the previous level, called the marginal impact. The contribution of a level is then the share of the overall variation.

Table 5.15 shows in detail how to perform the estimation of the marginal impact of each education level, based on the last line of Table 5.14.

TABLE 5.15 - Effect of Each Education Level on the Age at First Childbirth (Theoretical Example)

	Level of Education					
	None (1)	**Primary (2)**	**Lower Sec. (3)**	**Upper Sec. (4)**	**Higher (5)**	
Age at First Childbirth (Years)	17.4	18.3	19.7	21.3	23.2	
Marginal Impact (formula)		**a = (2)-(1)**	**b = (3)-(2)**	**c = (4)-(3)**	**d = (5)-(4)**	**Effet total E = a+b+c+d**
Marginal impact (results)		0.9	1.4	1.6	1.9	5.8
Distribution of the Total Impact (%)		**100 x a/ E**	**100 x b/ E**	**100 x c/ E**	**100 x d/ E**	**Total**
Impact of Each Education Level on Age at First Childbirth		15.4	25.0	26.5	33.1	100

Note: Data are for illustrative purposes only.

Findings

The age at first childbirth increases by 5.8 years (=23.2-17.4) on average for women with higher education (compared to uneducated women), all other things being equal. This is the total net effect of education on the variable. Higher education has the highest impact of any level (33 percent (=1.9/5.8) of the total impact) and primary education has the lowest impact (15 percent (= 0.9/5.8)). A woman who leaves school with lower secondary for instance will benefit from only 40 percent (=15+25) of the overall impact that would be achieved by continuing to higher education.

2.2.2 IMPACT OF EDUCATION ON THE KNOWLEDGE OF A MODERN CONTRACEPTIVE METHOD

As per the approach adopted above, the objective of this analysis is to: (i) estimate the evolution of the likelihood of women knowing at least one modern contraceptive method according to the number of years of education they have received, while holding the variables for other individual characteristics constant; and; (ii) compare the relative contributions of each education level to the overall impact.

MICS/DHS/HIV surveys usually include a series of questions about women's knowledge of contraception. Their responses enable the construction of a qualitative variable that adopts the value of 1 when women know of at least one modern contraceptive method, and the value of 0 otherwise. As the variable is binary (dummy variable)[75], logistical models (and not linear models as above) are the most appropriate to use in this case.[76]

The share of women knowing a modern contraceptive method after N years of education is then estimated according to the following equation:

$$P = \frac{1}{1+\exp^{-\sum_j b_j X_j}} = \frac{1}{1+\exp^{-S}} \quad \text{where } S = \sum_j b_j X_j \quad \text{, and}$$

X_j is the jth explanatory variable (the number of years of education completed, or a control variable) and b_j is the j^{th} parameter to estimate, that describes the direction of the effect of X_j on P. These parameters are then estimated thanks to specialised statistical software (Stata, SPSS, and so on). As for the linear model, the variable for the number of years of education is adjusted but the control variables are held constant (equal to their averages).

An illustration of the application of this approach is provided in Example 5.11. To estimate the respective contributions of each level of education, the same approach as in Example 5.10 above is used.

EXAMPLE 5.11

(Social Impact of Education by Level – Logistical Model): Impact of Each Level of Education on the Probability of Knowing at Least One Modern Contraceptive Method (Theoretical Approach)
Source: Authors.

Table 5.16 below presents the results of the logistical econometric estimation according to a model explaining the likelihood that women know at least one modern contraceptive method, based on: (i) the number of years of education completed; and (ii) control variables (women's age, age squared, area of residence, level of income, level of income squared).

TABLE 5.16 - Results of the Logistical Econometric Estimation of the Probability of Knowing at Least One Modern Contraceptive Method (Theoretical Example)

Variable (X_j)	Coefficient (b_j)	Wald	Significance
Number of Years of Education	0.845894	90,671,542	0.00%
Number of Years of Education Squared	0.005487	428,777	0.05%
Women's Age	0.060536	645,876	0.00%
Women's Age Squared	-0.000624	285,073	0.00%
Urban	0.127227	1,209,981	0.00%
Level of Income	4.235022	29,981,813	0.02%
Level of Income Squared	-7.277579	1,795,904	0.00%
Constant	-5.877556	23,662,970	0.01%

Note: Data are for illustrative purposes only.

Table 5.17 provides the different steps of the calculation to be performed to simulate the net probability of knowing a contraceptive method according to the number of years of education (all other things being equal).

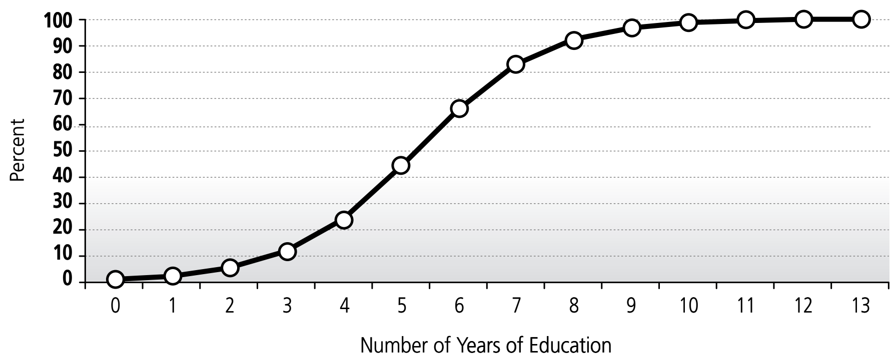
TABLE 5.17 - Simulation of the Probability of Knowing at Least One Modern Contraceptive Method by Number of Years of Education (Theoretical Example)

Variable (X_j)	Coefficient (b_j)	Average of X_j	Number of Years of Education (N)	0	2	4	6	8	10	13
Years of Education	0.84589	-	A = Coef. x N	0.000	1.692	3.384	5.075	6.767	8.459	10.997
Years of Education Squared	0.00549	-	B = Coef. x N^2	0.000	0.022	0.088	0.198	0.351	0.549	0.927
Age	0.06054	30.7770	C = Coef. x Avg.	1.863	1.863	1.863	1.863	1.863	1.863	1.863
Age Squared	-0.00062	988.0223	D = Coef. x Avg.	-0.616	-0.616	-0.616	-0.616	-0.616	-0.616	-0.616
Urban	0.12723	0.5375	E = Coef. x Avg.	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068	-0.068
Level of Income	4.23502	-0.0084	F = Coef. x Avg.	0.036	0.036	0.036	0.036	0.036	0.036	-0.036
Level of Income Squared	-7.27758	0.0121	G = Coef. x Avg.	-0.088	-0.088	-0.088	-0.088	-0.088	-0.088	-0.088
Constant	-5.87756	1	H = Coef. x Avg.	-5.878	-5.878	-5.878	-5.878	-5.878	-5.878	-5.878
			Sum (Probability knowing a means of contraception)	-4.614	-2.901	-1.143	0.658	2.504	4.393	7.309
			P = 1/(1+exp(-S)) (%)	1.0	5.2	24.2	65.9	92.4	98.8	99.9

Note: Data are for illustrative purposes only.

Figure 5.6 illustrates the evolution of the probability of knowing at least one means of contraception (last line of Table 5.17) according to the number of years of education completed.

FIGURE 5.6 - Evolution of the Probability of Knowing at Least One Modern Contraceptive Method According to the Number of Years of Education (Theoretical Example)



Note: Data are for illustrative purposes only.

Illustrative Findings

The variable with the highest impact on the knowledge of modern contraceptive methods is the number of years of education (the highest Wald statistic in Table 5.16 above). The probability of women knowing at least one means of contraception jumps from 1 percent for those without education to 65.9 percent for those having completed primary, to 100 percent for those with higher education.

2.3 CONSOLIDATION OF THE NET SOCIAL EFFECT OF EDUCATION

At the end of this section, it is helpful to summarise the results obtained for each of the four dimensions studied (health, the control of fertility, civic commitment and living conditions) and compute the cost-efficiency ratios for each level of education. This analysis provides education sector decision makers with further helpful information to guide the intra-sectoral allocation of resources to optimise the social benefit of education. Example 5.12 drawn from the Sierra Leone CSR illustrates the recommended approach.

EXAMPLE 5.12

(Consolidated Net Social Effect of Education): Global Social Impact of Different Education Levels, Sierra Leone, 2010

Source: Adapted from the Sierra Leone CSR, 2012.

Table 5.18 consolidates the net social effects of education on different behaviours to determine the global contribution of each level of education.

TABLE 5.18 - Distribution of the Social Impact of Education, by Level and Type of Behaviour, Sierra Leone, 2010

		Primary	JSS	SSS	Higher
Control of Fertility	Age at First Childbirth	45	20	25	10
	Total Number of Live Births	44	19	25	12
	Use of Contraception	46	25	20	9
Maternal and Child Health	Probability of Home Delivery	45	22	20	13
	Use of Tetanus Toxoid during Pregnancy	56	19	17	8
	Use of Malaria Prevention Medicine during Pregnancy	46	21	20	13
	Probability of at Least One Child Dying	42	22	22	14
Female Genital Mutilation	Probability of Approval for Daughters	38	23	24	15
HIV/AIDS	Knowledge Score	41	22	22	15
Poverty	Probability of Being among the 40% Poorest	33	16	12	39
Average Social Impact for the Level[1]		**43.6**	**20.9**	**20.7**	**14.8**
Average Social Impact of one Grade[2]		**7.3**	**7.0**	**6.9**	**7.4**
Public Recurrent Unit Cost per Grade (Multiple of Primary)		**1**	**1.6**	**2.7**	**18.6**
Cost-Efficiency Index = Impact / Cost x 100		**0.073**	**0.044**	**0.026**	**0.004**
Relative Cost- Efficiency (Primary = 100)[3]		**100**	**59.9**	**35.0**	**5.4**

Note: 1 Each item of this line is obtained as the simple average of the values of the respective column. For instance, 43.6 = (45+44+46+45+56+46+42+38+41+33)/10. 2 The items of this line are obtained by dividing the impact of each level by the number of years for that level. For instance, 7.3=43.6/6. 3 All the items of this line are obtained by dividing the values of the previous line by the primary level cost-efficiency index. For instance, 59.9=(0.044/0.073)*100.

Findings

On average, the primary cycle represents almost half (43.6 percent) of the total social impact of education on the behaviours considered. Secondary (combining junior and senior secondary) and higher education respectively account for 41.6 percent and 14.8 percent of the impact. When accounting for the number of years per cycle, a year of primary education accounts for 7.3 percent of the total social impact, a year of secondary for 7.0 percent and a year of higher education for 7.4 percent. On this basis, each year of schooling in Sierra Leone has a marginal impact on social behaviour of approximately 6.7 percent.

The results in the last row of the table underline the very high cost-efficiency of the primary cycle in human development terms, compared to the secondary and especially the tertiary levels. Indeed, the decreasing level of cost-efficiency with each level of education is notable. All costs being equal, the efficiency of the primary cycle in enhancing human development is two times higher than that of the secondary cycle and 20 times higher than that of tertiary education.

NOTES

46 Furthermore, because the production of such data is generally the responsibility of institutions that are not part of the education and training sector as such, their interest in the issue is often dampened.

47 By being better informed, it is expected that individuals' participation in the life of the community will be more appropriate.

48 For all indicators and analyses, it will be important where data permit to provide a historical perspective and an international comparison with countries of similar characteristics.

49 Company is used here in a generic sense, to designate any goods and/or services production unit, be it for profit (public, public-owned or private enterprises) or non-profit (public institutions, charities, etc.).

50 Regional employment may also be worthy of analysis, especially for higher education graduates.

51 These issues should be further highlighted in section 1.3 where the quality of employment is analysed.

52 Unless specifically mentioned, the generic term *household surveys* will be used to encompass any survey with an employment module.

53 Household surveys often enable more detailed analysis, by disaggregating indicators by individuals' gender, age, area of residence and level of education. Whether from administrative or survey data, it is always helpful to provide a recent historical perspective.

54 The definition of activity branches adopted by AFRISTAT member countries (the NAEMA classification), is derived from the United Nations' International Standard Industrial Classification (ISIC) by type, industry and economic activity branch.

55 Written or verbal agreement whereby an active individual offers their activity to the service of an employer (in exchange for remuneration or not).

56 This approach is best especially where no questions were asked to determine an individual's salary status.

57 It can help to limit analyses to a sample of recent graduates/leavers (See Annex 5.3).

58 Unstable positions are those whose contractual status is temporary. For the analysis, it is common to consider self-employment and unpaid family helpers as members of the active population with instable positions.

59 Finally, a third complementary approach may be used where the data permit, and consists of the qualitative opinion of individuals with respect to their under-employment or over-qualification.

60 This definition was introduced by Nauze et al., 2002. Instead of the mean income, the average income minus one standard deviation is sometimes used.

61 The social return on investment presented in this section is not the same as the social impact of education presented in Section 2 of this chapter.

62 The evolution of the supply of jobs is generally considered to be linear between the two periods considered.

63 For instance, if 100,000 new jobs were available each year over the 2005-10 period and that the unemployment rate among new graduates/leavers was 10 percent, the training-employment balance should be based on a cohort of 111,111 youth (=100,000/(1-10%)).

64 If only the data from one survey is available and that it provides information on individuals' seniority, the number of employed with at least X years of seniority (say 5 years) can provide a gross estimate of the total number of new jobs provided over the last X years. This number can then be divided by X to obtain an estimate of the annual average number of new jobs.

65 Senior and mid-level professional positions and similar jobs are considered to be highly qualified positions; qualified employers, foremen and technicians are considered to require average qualifications; and self-employed, managers and manual labour positions are considered to require few qualifications.

66 See Annex 5.4.

67 These surveys may provide information on poverty, literacy, birth registration, knowledge of HIV/AIDS transmission, maternal and child health, and so on. Annex 5.2 provides further detail on such surveys.

68 The demographic transition is the change from a traditional demographic growth pattern in which both birth and mortality rates are very high (around 40‰) to a modern one, where birth and mortality rates are weak (around 10‰). The transition often begins with a drop in mortality (helped by progress in terms of health), to then be accompanied by a drop in birth rates (which takes longer to become effective given the heavy social and behavioural changes implied). Thus, demographic transition processes are accompanied in their early stages by strong demographic growth.

69 See Annex 5.2 for a description of such surveys.

70 A factor analysis is a mathematical approach enabling the synthesis of data into a mono or multidimensional indicator, based on several elements (variables) that describe a phenomenon. An index can also be directly although subjectively constructed giving appropriate weights to each of the constituents of wealth.

71 A net effect estimates the association of a variable with an other, all other variables being equal.

72 Such variables include the area of residence, household living conditions, age and so on.

73 For a more precise measurement still, it may be helpful to use a more complex statistical model (a simple duration model) given that the age at first childbirth is a quantitative variable that is right-censored: it is only measured for women having given birth at least once in their life. However, the results with a simple duration model are usually similar to those reached through the linear model.

74 Some variables are squared when it is suspected that the relationship between the variable and the phenomenon under study is not only linear. This allows to take into account the fact that the concavity of the relationship can change over time.

75 A binary (or dummy) variable is a variable that takes the value either 1 or 0 (usually matching with the answers "Yes" and "No").

76 Probit type models can also be used. See Annex 0 for further details.

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CHAPTER 6

EQUITY

› Chapter Objective:
To analyse: (i) the extent to which enrolment patterns and school results vary according to key sociodemographic factors, and (ii) how policy choices in terms of public resource distribution affect equity.

1. EQUITY IN ENROLMENT AND LEARNING ACHIEVEMENTS

ISSUE

Do all children face the same enrolment chances? Or, on the contrary, are the disparities in schooling careers and results large, and affected by criteria beyond individuals' control?

OBJECTIVES

- Identify the existence and extent of disparities in schooling careers and results according to gender, area of residence (urban/rural), geographic location, people with disabilities and household wealth.

METHODS

- Analyse individuals schooling careers and results according to gender, location, and household income; and
- Illustrate the disparities through the use of various indicators: parity index, odds ratios, and so on.

SOURCES

- Population: projection data based on population censuses (gender, area of residence) or United Nations projections (gender), household surveys (gender, area of residence, location, household income);
- School data (enrolment, repetition by gender and location): data provided by education management information systems (EMIS);
- Specific surveys on learning achievements;
- National exam/test results; and
- Household surveys (MICS, DHS, CWIQ, and so on).

2. EQUITY IN THE DISTRIBUTION OF PUBLIC EDUCATION RESOURCES

ISSUE

Do public education resources benefit all equally, or are they concentrated within a particular segment of the population? Is the education system a channel for the reduction or the increase in inequalities inherent at birth?

OBJECTIVES

- Evaluate the degree of equity in the distribution of public education resources by highest year of schooling achieved (structural equity); and
- Evaluate the degree of absorption of public resources by various socioeconomic groups (distributive equity/social selectivity).

METHODS

- Build the Lorenz curve and deduce the Gini coefficient and the share of education resources absorbed by the 10 percent most educated;
- Calculate the factor of appropriation of public resources by different socioeconomic groups; and
- Carry out international comparisons.

SOURCES

- School data from EMIS;
- Household surveys; and
- Unit costs (see Chapter 3).

Introduction

What is equity?

The notion of equity is to be distinguished from that of equality with which it is sometimes confused, however close they may be. Equality is based on a mathematical premise, the relative evenness in the distribution of resources, and is close to the notion of equal treatment. Equity on the other hand refers to a concept of social justice and thus is more assimilated to the notion of equal chances.

In the name of the principle of equity (increasing social justice), the two main approaches are:

- *Treating equals equally.* In this case, the allocation of resources will be deemed equitable if all members of a group with similar needs (the poor, adolescents, rural populations, people with disabilities, and so on) benefit from equal treatment. According to the distribution criteria chosen, one will analyse whether allocated resources, access, usage, or the benefits of education are equally shared within the group; and

- *Not treating unequals equally*. Here, the idea is to avoid treating all groups equally, instead favouring some or disadvantaging others through positively discriminatory policies or quotas. These measures aim to offer more to those with special needs, therefore compensating the inequity they face as a result of their difference.

In the analysis of equity and in the context of this guide, the first step will be to determine the groups (and its individuals' characteristics) that suffer from a disadvantage in terms of access to education and schooling careers. The most relevant characteristics, according to the principle of equal chances, are those that individuals have little control over. Although there is currently no consensus regarding these characteristics, that often hinge on a particular cultural or historical context, this guide proposes to retain a set that are easily identified and measured: gender, area of residence (urban/rural), location and socioeconomic status. This non exhaustive list may be extended to other characteristics that reflect the particular circumstances of a given analysis: ethnic origin, religion, disability, orphanhood, and so on.[77]

Why is it important that education sector policies incorporate the equity dimension?

The search for equity in education responds to two basic issues. The first is about social justice and reducing socioeconomic inequalities; the second is about socioeconomic efficiency.

Education is considered to be one of the best channels to reduce socioeconomic inequalities, and especially, a powerful tool to reduce their trans-generational transmission. The level of qualifications and degrees obtained throughout schooling determine an individual's future socioeconomic status to a certain extent. Education systems are therefore expected to offer each child similar chances of success, based on merit over and above personal characteristics beyond their control (gender, area of residence, and so on). Given that schooling options are likely to be affected by individuals' financing ability and other specific characteristics, it is important to determine the extent to which education systems, especially those that are publicly funded, take these factors into account to limit their impact on individuals' access to school and results.

Socioeconomic efficiency reflects the theory that education, as human capital, is a key determining factor for social and economic development, such as through the reduction of maternal, infant and child mortality or fertility at the individual level, or through the contribution to innovation and economic growth at the collective level. The collective interest implies ensuring that all members of society achieve a minimal level of education on the one hand, and that the most capable individuals reach the highest levels of education, regardless of their socioeconomic origin, on the other.

In addition, paying attention to equity in the education policy is a way to promote and strengthen social cohesion and can help reduce the risks of conflicts (see World Bank WDR 2011). This chapter is also an opportunity to address the equity issues faced by children with disabilities. For many reasons, children with disabilities are more likely to not be enrolled in school or to drop out. Box 6.1 outlines the main issues.

BOX 6.1
CHILDREN WITH DISABILITIES AND ACCESS TO EDUCATION

An estimated 24 million out-of-school children experience some form of disability including learning, speech, physical, cognitive, sensory disabilities or emotional difficulties. In addition, there are many children with disabilities who are in school, but are expected to drop out. This population at risk consists of three main categories:

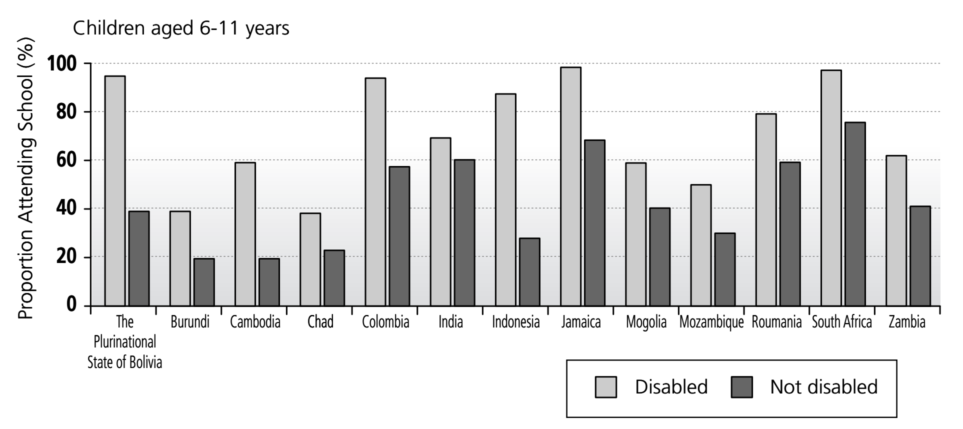
(i) Children with disabilities who are enrolled in school but who are excluded from learning because the curriculum has not been adapted to fit their needs or teachers do not have the capacity or time to make the needed adaptations, and/or they do not have access to assistive devices necessary for their learning needs (for instance, children with low vision are unable to see the board without eye glasses, and some of them require large print textbooks);

(ii) Children who are not enrolled in school but who could participate well if schools had the capacity in terms of knowledge, skills and equipment to respond to their specific needs (for instance, children with physical disabilities cannot go to school when buildings are not accessible);

(iii) Children with severe disabilities who require additional specialised support.

The group of children with severe disabilities is usually a relatively small group (2-3 percent), yet children with milder disabilities suffer from inequality in terms of access to education and retention.

FIGURE 6.1 - Proportion of Children Aged 6-11 with and without a Disability who Are in School



Source: World report on disability, WHO, 2011.

The inclusion of children and adults with disabilities in education is important for several reasons: Education contributes to human capital formation and is thus a key determinant of personal well-being and welfare; excluding children with disabilities from educational and employment opportunities has high social and economic costs (for example, adults with disabilities tend to be poorer than those without disabilities, but education weakens this association); countries cannot achieve Education for All or the Millennium Development Goal of universal completion of primary education without ensuring access to education for children with disabilities.

Despite the increased global interest in children with disabilities, relatively little is known about the specific situation of children with disabilities, particularly in developing countries. There is an urgent need for better quality data on children with disabilities, especially disaggregated data that explain the different disabilities and impairments as well as the level of severity so that appropriate measures can be taken.

More information can be found in the 2011 WHO World Report on disability (Chapter 7: Education).

Two types of analysis are offered by this guide to establish the extent to which an education system is either equitable or inequitable:

- The first deals with inequalities in access to school, schooling paths, and learning achievements: it will establish the extent to which access, retention and learning are related to individual characteristics;

- The second deals with inequalities in the distribution of public education resources. Education is financed mainly by the state, on public funds; each individual will absorb a certain level of public resources, based on their schooling career. Therefore the distribution of public education resources among a generation of children will depend on: (i) the distribution according to the highest level achieved; and (ii) the structure of public spending by pupil for each level. The distribution will be all the more unequal as schooling careers vary considerably and unit costs increase substantially with successive cycles. Conversely, it will be all the more equitable if all children of a given age have access to school and follow similar schooling careers, and/or if unit costs only increase marginally with each level. In this regard, it will be appropriate to analyse whether the distribution of resources favours equity; in other words, whether it compensates the inequalities that exist among different groups at birth, or reinforces them.

To answer these questions and evaluate the equity of an education system, a battery of indicators is available to help quantify and measure the phenomena at play. The basic underlying principle is that equitable and effective education policies should lead to equality in the access to education opportunities in the broadest sense by different social groups.

SECTION 1

EQUITY IN ENROLMENT AND LEARNING ACHIEVEMENTS

Reviewing the equality of school access chances is the first step in the analysis of an education system's level of equity. If children do not have the same chances of access to school, the system will clearly not offer them all the same chances to learn. The guide will therefore first focus on the identification of possible disadvantaged groups in terms of school access, through both access indicators (*gross access rate, access probability*, and so on), and equity indicators elaborated on the basis of the former. Equity indicators can be computed for any education cycle/level.

However, ensuring an equitable initial access to school is insufficient in as much as differences may arise during children's progression through school. The second step will therefore be to establish the extent to which these differences do arise, and if they occur at the expense of a group of individuals defined by characteristics beyond their control (gender, location, ethnic origin, socioeconomic status, and so on). This analysis will be carried out with the help of indicators measuring schooling careers (*access rates* to different school levels, *transition rates* between school cycles and *retention rates* within given cycles). It will also be possible to provide more global perspectives of school participation through *gross enrolment rates* and *school life-expectancy*.

The third step may involve an evaluation of the learning achievements of children in light of the academic objectives set, which is a challenge. The analysis may focus on the extent to which differences in learning achievements or qualifications upon leaving school (exam success rates and results) are related to pupils' characteristics and origins. Here again, the calculation of specific equality indicators on the basis of the outcome indicators will help to establish the degree of equity.

In the following sections, the guide will illustrate through specific examples how various indicators may be used to highlight equity issues in a given education system. See Chapters 2 and 4 and the annexes for a description of schooling and learning achievement indicators.

1.1 THE ABSOLUTE GAP IN PERFORMANCE BETWEEN TWO GROUPS

The absolute gap in the performance of two groups A and B (such as urban and rural populations, boys and girls, rich and poor) is calculated by subtracting the chosen performance indicator (intake rate or probability, gross enrolment rate, completion rate, or exam success rate) for group A from that for group B:

Absolute gap in the primary level gross intake rate (GIR) between boys and girls:
Boys' GIR – Girls' GIR

Where the primary gross intake rate for girls (the same applying for boys) is:

$$\frac{\textit{Number of non-repeating female students in primary Grade 1}}{\textit{Female population of the theorical age of primary Grade 1}}$$

The absolute gap is interpreted as the amount by which it is necessary to increase the performance indicator for group B (girls in this instance) to achieve equity between the two groups.

EXAMPLE 6.1 **(Absolute Gap): Gender Disparities in Primary Access, Mali, 2007/08**
Source: Translated and Adapted from the Mali CSR, 2010.

TABLE 6.1 - Gender Disparities in Access to the First Cycle of Basic Education, Mali, 2007/08

Year of Study	Boys	Girls	Gap
1	86.8%	72.3%	14.5 = 86.8 - 72.3
6	63.5%	44.7%	18.8 = 63.5 - 44.7

Findings
In the example illustrated by Table 6.1, a total gap of 14.5 percentage points is observed between the primary access of boys and girls in Mali in 2007/08, indicating the need to increase the primary access rate of girls by 14.5 percentage points for gender equity in terms of access to be achieved.

It is also possible to compare subgroups to identify extreme situations. The example below represents the disparities in schooling between two extreme groups, wealthy urban boys and poor rural girls, based on school access rates.

Absolute gap in the access rates of the extreme groups (combining gender, location, and level of income):

Access rate for wealthy urban boys – Access rate for poor rural girls

EXAMPLE 6.2

(Absolute Gap): Cumulative Disparities in Access to Primary Levels, The Gambia, 2006

Source: Adapted from the Gambia CSR, 2011.

TABLE 6.2 - Cumulative Disparities in Access Rates to Various School Levels, The Gambia, 2006

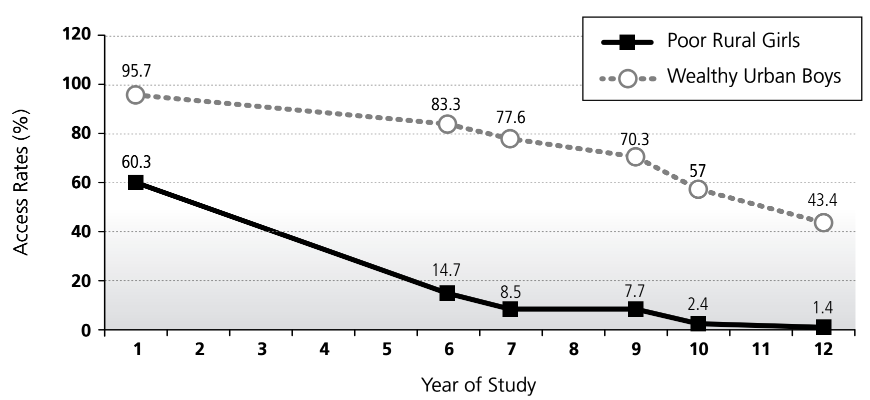
Year of Study	Wealthy Urban Boys	Poor Rural Girls	Gap
1	95.7%	60.3%	35.4 = 95.7 - 60.3
6	83.3%	14.7%	68.6
7	77.6%	8.5%	69.1

Findings

The example of The Gambia shows that the gap between the two groups is apparent and grows quickly throughout the primary cycle to reach 68.6 percentage points (83.3 – 14.7) by the end of the cycle (Year 6). The gap between wealthy urban boys and poor rural girls continues to increase with secondary cycle access (Year 7).

The graphic representation of these indicators offers an interesting visual illustration:

FIGURE 6.2 - Cumulative Disparities in Access Rates to Various School Levels, The Gambia, 2006



1.2 THE PARITY INDEX

The parity index comparing groups A and B is obtained by dividing the performance indicator (school coverage, access rate, retention rate, completion rate, repetition rate, learning results, and so on) of group A by that of group B. The parity index provides the factor by which it would be necessary to multiply the group B indicator (or divide the group A indicator) to achieve an equal value for both groups. Parity between the two groups is achieved when the parity index is equal to 1. An index value above 1 indicates an *advantage* for group A (numerator); conversely, an index value below 1 indicates a *disadvantage* for group A. The greater the divergence of the index from the value of 1, the greater the disparity between the two groups.

Gender Parity Index for the Primary Completion Rate (PCR): $\frac{\textit{Girls' PCR}}{\textit{Boys' PCR}}$

The PCR can also be calculated according to the area of residence, location, or socioeconomic status, as illustrated by the example of Malawi below.

EXAMPLE 6.3

(Parity Index):
PCR Disparities, by Socioeconomic Characteristic, Malawi, 2006
Source: Adapted from the Malawi CSR, 2010.

TABLE 6.3 - Parity Index for the Primary Completion Rate, by Children's Socioeconomic Characteristic, Malawi, 2006

Socioeconomic Characteristics		PCR (%)
Gender	Boys	45
	Girls	31
	Gender Parity Index (Girls/Boys)	**0.69 = 31/45**
Area of Residence	Urban	66
	Rural	32
	Residence Parity Index (Rural/Urban)	**0.48 = 32/66**
Household Wealth	Q5 (Wealthiest 20%)	67
	Q1 (Poorest 20%)	23
	Wealth Parity Index (Q1/Q5)	**0.34 = 23/67**

Findings
In this example, the gender parity index is 0.69, meaning that for every 100 boys completing primary, only 69 girls complete the cycle. The gaps by area of residence and household wealth are starker still: for every 100 children from the wealthiest quintile completing primary, only 34 children from the poorest quintile finish the cycle.

It is noteworthy that the absolute gap and the parity index do not necessarily vary in the same direction. An illustration of this is offered in Annex 6.1. See also Annex 6.2 for a more detailed analysis of enrolment, and in particular the respective weight of different schooling stages in explaining overall disparities in the enrolment of different groups.

1.3 THE PARITY LINE

To construct a parity line, performance data (such as gross intake rates) must be available for two groups (such as boys and girls) for a given entity (such as the regions of a country, or various countries). A graphic representation of the state of each entity can be elaborated, where each entity is represented by the couple of performance indicators for each group. The parity line (the line where y = x) is determined by the entities where the indicators for each group are equal.

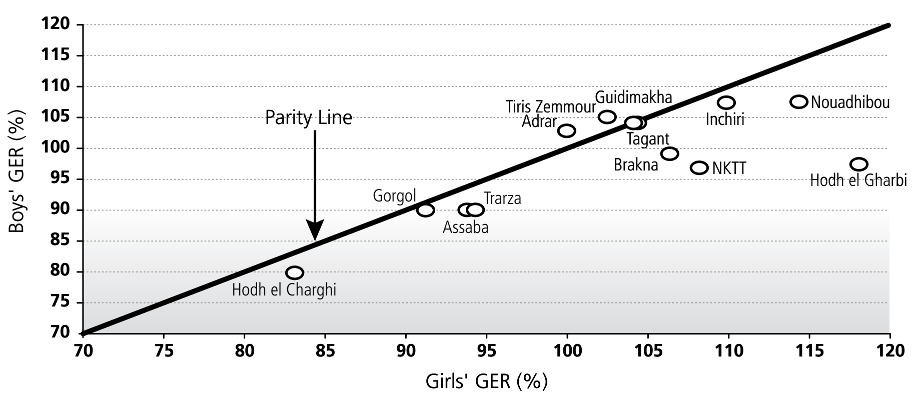
The advantage of using the parity line approach is firstly to underline the existence (or not) of disparities for each entity considered, and secondly to compare the disparities of each to establish which are the most inequitable. Entities being graphically distant from the line indicate a situation of inequity between the two groups for the chosen performance indicator. The greater the distance from the parity line, the greater the inequity.

EXAMPLE 6.4

(Parity Line): Regional Disparities in the GERs, by Gender, Mauritania, 2007/08

Source: Translated and Adapted from the Mauritania CSR, 2010.

FIGURE 6.3 - Gender Parity in Primary Enrolment, Mauritania, 2007/08



Findings

Figure 6.3 shows that the regions on the parity line have identical gross enrolment rates for boys and girls, such as Tagant. Regions above the line indicate that the girls' gross enrolment rate is below that of boys (e.g. Adrar, Guidimakha and Tiris Zemmour). In many regions, those below the line, however, boys are at a disadvantage in terms of access (e.g. Hodh el Gharbi, Nouakchott and Nouadhibou).

1.4 SCATTER CHARTS

Scatter charts, just as the parity line, are interesting as they offer a visual representation of a given situation while highlighting disparities among entities (such as the regions of a country, or countries).

Two indicators of school performance are each assigned an axis on the chart (such as the intake rate and the mean distance from a school).[78] The chart area is divided into sections by horizontal and vertical lines that represent reference situations (such as the mean). These areas denote four different levels of performance: (i) an area where entities' performance is above the reference situation for both indicators; (ii) two areas where entities outperform the reference on one indicator but are behind on the other; and (iii) an area where the entity underperforms the set reference situation on both counts.

EXAMPLE 6.5

(Scatter Chart): Relationship between Basic Education Coverage and Teacher Availability, The Gambia, 2009

Source: Adapted from the Gambia CSR, 2011.

An illustration of the scatter chart is offered in this example drawn from The Gambia CSR, as a possible method of identification of the underlying causes of underenrolment at the district level. It compares the supply of education available in districts with the level of enrolment achieved by them. The supply of education is represented by the number of teachers by 1,000 youth aged 7 to 15 years and the level of enrolment is represented by the gross enrolment rate for basic education. The lineal regression line (slanted dotted line) provides an estimation of the level of enrolment expected for a given level of education supply.

Findings

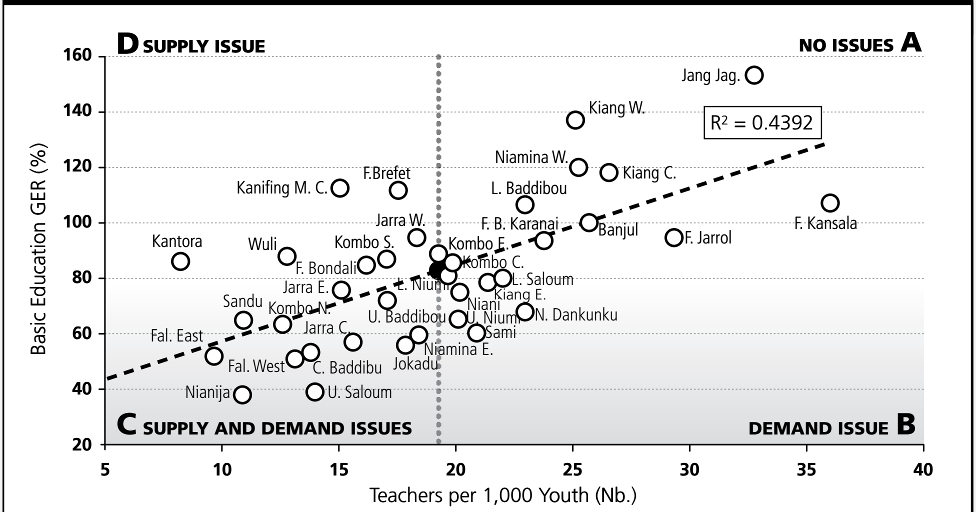
Beyond the positive relationship between the two variables that it underlines, Figure 6.4 also identifies districts that face a weaker level of enrolment than expected (districts beneath the regression line), considering the level of education supply available. Taking the average supply for all districts (vertical line) into account distributes districts into four groups:

- ***Area C:*** *The first group is comprised of the districts that combine below average supply and a level of enrolment below expectations. These districts face both schooling supply and demand issues. This group includes the districts of: Falladu East, Central Baddibu, Nianija, Falladu West, Upper Saloum, Jarra Central, Kombo North, Upper Baddibu, Jokadu and Niamina East;*
- ***Area B:*** *The second group comprises those districts whose enrolment is below expectations despite education supply being above average. These districts specifically face a demand issue. This group includes the districts of: Upper Niumi, Sami, North Dankunku, Kiang East, Niani, Lower Saloum, Foni Jarol, Foni Kansala and Foni Bitang Karanai;*

- ***Area D:*** *The third group comprises those districts where enrolment is higher than expected despite supply being below average. The districts in this group mainly face supply constraints. It would be appropriate to increase the supply of education in these districts to increase enrolment. This group includes the districts of: Kantora, Kanifing Municipal Council, Wulli, Sandu, Jarra East, Jarra West, Foni Bondali, Kombo South and Foni Brefet; and*

- ***Area A:*** *The fourth and final group comprises those districts that have above average education supply and a level of enrolment in line with or higher than expected. There are therefore no major issues of supply or demand in these districts, which include: Banjul, Jangjangbureh, Lower Baddibou, Kiang Central, Kiang West and Niamina West.*

FIGURE 6.4 - Relation of Basic Education GER to Number of Teachers per 1,000 Youth (7 to 15 Years), by District, The Gambia, 2009



Note: The slanted line is equivalent to the expected enrolment ratio for a given level of supply. The vertical line is equivalent to the average supply index.

1.5 MAPS

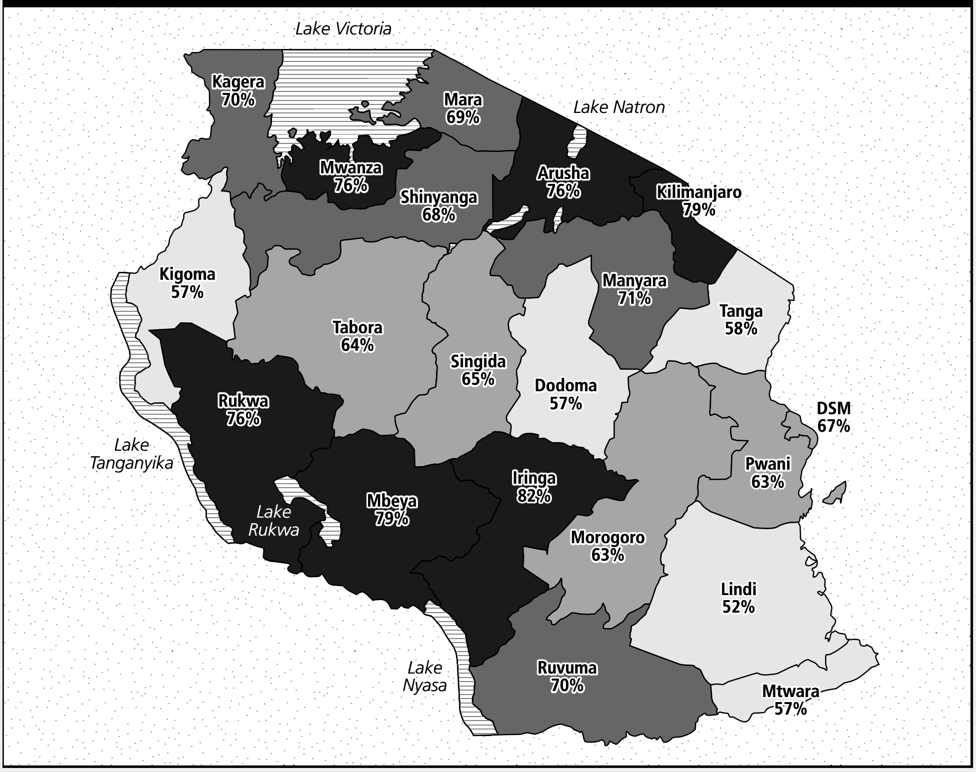
Maps are a particularly attractive visual illustration. Through the use of contrasting colors, they enable the analyst to underline the subnational disparities for a given indicator (between regions, districts and so on) for the country of interest. The choice of ranges for each color is arbitrary, although the idea is to highlight the disparities through the choice of subdivision groups. An illustration is offered in Example 6.6 below, showing disparities in results at the end of lower secondary exam (CSEE) in Tanzania in 2009.

EXAMPLE 6.6 (Maps): Disparities in End of Lower Secondary Exam (CSEE) Results, Tanzania, 2009

Source: Adapted from the Tanzania CSR, 2012.

Four colors have been used according to the level of success in the CSEE exam: (i) 61 percent or less; (ii) 61 percent to 67 percent; (iii) 68 percent to 74 percent; and (iv) 75 percent and above. The lower and higher ranges have been defined according to the average success rate (67.5 percent), more or less 10 percent.

MAP 6.1 - Map of Disparities in CSEE Results, by Region, Tanzania, 2009



Note: : Result of 61% or less.
: Result of 61% to 67%.
: Result of 68% to 74%.
: Result of 75% or above.

Findings

Strong variations in CSEE results are apparent from one region to another. There is a significant divide between the north east (Mwanza, Arusha and Kilimandjaro) and south west (Rukwa, Mbeya and Iringa) regions whose CSEE results are the best nationwide (over 75 percent), and the rest (Tanga, Dodoma, Kigoma or Lindi), whose performance is lagging behind (reaching 52 percent in the worst case).

1.6 SOCIAL MOBILITY TABLES

A social mobility table is a double-entry table that compares the social status of individuals at a given point in time with their class origin. Such tables can be adapted for use in the analysis of equity in education. For such cases, the parents' level of education or income can be used as a variable defining an individual's origin, and school performance indicators (intake, schooling paths or learning achievements) can be used as the status variable.

In practice, a basic mobility table is used to distribute individuals according to the two chosen criteria reflecting origin (by line) and status (by column). Each cell will contain the individuals whose characteristics fit both the line and column of the table. For instance, Table 6.4 is the mobility table for children belonging to groups of origin A and B (where group A is the more favoured) and with school performances ranging from e (high) to f (low), where:

TABLE 6.4 - Mobility Table Calculation Formula

School Performance / Group Origin	e (High)	f (Low)	Total
A	n_{Ae}	n_{Af}	$n_{A(e+f)} = n_{Ae} + n_{Af}$
B	n_{Be}	n_{Bf}	$n_{B(e+f)} = n_{Be} + n_{Bf}$
Total	$n_{(A+B)e} = n_{Ae} + n_{Be}$	$n_{(A+B)f} = n_{Af} + n_{Bf}$	$n_{(A+B)(e+f)} = n_{A(e+f)} + n_{B(e+f)}$ $= n_{(A+B)e} + n_{(A+B)f}$

n_{Ae} and n_{Af} are the number of group A individuals having respectively achieved school performance levels e and f, n_{Be} and n_{Bf} are the number of group B individuals having respectively achieved school performance levels e and f, $n_{(A+B)e}$ is the total number of individuals having achieved school performance level e, and $n_{B(e+f)}$ is the total number of individuals of group B.

This basic mobility table can be used to derive two further tables, the outcome table and the origin table (or recruitment table):

- **The outcome table** offers information about what children become, according to their origin. It is obtained by calculating the percentage distribution of children of a given origin among school outcomes, each line summing to 100 percent. The table is then read by line: what are the outcomes achieved by 100 group A children? By 100 group B children?

- **The origin table** offers information about the origin of children achieving a given outcome. It is obtained by calculating the percentage distribution of children achieving a given performance status, each column totaling 100 percent. The table is then read by column: what are the origins of 100 children achieving a school performance level of e or f? This performance is then compared to the total column values, to establish whether a given group is proportionally over- or under-represented in achieving a set outcome.

EXAMPLE 6.7 **(Mobility Table): Theoretical Differentiated School Careers of Professionals' and Farmers' Children**

TABLE 6.5a - Comparative School Achievement of Professionals' and Farmers' Children (Outcome Table)

Group Origin \ School Performance	Finished primary at best	Started secondary at least	Total
Professionals' Children	100,000 67%	50,000 33%	150,000 100%
Farmers' Children	500,000 98%	10,000 2%	510,000 100%
Total	600,000 91%	60,000 9%	660,000 100%

Findings

The horizontal reading *of outcome Table 6.5a indicates that 33 percent of professionals' children (50,000 / 150,000) continue their schooling beyond primary, against only 2 percent of farmer's children (10,000 / 510,000).*

TABLE 6.5b - Comparative Origin of Children Finishing Primary at Best and Starting Secondary at Least (Origin Table)

Group Origin \ School Performance	Finished primary at best	Started secondary at least	Total
Professionals' Children	100,000 17%	50,000 83%	150,000 22.7%
Farmers' Children	500,000 83%	10,000 17%	510,000 77.3%
Total	600,000 100%	60,000 100%	660,000 100%

Findings

The vertical reading *of origin Table 6.5b indicates that 83 percent of children having pursued their schooling beyond primary are professionals' children (50,000 / 60,000), and just 17 percent are farmers' children (10,000 / 60,000) despite the latter representing 77.3 percent of the total target population and the former 22.7 percent.*

1.7 ODDS RATIOS

Odds ratios measure the comparative advantage (or handicap) of individuals belonging to group A over those belonging to group B in achieving a high outcome (e) for a given school performance indicator, rather than a poor outcome (f).[79]

The odds ratio is defined as the ratio between the respective probabilities that groups A and B achieve a given result e rather than f. Maintaining the definitions for $\boldsymbol{n}_{Ae}$, $\boldsymbol{n}_{Af}$, $\boldsymbol{n}_{Be}$ and $\boldsymbol{n}_{Bf}$ used for the social mobility table above, the odds ratio OR is defined as:

$$OR_{AB/ef} = \frac{\boldsymbol{n}_{Ae} / (\boldsymbol{n}_{Ae}+\boldsymbol{n}_{Af}) \Big/ \boldsymbol{n}_{Af} / (\boldsymbol{n}_{Ae}+\boldsymbol{n}_{Af})}{\boldsymbol{n}_{Be} / (\boldsymbol{n}_{Be}+\boldsymbol{n}_{Bf}) \Big/ \boldsymbol{n}_{Bf} / (\boldsymbol{n}_{Be}+\boldsymbol{n}_{Bf})}$$

or

$$OR_{AB/ef} = \frac{\boldsymbol{n}_{Ae} \times \boldsymbol{n}_{Bf}}{\boldsymbol{n}_{Af} \times \boldsymbol{n}_{Be}}$$

The odds ratio is interpreted as follows: the probability of achieving a school performance level e rather than f is $OR_{AB/ef}$ times more likely for a group A individual than for a group B one. If $OR_{AB/ef}$ equals 1, group A individuals have no comparative advantage over group B individuals. This implies that there is no apparent relation between origin and outcome. Supposing for instance that the outcome e is to have pursued school beyond primary and f is to have a primary education at best, an odds ratio of one indicates that group B individuals have the same chances of pursuing their schooling beyond primary as group A individuals.

EXAMPLE 6.8 **(Odds Ratios): Theoretical Relative Probability of Secondary Intake, for Professionals' and Farmers' Children**

As per the example above, assuming that outcome e is to have pursued school beyond primary and outcome f is to not have pursued beyond primary, an odds ratio equal to 1 indicates that farmers' children (group B individuals) are just as likely to continue their schooling as professionals' children (group A individuals). The odds ratios can be derived from Table 6.5a as follows:

Number of professionals' children having pursued secondary schooling (n_{Ae}) = 50,000
Number of farmers' children having pursued secondary schooling (n_{Be}) = 10,000
Number of professionals' children having finished primary at best (n_{Af}) = 100,000
Number of farmers' children having finished primary at best (n_{Bf}) = 500,000

The odds ratio is then equal to: $\dfrac{50{,}000 / 100{,}000}{10{,}000 / 500{,}000} = \dfrac{1/2}{1/50} = \dfrac{1 \times 50}{2 \times 1} = 25$

Findings
Therefore, professionals' children are 25 times more likely to pursue their education beyond primary school than farmers' children.

1.8 MARGINAL EFFECTS AND ODDS RATIOS BASED ON ECONOMETRIC MODELS

The analysis of equity can be fine-tuned with the help of an econometric model through an approach that estimates the explanatory factors for the performance indicator chosen. The advantage of the econometric analysis is the possibility to establish the net impact of variables expected to influence individual outcomes. The approach enables the measurement of the effect of a variable while controlling for the effects of other variables expected to also affect the performance of the indicator.

For instance, when analysing school intake relying on bivariate analysis (descriptive simple statistics), that would take into account only the area of residence, one might indicate that rural children are less likely to access school than their urban peers. However, the urban population differs from the rural population in other aspects that are likely to influence children's likelihood of school access: the illiteracy rate and the poverty rate are often lower than in rural areas, and education services offered are generally of better quality. Keeping this in mind, it becomes difficult to establish the extent to which the difference in intake rates is explained by the area of residence. To achieve this, it is necessary to compare the intake rates for children that are identical in every respect (household wealth, parents' literacy, and so on) except their area of residence. Econometric models enable this multi-variable analysis, and its results will be all the more precise and valid if no factor influencing the outcome is omitted.[80]

The choice of the type of model to use obviously depends on the type of variables, and especially the school performance variable to be explained. When this indicator is *dichotomous*[81], a logistic econometric model (or probit model) will be best. If on the other hand the indicator is *continuous*, a *linear* model will be more appropriate.[82] Econometric estimations provide statistics that firstly determine the significance of the effect of each variable expected to have an effect on the school performance indicator, and secondly provide coefficients for each variable, whose sign and value respectively indicate the direction and degree of the association with school performance.

Let's repeat here that econometric models are powerful tools but only measure correlations, and not causality relations. It is thus important that the interpretation of results be done without the intention of identifying direct causality between the observed variables and the measured "effects" and that no such conclusion be made.

Following a regression (whether linear or logistic), it is possible to generate the *marginal effects* of explanatory variables. The marginal effect of a variable X is *additive*. In the case of a linear regression model with a continuous explanatory variable X, it is the *amount* by which the dependent variable increases or decreases with a unit change in the explanatory variable X, all other variables being held constant, generally at the average level for the sample or for the observed population. In the case of a dummy explanatory variable, the marginal effect is the amount by which the probability the dependent variable increases or decreases when one moves from the reference category to the actual one.

EXAMPLE 6.9

(Marginal Effects, Regression):
Disparities in Learning Achievements: the Net Effect of Gender, Area of Residence, and Household Wealth, The Gambia, 2009/10
Source: Adapted from The Gambia CSR, 2011.

Table 6.6 illustrates Gambian children's reading ability in Grade 3 of primary school measured by the EGRA aggregated score, according to a selection of variables: pupils' individual characteristics, characteristics of schools/classrooms and teaching approaches, and learning time (approximated here by pupil absenteeism). This example will comment on the individual characteristics that are of interest in this chapter.

Findings
All other variables being held constant, girls' EGRA performance is lower than boys', by about three points; the marginal effect of gender is important and significant at the 1 percent level. Family characteristics appear not to be statistically associated with results; the coefficients for household wealth and having books at home are not significant. The area of residence does not explain EGRA performance either; again, the coefficient is not significant. On the other hand, the previous enrolment of pupils in preschool, be it public or Koranic, is strongly and positively

associated with children's learning achievements in Grade 3, improving their EGRA scores by close to five points. Pupil absenteeism is highly negatively associated with performance, significant at the 1 percent level.

TABLE 6.6 - Econometric Modeling of Aggregate EGRA Scores for Grade 3 Primary Pupils, The Gambia, 2009/10

R^2	34.7%	
Number of Observations	400	
	Average or Percentage	**Marginal Effect and Significance**
Urban (Réf. Rural)	20%	+2.46
Double shift (Ref. single shift)	50%	5.44 ***
PTR > 40 (Ref. PTR ≦ 40)	31%	-3.67 *
Initial EGRA Score (School-Level, 2007)	48.67	0.59 ***
Girl (Ref. Boy)	57%	-3.14 ***
Age (Years)	10.19	0.62
Pupil has already repeated	19%	-4.44 ***
Pupil attended a public preschool	47%	3.74 **
Pupil attended a madrassa	22%	5.75 **
Pupil's Household Wealth Index	8.42	0.34
Pupil has books at home	68%	0.36
Pupil studies at home	60%	1.92
Pupil ate before school	77%	2.10
Pupil was absent (Number of days)	29%	-4.63 ***
Teacher practices phonetics in class	72%	1.27
Pupil is encouraged when performance is low	23%	2.78
Pupil is punished when performance is low	28%	-2.91
Pupil is encouraged when performance is good	64%	3.69 *

Note: *** Statistically significant at the 1% level; ** Statistically significant at the 5% level; * Statistically significant at the 10% level; otherwise not significant. EGRA scores were adjusted to obtain an average value of 50 and a standard deviation of 15.

It is also possible to generate the odds ratios of explanatory variables through a logistic regression. The odds ratio of a variable X is *multiplicative*. It corresponds to the amount by which the odd (=p/(1-p), where p is the probability of an event occurring) is multiplied when one moves from the reference modality to the actual one, all other variables being held constant. An illustration of odds ratios is given below, based on the modeling of primary school retention in Tanzania.

EXAMPLE 6.10

(Odds Ratios' Regression): Disparities in Primary Retention, by Socioeconomic Characteristic, Tanzania, 2006

Source: Adapted from the Tanzania CSR, 2012.

TABLE 6.7 - Primary Retention Factors, Tanzania, 2006

Pseudo-R^2 (%)		13.31	
Predicted Probability (%)		0.85	
Variables		Odds Ratios	Significance
Boy (Ref. Girl)		1.10	ns
Has a Birth Certificate (Ref. Has None)		1.93	***
Urban (Ref. Rural)		1.61	***
Household Head is Female (Ref. Is Male)		0.96	ns
Household Head is Literate (Ref. is Illiterate)		2.04	***
Size of Household		1.06	**
Household Wealth	Q1 (The Poorest 20%)	Ref.	
	Q2	1.42	**
	Q3	2.13	***
	Q4	2.71	***
	Q5 (The Wealthiest 20%)	3.19	***
Distance to the Nearest Primary School	Under 3 Kilometers	0.84	ns
	3 to 5 Kilometers	1.30	ns
	Over 5 Kilometers	Ref.	
Distance to the Nearest Secondary School	Under 5 Kilometers	1.46	*
	5 to 10 Kilometers	1.72	**
	Over 10 Kilometers	Ref.	

Note: *** Statistically significant at the 1% level; ** Statistically significant at the 5% level;
* Statistically significant at the 10% level; ns not significant

Findings

Table 6.7 shows that the variable associated the most with retention is household wealth: children from the wealthiest households (Q5) are three times more likely to reach the last year of primary than their poorest peers (from Q1 households). The literacy of the household head, significant at the 1 percent level, is also a strong discriminatory factor, multiplying by two the probability of completing the cycle. Living in urban areas increases retention likeliness by a factor of 1.6, as does the existence of a secondary school near home, apparently acting as an additional incentive to complete primary.

The analysis can be taken further through simulations. An example is offered in Annex 6.3, reviewing the access of children to primary according to given characteristics and the distance from school, all other things being equal.

SECTION
2 MEASURING EQUITY IN THE DISTRIBUTION OF PUBLIC RESOURCES

This section will offer tools to analyse the distribution of public education resources, and to evaluate whether it contributes to equity, or reinforces inequalities existing at birth. The allocation of public education resources is deemed inequitable if a group considered to be advantaged (economically or otherwise) consumes the greater part of them, through longer schooling careers in government-funded institutions for instance. The result is that inequalities between groups are reinforced. The distribution of public resources is deemed equitable on the other hand, if it tends to compensate the initial disadvantages of groups considered to be disfavoured, through an allocation of resources proportionally greater than the group's weight in the total population.

To understand the structural and distributive dimensions of equity in the distribution of public education resources, two approaches are offered:

- To analyse the territorial distribution of resources, and establish whether certain regions benefit from greater education resources (teachers, qualified teachers, textbooks, desks, latrines, and so on). From an equity perspective, the most disadvantaged regions in terms of education and more broadly, living standards, are expected to receive at least the amount of public education resources allocated to the most favoured regions. These aspects of equity are primarily management issues, and as such are dealt with in Chapter 4; Annex 6.4 also provides a description of coefficients that can be used to analyse equity in the distribution of public resources; and

- To analyse the degree of equity in the distribution of public education resources between individuals or groups of individuals. Different lengths of schooling careers and cycle unit costs (recurrent public expenditure per student per year) generate a framework that is more or less inequitable, and that in itself embeds an important dimension of the equity of a given national education system. The analysis of the *structural equity* in the distribution of resources is complemented by a review of the *distributive equity*, which consists of analysing the spending of public resources according to the socioeconomic characteristics of groups or individuals, and by linking those results to enrolment selectivity. Both of these aspects of equity are described in the subsections below.

2.1 THE STRUCTURAL DISTRIBUTION OF PUBLIC EDUCATION RESOURCES

In order to illustrate the structural dimension of equity, three hypothetical countries which spend the same total public resources on education will be compared, each having made different choices in terms of the distribution of enrolment and unit costs (**recurrent public expenditure per student per year**) among different education cycles (See Tables 6.8a and 6.8b below).

In terms of school coverage, countries A and B are identical (they share the same GER at every level); on the other hand, country B's structure of unit costs is more favourable to the primary level (for most children) and less favourable to higher education (that only benefits a more limited number of individuals) than country A's.[83] This gives the intuitive notion that the distribution of public resources is more equitable (less concentrated) in country B than in country A.

TABLE 6.8a - School Coverage (GER) and Education Unit Costs, by Education Level, in Two Fictitious Countries with Identical School Coverage, but Different Unit Costs

	Country A	Country B
GER (%)		
Primary	90	90
Secondary	30	30
Higher	5	5
Unit Cost (recurrent public expenditure per student per year)		
Primary	5	10
Secondary	30	30
Higher	370	100

The comparison of countries B and C shows that these two countries have the same unit costs, but that country C's primary enrolment is below country B's, whereas its higher education enrolment is above country B's. Intuitively, country C's distribution of public expenditure is more inequitable than country B's, given that the high unit costs for higher education benefit a greater elite in country C than in country B (15 percent and 5 percent of the enrolled population, respectively), whereas the lower primary unit costs only benefit 60 percent of country C's population, compared to 90 percent of country B's population.

TABLE 6.8b - School Coverage (GER) and Education Unit Costs, by Education Level, in Two Fictitious Countries with Identical Unit Costs, but Different School Coverage		
	Country B	**Country C**
GER (%)		
Primary	90	60
Secondary	30	30
Higher	5	15
Unit Cost (recurrent public expenditure per student per year)		
Primary	10	10
Secondary	30	30
Higher	100	100

Overall, it is clear that: (i) the three countries are structurally different in terms of their distribution of public education resources, and (ii) this difference is determined by the structure of enrolment and unit costs among education levels. These two distributions (school coverage and unit costs) are determinants in that they influence the volume of public resources consumed by individuals, according to the length of their schooling careers.

2.1.1 THEORETICAL COMPUTATION FRAMEWORK

In practical terms, the structural distribution of public education resources is obtained through the comparison of the share of resources consumed by different groups of individuals according to the highest level of education attained, and their weight in the overall population. Table 6.9 presents the different steps that lead to these two proportions, which are displayed in columns [10] and [9], respectively.

1. The first step is to estimate adjusted unit costs, UC, for each cycle, by dividing the public recurrent expenditure by the total number of students (in public and private schools). As a good approximation, the same unit cost will be used for each grade of a given cycle. These adjusted unit costs are also equal to the product of the recurrent unit costs computed in chapter 3 multiplied by (1 - %Pr) where %Pr is the percentage of students who are enrolled in private schools.
2. Then, one classifies individuals according to their terminal schooling level, in column [5]. This is deduced from the information in column [4], corresponding to the schooling profile, subtracting the access rate value[84] for a given level from that of the following level;[85]
3. The analysis is pursued by calculating the amounts of public expenditure consumed by students according to their terminal education level, in column [6]. This amount is equal to the unit costs for a given level (column [2]), multiplied by the number of years for that level (column [3]), which is then cumulated with the previous amounts;[86]

TABLE 6.9 - Structural Distribution of Public Education Resources, Theoretical Computation Framework

[1] Grade / Cycle	[2] Unit Costs (recurrent public expenditure per public and private student)	[3] Nb. of Years	Cohort (%)		Public Resources Used			[9] Cumulated Students by Terminal Grade (%)	[10] Cumulated Resources by Terminal Grade (%)
			[4] Access Rate	[5] Terminal Rate	[6] By Student by Terminal Grade (Currency)	[7] By Group by Terminal Grade (Currency)	[8] By Group by Terminal Grade (in % of total resources)		
Never enrolled	-	-		$T_0 = 100 - A_1$	-	-	-	$CS_0=T_0$	$CR_0=O$
1	UC_1	1	A_1	$T_1 = A_1 - A_2$	$RS_1 = 1\ xUC_1$	$R_1 =RS_1xT_1$	$RG_1= R_1 / RT$	$CS_1= CS_0+T_1$	$CR_1= RG_1$
2	UC_2	1	A_2	$T_2 = A_2 - A_3$	$RS_2 = RS_1 + 1\ xUC_2$	$R_2= RS_2xT_2$	$RG_2= R_2 / RT$	$CS_2= CS_1+T_2$	$CR_2= CR_1+RG_2$

---									
n - 1	UC_{n-1}	1	A_{n-1}	$T_{n-1} = A_{n-1} - A_n$	$RS_{n-1}=RS_{n-2} +UC_{n-1}x1$	$R_{n-1}= RS_{n-1}xT_{n-1}$	$RG_{n-1}= R_{n-1} / RT$	$CS_{n-1}= CS_{n-2}+T_{n-1}$	$CR_{n-1}= CR_{n-2}+RG_{n-1}$
n (Higher)	UC_n	4	A_n	$T_n = A_n$	$RS_n=RS_{n-1} +UC_nx4$	$R_n= RS_nxT_n$	$RG_n= R_n / RT$	$CS_n= CS_{n-1} +T_n =100\%$	$CR_n= CR_{n-1} +RG_n =100\%$
TOTAL						$RT= \sum_{i=1}^{n} R_i$	100%		

4. To obtain the cumulated amounts for each terminal level (column [7]), the unit costs consumed at a given level (column [6]) are multiplied by the number of individuals for whom the given level is the last one (column [5]). If the total population is assumed to be 100, then T_0 children (= 100 - A1) (column [5]) never attended school. For these children, the government incurred no expense (column [7]);
5. To complete column [8], the public education resources allocated to each school group must be calculated as a share of total public expenditure, which is obtained by straightforward triangulation;
6. Column [9] is obtained by cumulating the frequencies of the population of each group of children, as per column [5]; and
7. Finally, column [10] is reached by cumulating the shares of resources consumed by each group of children, as per column [8].

A concrete illustration of the analysis of the structural distribution of education resources is reproduced below, based on The Gambia. In this analysis, the transversal schooling profile was used to obtain the terminal schooling levels (An illustration based on the AER is also offered in Annex 6.5).

EXAMPLE 6.11

(Distributive Equity): Structural Distribution of Public Education Resources, Based on the Schooling Profile, The Gambia, 2006

Source: Adapted from The Gambia CSR, 2011.

TABLE 6.10 - Structural Distribution of Public Education Expenditure among a Cohort of 100 Students, The Gambia, 2006

				Cohort (%)		Cumulative Public Resources Absorbed				
[0] Education Cycles	[1] Grade / Cycle	[2] Unit Costs (recurrent public expenditure per public and private student)	[3] Number of Years	[4] Access Rate	[5] Terminal Rate	[6] By Student by Terminal Grade (Currency)	[7] By Group by Terminal Grade (Currency)	[8] By Group by Terminal Grade (%)	[9] Cumulated Students by Terminal Grade (%)	[10] Cumulated Resources by Terminal Grade (%)
Never enrolled	Never enrolled	-	-		6.2= 100-93.8	-	-	-	6.2	0.0
Lower basic education	1	1,389	1	93.8	4.8= 93.8-89	1,389	6,667= 1,389x4.8	0.4=6,667/ 1,553,507	11.0= 6.2+4.8	0.4
	2	1,389	1	89.0	4.5	2,778= 1,389+1,389	12,501	0.8	15.5= 11+4.5	1,2
	3	1,389	1	84.5	3.8	4,167	15,835	1.0	19.3	2.3
	4	1,389	1	80.7	3.0	5,556	16,668	1.1	22.3	3.3
	5	1,389	1	77.7	2.9	6,945	20,141	1.3	25.2	4.6
	6	1,389	1	74.8	7.2	8,334	60,005	3.9	32.4	8.5
Upper basic education	7	1,784	1	67.6	2.4	10,118	24,283	1.6	34.8	10.0
	8	1,784	1	65.2	6.6	11,902	78,553	5.1	41.4	15.1
	9	1,784	1	58.6	22.5	13,686	307,935	19.8	63.9	34.9
Senior Secondary	10	2,454	1	36.1	1.8	16,140	29,052	1.9	65.7	36.8
	11	2,454	1	34.3	5.9	18,594	109,705	7.1	71.6	43.9
	12	2,454	1	28.4	23.8	21,048	500,942	32.2	95.4	76.1
Higher	Higher	14,913	4	4.6	4.6	80,700= 21,048+4 x14,913	371,220= 80,700 x4.6	23.9= 371,220/ 1,553,507	100.0	100.0
Total							**1,553,507**	**100.0**		

Findings

From the above, it appears that disparities in terms of the distribution of education resources among different population groups by terminal education level are strong. Indeed, columns [9] and [10] indicate that the 32.4 percent of the cohort that has no education beyond primary has consumed 8.5 percent of resources, whereas the 4.6 percent of students who proceed to higher education consume 23.9 percent (= 100 – 76.1) of total resources.

To be more practical and concrete in describing the structural dimension of equity in the distribution of public education resources, different measures of the concentration of resources are generally used. The most common are the Lorenz curve, the Gini coefficient, and the share or resources consumed by the 10 percent most educated. These measures are described successively below, and illustrated through the Gambian example.

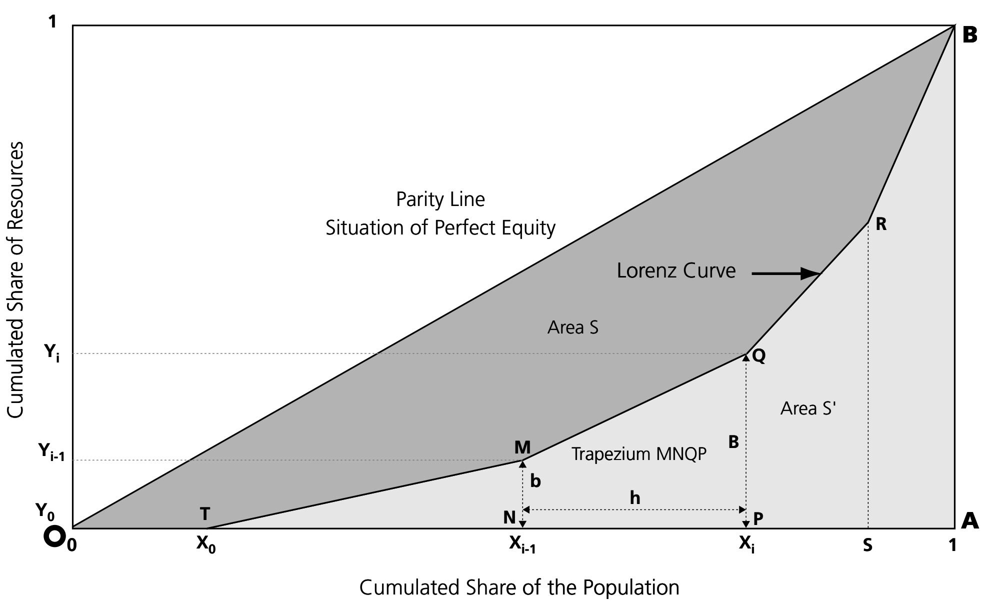
2.1.2 THE LORENZ CURVE

The Lorenz curve provides a graphical representation of the concentration of resources within various groups of the population (differentiated here according to their terminal level of education). In this respect, the curve is a methodological tool that enables the visual understanding of the degree of inequality in the distribution of resources.

The curve is plotted by applying the cumulative proportion of the population on the x-axis (from column [9] of Table 6.9 above), and the cumulative proportion of resources on the y-axis (column [10] of Table 6.9 above).

Each point of the curve is a coordinate pair representing the association of the cumulated proportion X of individuals and the respective cumulated share Y of total resources consumed by X (Curve OTMQRB in Figure 6.5). Should the Lorenz curve coincide with the parity line (parity or equidistribution line OB in Figure 6.5), the allocation of resources would be considered to be perfectly equitable, given that any share of the population would absorb that exact same share of resources.[87] The further the curve from the parity line (OB), the more the distribution of resources is considered inequitable; the most inequitable situation

FIGURE 6.5 - Lorenz Curve



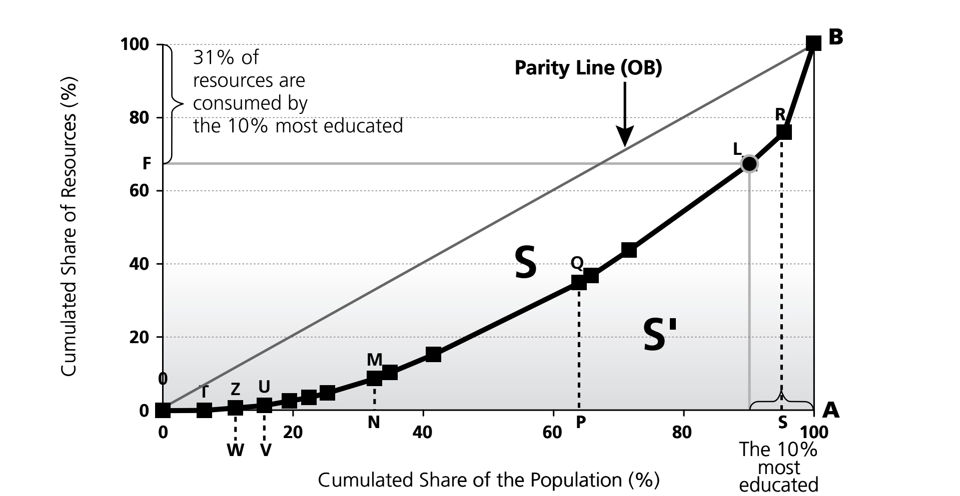
that the graph could describe would be one where the Lorenz curve coincides with the segments (OA) and (AB), indicating that a single individual absorbs 100 percent of resources.

EXAMPLE 6.12 **(Lorenz Curve and Share of Resources Consumed by the 10% most Educated): The Distribution of Public Education Resources, The Gambia, 2006**

Source: Adapted from The Gambia CSR, 2011.

Columns [9] and [10] of Table 6.10 enable the construction of the Lorenz curve for The Gambia, respectively providing the values for the horizontal and vertical axes.

FIGURE 6.6 - Lorenz Curve, The Gambia, 2006



Findings

The Lorenz curve is fairly distant from the parity line, which indicates a high level of inequity in the Gambian education system. However, the degree of inequity can only be truly determined by an analysis that is comparable through time, and/or with other countries with a similar development level.

2.1.3 THE GINI COEFFICIENT

The Gini coefficient synthetically summarizes the information provided by the Lorenz curve on the concentration of resources among the population in a single figure. The Gini coefficient is two times *S*, the area between the Lorenz curve of effective distribution of resources (OTMQRB) and the parity line OB (See Figure 6.5).

For practical reasons, an indirect estimation method is generally used, which consists of calculating the *S'* area contained below the Lorenz curve (See Figure 6.5), given that it is much more straightforward to estimate:[88]

$$\textit{Gini coefficient} = 1 - \frac{2S'}{100 \times 100}$$

Indeed, the *S'* area is easily calculated, being the sum of the areas of the TMN triangle and of the trapeziums MNQP, QPRS and RSAB where the area of the MNT triangle is equal to the length of the NT segment multiplied by the length of the MT segment and divided by two. The areas of the trapeziums are obtained with the help of the following formula:

$$Area_{Trapeziums} = \frac{(\textit{Long base} + \textit{Short base}) \times \textit{height}}{2}$$

The value of the Gini coefficient is comprised between zero and one. At one end of the scale, a theoretical value of zero means that the area *S* is nil, or that the Lorenz curve coincides with the equi-distribution diagonal line (OB), and hence indicates a situation of perfect equity. At the other end of the scale, a theoretical value of 1 indicates a situation of perfect inequity, where the Lorenz curve coincides with the segments (OA) and (AB), and a single person absorbs 100 percent of resources. The closer the value of the Gini coefficient to zero, the more equitable the distribution of resources.

This indicator, when isolated, is difficult to interpret as it is difficult to identify a specific value which would represent a "good" value for the Gini coefficient. It is however of interest when compared over time for a given country (which provides a glimpse of the evolution of the level of equity of an education system through time), or when compared to other countries at a given point in time, which illustrates how the equity of a given education system compares to that of neighbour countries. Caution should also be exercised in comparing these coefficients, as a same value for the Gini coefficient can represent several different situations of distribution (several shapes of the Lorenz curve can result in the same value for the area S'). Again, the Gambian example provides an illustration of the calculation of the Gini coefficient.

EXAMPLE 6.13

(Gini Coefficient): The Distribution of Education Resources, The Gambia, 2006

Source: Adapted from The Gambia CSR, 2011.

The information required for the calculation of the Gini coefficient is presented in column [11] of Table 6.11. The values of column [11] are equivalent to the areas of the TWZ triangle and the 12 trapeziums that form the S' area (see Figure 6.6, Note that not all 12 trapeziums are reproduced in the figure to avoid making its reading too heavy). On the basis of the definitions for the calculation of the areas of the triangle and the trapeziums presented earlier, the following can be deduced:

The area of TWZ triangle: TW x WZ / 2,
where TW = OW – OT = 11.0 – 6.2 = 4.8 and WZ = 0.4; thus:
TWZ = 4.8 x 0.4 / 2 = 0.96 (rounded off to 1);

The area of the first trapezium WZUV (the areas of the other trapeziums are determined according to the same approach: (VU+WZ) x WV / 2,

where VU = 1.2, WZ = 0.4 and WV = 15.5 – 11.0 = 4.5; thus
WZUV = (1.2+0.4) x 4.5 / 2 = 3.6 (rounded off to 4);

The area of *S'* area is therefore:
S' = 1 + 4 + 7 + 8 + 11 + 47 + 22 + 83 + 563 + 65 + 238 + 1,428 + 405 = 2,881; and thus

The Gini coefficient itself is:

$$Gini = 1 - \frac{2\ S'}{100 \times 100} = 1 - \frac{2 \times 2{,}881}{100 \times 100} = 0.42$$

In the case of The Gambia, for 2006 the numerical value of the Gini coefficient for the distribution of education resources was 0.42.

TABLE 6.11 - Computation of the Gini Coefficient

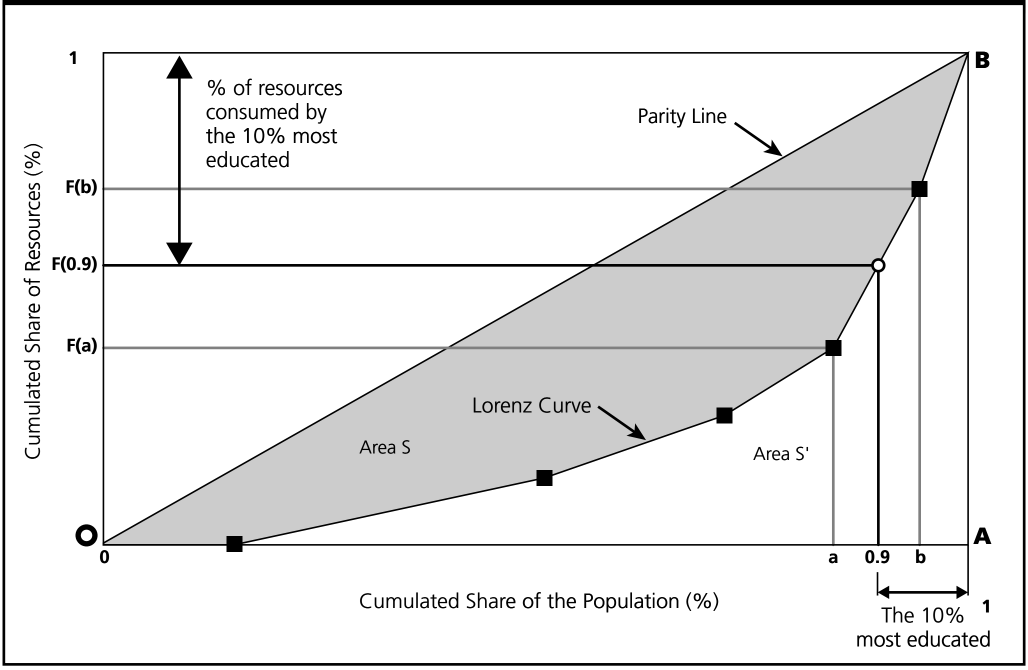
[1] Grade / Cycle	[9] Cumulated Students by Terminal Grade (%)	[10] Cumulated Resources by Terminal Grade (%)	[11] Extreme Area
Never enrolled	6.2	0.0	0
1	11.0= 6.2 + 4.8	0.4	1 = (0.4-0.0) x (11 – 6.2) / 2
2	15.5	1.2	4 = (1.2+0.4) x (15.5-11.0) / 2
3	19.3	2.3	7
4	22.3	3.3	8
5	25.2	4.6	11
6	32.4	8.5	47
7	34.8	10.0	22
8	41.4	15.1	83
9	63.9	34.9	563
10	65.7	36.8	65
11	71.6	43.9	238
12	95.4	76.1	1,428
Higher	100.0	100.0	405 = (100 + 76.1) x (100 – 95.4) / 2
Total			2,881

Source: Columns 1, 9 and 10 are from table 6.10.

2.1.4 THE SHARE OF PUBLIC RESOURCES USED BY THE 10 PERCENT MOST EDUCATED

Unlike the Gini coefficient, that offers a synthetic vision of the overall distribution of resources, the share of public resources devoted to the 10 percent most educated individuals of a generation of children provides information on the tail-end of the distribution, or the most educated, which are those that benefit from most public resources.

FIGURE 6.7 - Estimation of the Share of Resources Used by the 10% Most Educated



The share of resources consumed by the 10 percent most educated can be read off the Lorenz curve (See Figure 6.7 above). The 10 percent most educated are graphically represented by the utmost right hand side of the horizontal axis. One may read the coordinate on the vertical axis of the point of the Lorenz curve that represents this group. On Figure 6.7, this share is equal to 1 - F(0.9).

The share of resources absorbed by the 10 percent most educated (called *p*) can also be calculated using available data points obtained through the calculation of the structural distribution, with the linear interpolation formula indicated below:

$$p = 1 - \left[F(a) + (0.9 - a) \times \frac{F(b) - F(a)}{b - a} \right]$$

for cumulated shares comprised between zero and one, and

$$p = 100 - \left[F(a) + (90 - a) \times \frac{F(b) - F(a)}{b - a} \right]$$

for cumulated shares expressed as a percentage, where:

F(*a*) designates the percentage of resources accumulated by the *a* percent least educated, where a is the cumulated share of the population for the point immediately below 0.9 (or 90 percent), and F(*b*) is the percentage of resources absorbed by the *b* percent least educated, where *b* is the cumulated share of the population for the point immediately above 0.9 (or 90 percent).

CHAPTER 6

EQUITY

EXAMPLE 6.14

(Linear Interpolation - Share of Resources Absorbed by the 10 Percent Most Educated): The Distribution of Education Resources, The Gambia, 2006

Source: Adapted from The Gambia CSR, 2011.

In the Gambian example described above and illustrated by Figure 6.6, to graphically determine the share of resources consumed by the 10 percent most educated among the population, one identifies on the horizontal axis the point with a coordinate of 90 percent. This point's coordinate on the vertical axis is approximately 69 percent, which corresponds to the share of resources consumed by the 90 percent of the population that are least educated. The 10 percent most educated therefore consume 31 percent of total education resources (= 100 – 69). Thus, a tenth of the Gambian population benefits from close to one third of public education resources, a share that is close to that consumed by those whose terminal education level is the end of secondary (35 percent), that represent 64 percent of the population. It therefore appears that the Gambian education system contributes, through the structure of the distribution of resources, to generate inequalities.

To be more precise, the share of public education resources consumed by the 10 percent most educated (called *p*) can also be calculated with the formula provided above, where *a* is the cumulated share of the population immediately below the 90 percent mark, or 71.6 percent (column [9]), F(*a*) is the share of resources consumed by the a percent least educated, or 43.9 percent, b is the share of pupils immediately above the 90 percent mark, or 95.4 percent and F(*b*) is the share of resources they consume, or 76.1 percent. On this basis:

$$P = 100\% - \left[43.9\% + (90\% - 71.6\%) \times \frac{76.1\% - 43.9\%}{95.4\% - 71.6\%}\right] = 31.2\%$$

Findings

The share of resources consumed by the 10 percent most educated individuals in The Gambia is 31.2 percent, about the same amount as that absorbed by the 64 percent least educated.

2.1.5 COMPARATIVE ANALYSIS

To enable a true appreciation of the degree of equity in the distribution of resources, a comparative analysis can be performed. A historical perspective of the evolution of equity can be offered by comparing any of the above described indicators (Lorenz curve, Gini coefficient, 10 percent absorbed by the most educated) at different points in time, to establish the extent to which recent education policy has contributed to the reduction or increase in structural inequities. A geographical perspective can also be provided, comparing any of the above for different countries with similar levels of development at a given point in time, providing more realistic benchmarks to evaluate performance.

A prospective analysis can also be conducted, to simulate the potential impact in terms of equity of future education policy measures that aim to change the structure of enrolment and/or unit costs.

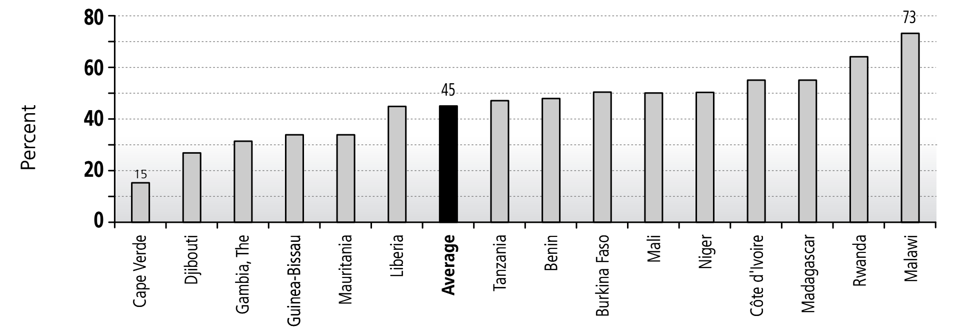
EXAMPLE 6.15

(Comparative Analysis): Education Resources Consumed by the 10 Percent Most Educated, Sub-Saharan Africa, 2009

Source: Country Database, Pôle de Dakar (UNESCO-IIEP).

Figure 6.8 collects the data of the share of public education expenditure consumed to the 10 percent most educated individuals for each country of a subsample of Sub-Saharan Africa for which data was available in 2009.

FIGURE 6.8 - Share of Public Resources Consumed by the 10 Percent Most Educated, Sample of Sub-Saharan African Countries, 2009 or MRY



Findings

The scope of the variation in this indicator, that ranges from 15 percent for Cape Verde (the most equitable) to 73 percent for Malawi (the most inequitable), indicates a series of contrasting situations in terms of equity in the funding of education systems in the region.

2.2 DISTRIBUTIVE EQUITY IN PUBLIC EDUCATION EXPENDITURE: SOCIAL DISPARITIES IN THE APPROPRIATION OF EDUCATION RESOURCES AND BENEFIT INCIDENCE ANALYSIS

Whereas section 2.1 focused on the *individual* distribution of public education resources according to the highest level attained, this section seeks to offer tools for the analysis of the distribution of education expenditure by *socioeconomic group*, and to link the results obtained to enrolment selectivity.

The method used to estimate the scope of social differences in the consumption of public education resources consists in the identification of the schooling profiles of individuals from different social groups (girls/boys, urban/rural, wealthy/poor), and to use their representation in the total national population to extrapolate the expenditure devoted to each of the different groups.

This approach generally enables the use of two indicators: (i) the *relative representativity coefficient*, that uses information on the distribution of the school-aged population by enrolment status and social characteristics to establish whether groups of given socioeconomic characteristics are over or under represented; and (ii) the *resource appropriation index* that provides information on the degree of concentration of resources within groups of different socioeconomic characteristics.

2.2.1 RELATIVE REPRESENTATIVITY COEFFICIENTS

The calculation of the relative representativity coefficient (RRC) is derived from the social distribution of the school-aged population among various education levels. Generally, individuals aged 5 to 24 years[89] are included, and their distribution is usually established according to gender, area of residence (urban/rural) and household wealth. The distribution of enrolled children by socioeconomic characteristics can be established on the basis of household survey data. However the distribution by area of residence or gender may also be possible through school administrative survey data (to be used in addition to the population data obtained from national census or projections).

Relative representativity coefficients are effectively a measure of the odds ratio of the enrolment of different social groups, by education level. The odds ratio is the ratio of the representativity of a given group within an education level, and its representativity among the total population. The coefficient for a given social characteristic and education level is thus the relation between the chances of enrolment of an advantaged group A (generally boys, urban children and the wealthy) and those of a disadvantaged group B (generally girls, rural children and the poor).

The indicator is established according to the following equation for a given education level *E*:

$$RRC_{AB/E} = \frac{\boldsymbol{n}_{AE} / \boldsymbol{n}_{BE}}{\boldsymbol{n}_{APOP} / \boldsymbol{n}_{BPOP}}$$

Where $\boldsymbol{n}_{AE}$ and $\boldsymbol{n}_{BE}$ are respectively equivalent to the proportions of children of groups A and B reaching the education level *E*, and $\boldsymbol{n}_{APOP}$ and $\boldsymbol{n}_{BPOP}$ respectively refer to the shares of groups A and B in the total population.

The Gambian example below illustrates the social distribution of the 5-24 years old and the relative representativity coefficients obtained.

EXAMPLE 6.16

(Relative Representativity Coefficients): Social Distribution of Children by Education Level, The Gambia, 2006

Source: Adapted from The Gambia CSR, 2011.

Table 6.12 offers two complementary reading levels: vertical and horizontal. The vertical reading illustrates the distribution of students by gender, area of residence and household income, for each level of schooling. The relative proportions can be compared with those of the total population of school age indicated in the last column. A horizontal read of the table, on the other hand, shows the evolution of the share of each social group considered throughout the education pyramid. Again, the interpretation of the data is relative, comparing the weight of each group with their weight in the total population (last column of the table).

TABLE 6.12 - Social Distribution of Children Aged 5-24 Years, by Education Level, The Gambia, 2006

(Percent)	Highest Level Attained (%)					TOTAL
	Never Enrolled	Basic 1	Basic 2	Secondary	Higher	
Gender						
Boys	44.8	48.4	51.5	56.0	50.7	48.7
Girls	55.2	51.6	48.5	44.0	49.3	51.3
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Area of Residence						
Urban	27.9	38.5	50.4	70.9	76.5	37.9
Rural	72.1	61.5	49.6	29.1	23.5	62.1
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Household Wealth						
Q1	26.9	17.7	10.3	3.4	0.7	19.6
Q2	21.9	21.5	19.6	9.7	5.1	20.2
Q3	21.9	20.1	19.5	15.0	8.1	20.0
Q4	17.4	21.7	23.8	21.6	16.2	20.2
Q5	11.9	18.9	26.8	50.3	69.9	20.0
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Relative Representativity Coefficients (RRC)						
Boys/Girls	0.85	0.98=(48.4/51.6) /(48.7/51.3)	1.12	1.34	1.08	1.00
Urban/Rural	0.63	1.03	1.67=(50.4/49.6) /(37.9/62.1)	4.01	5.34	1.00
Q5/Q1	0.43	1.05	2.55	14.50	93.16	1.00

Findings

The vertical read of Table 6.12 shows that: (i) the disparities according to gender are weak, even if girls are slightly under-represented at post-Basic 1 levels, and especially in the secondary cycle where they only represent 44 percent of enrolment despite accounting for 51 percent of the total population of the relevant age; (ii) 72 percent of those not enrolled live in rural areas, that only account for 62 percent of the total population. Conversely, the urban population is heavily over-represented at the secondary and higher education levels; and (iii) the majority of secondary *and higher education students are from the wealthiest income quintile and the share of the Q1 students in higher education is insignificant, despite their equal share in the total population.*

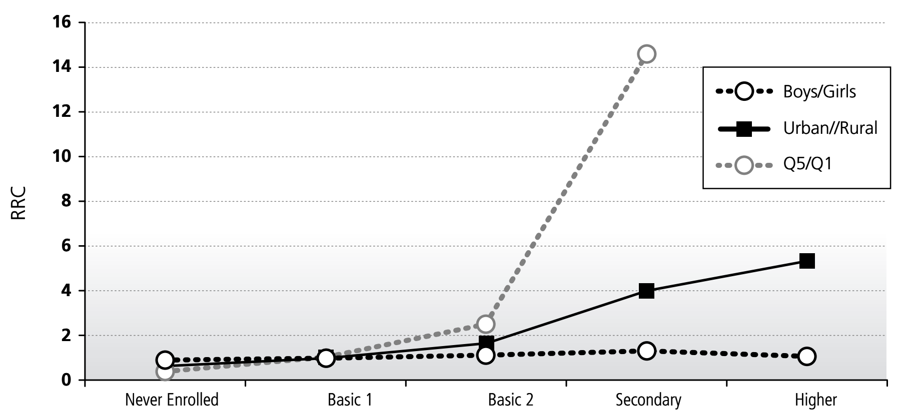
The horizontal read, on the other hand, shows that the disparities among groups are generally weak at the primary level, but begin to deepen as of Basic 2. Indeed, the share of the disadvantaged groups (girls, rural children, the poor) enrolled tends to decrease in Basic 2, and drop further still thereafter. From 61 percent in Basic 1, the share of the rural population drops to just 24 percent at university, despite representing 62 percent of the total population[90]. This reflects the urban bias in post-Basic 1 education infrastructure, and the fact that universities are exclusively established in towns. Similarly, the share of students from the poorest quintile of the population drops from 18 percent in Basic 1 to just 1 percent for higher education, against a concomitant rise from 19 percent to 70 percent for the wealthiest children; the representativity of each group in the total population is, by definition, identical, at 20 percent.

The relative representativity coefficients are calculated by dividing the relative share of individuals of a given characteristic enrolled by the relative share of those individuals in the total population. For instance, the relative representativity coefficient for boys enrolled in Basic 1 is 0.98, or the relative proportion of boys enrolled in Basic 1 (48.4 / 51.6), divided by the relative proportion of boys in the total population (48.7 / 51.3).

This coefficient, just below 1, indicates that boys are slightly under-represented in Basic 1. Similarly, the relative representativity coefficient for urban children enrolled in Basic 2 is 1.67, or (50.4 / 49.6) / (37.9 / 62.1), indicating that urban children are vastly over-represented in Basic 2.

These coefficients can also be plotted on a graph for greater clarity.[91]

FIGURE 6.9 - Relative Representativity Coefficients, by Socioeconomic Characteristic and Education Level, The Gambia, 2006



Findings

Figure 6.9 illustrates three fundamental aspects of equity in the case of The Gambia: (i) social inequities increase with each level of education, with relative disparities being least accentuated in Basic 1 and most pronounced from secondary onwards; (ii) disparities between boys and girls are generally minor, as shown by the virtually horizontal line formed by the relative representativity coefficients for gender; and (iii) the socioeconomic characteristic that highlights the greatest disparities is that of household wealth, over and above area of residence. Indeed, boys are 1.34 times more likely to access secondary education than girls; urban children are 4.01 times more likely to access secondary than their rural peers; but the wealthiest children (Q5) are 14.50 times more likely to access secondary than the poorest (Q1).

2.2.2 BENEFIT INCIDENCE ANALYSIS AND RELATIVE APPROPRIATION INDEX

How do these disparities translate in terms of consumption of public education resources? Section 2.1 demonstrated that individuals benefit from education expenditure more the higher their final level of education. Combining the social dimension of enrolment (Section 2.2.1) with the analysis of the distribution of public education resources according to the highest level of education attained (Section 2.1) is the last step in comparing how different groups benefit from education expenditure which allows one to conduct a benefit incidence analysis.

A synthetic measure used to conduct a benefit incidence analysis is the relative appropriation index. It is based on the existing relationship between the education expenditure consumed by each socioeconomic group and their respective weight in the population. The index is also deduced by comparing the level of appropriation of the resources consumed by one group (generally the advantaged one) with those of a reference group (generally disadvantaged). Thus, the index enables one to determine what volume of resources is appropriated by an individual of an advantaged group (often boys, urban children, and those from wealthy families), as a multiple of the volume of resources appropriated by an individual of a disadvantaged group (girls, children from rural areas, or those from poor families, in this instance).[92]

The principles for the benefit incidence analysis and calculation of the relative appropriation index are explained here through the concrete example of The Gambia.

EXAMPLE 6.17 (Benefit Incidence Analysis and Relative Appropriation Index): Social Disparities in the Appropriation of Education Resources, The Gambia, 2006

Source: Adapted from The Gambia CSR, 2011.

Table 6.13 below provides the calculation approach for the relative appropriation index. The table's column [a] provides the percentage of public resources consumed throughout the education system by the individuals belonging to each listed socioeconomic population group (See Annex 6.6 for a detailed explanation on how to obtain the figures for this column). An intermediary calculation (the R ratio) is carried out by applying these percentages to the weight of each group in the population aged 15 to 24 years (column [b], equivalent to the last column of Table 6.12).

The relative appropriation indices can then be obtained by dividing the R ratio for each group (defined by a socioeconomic dimension such as gender, area of residence, or income) by the R ratio of the reference group (often the most disadvantaged group) within a category.

TABLE 6.13 - Social Disparities in the Appropriation of Public Education Resources, The Gambia, 2006

	All Education Cycles			
	Share of Resources Consumed (%) [a]	Share of Each Group in the Total 5-24 Years Population (%) [b]	Share of Resources Consumed / Relative Share of Group [R] = [a] / [b]	Relative Appropriation Index [I]
Household Wealth				
Q1 (The poorest 20%)	5.8	19.6	0.298	1.0=0.298/0.298
Q2	12.3	20.2	0.608	2.0=0.608/0.298
Q3	15.0	20.0	0.747	2.5=0.747/0.298
Q4	20.9	20.2	1.034	3.5=1.034/0.298
Q5 (The wealthiest 20%)	46.0	20.0	2.304	7.7=2.304/0.298
Q1+Q2	18.1	39.8	0.455	1.0
Q4+Q5	66.9	40.2	1.666	3.7= 1.666/0.455
Gender				
Girls	47.1	51.3	0.919	1.0
Boys	52.9	48.7	1.085	1.2
Area of Residence				
Rural	36.0	62.1	0.579	1.0
Urban	64.0	37.9	1.691	2.9

Source: Column [a] data is drawn from the last column of Annex Table A6.7; column [b] data is drawn from the last column of Table 6.12.

Findings

The results indicate that in The Gambia: (i) boys consume 20 percent more education resources than girls (or 1.2 times more) than is justified by their respective weights in the total population; (ii) urban children absorb 2.9 times more resources than their rural peers, considering their respective demographic representativity; (iii) children from the wealthiest households are effectively allocated 7.7 times more resources than children from the poorest households; however (iv) in comparing the wealthiest two quintiles to the poorest two quintiles, the gap is reduced to a factor of 3.7.

The overall picture that is projected by these computations is that of an education system where social inequities, both in enrolment and the distribution of public resources, are substantial.

NOTES

77 Household surveys and school censuses sometimes offer specific modules on children's disabilities as well as on orphanhood.

78 Other typical examples include the GIR/PCR pairing, the availability of textbooks/exam success rate pairing, share of pupils enrolled in incomplete schools (those that do not offer all cycles)/retention rate in complete schools pairing, and so on.

79 Again, the supposition is that group A is more favoured than group B, which underlies an expectation with respect to the initial distribution. A dichotomy in the school performance indicator is an underlying hypothesis (performance can either be high or poor). Criteria should also be complementary events.

80 See Annex 0 for an explanation of the basic principles of econometric models. The reader is also advised to consult more specialist publications on the subject to perform more detailed analysis.

81 A dichotomous (or binary or dummy) variable is a qualitative variable that can only be attributed one of two mutually exclusive values: enrolled at school/not enrolled; pursues higher education/does not pursue; success at exam/failure.

82 A continuous variable, on the other hand, is a quantitative variable that can assume one of an infinity of values.

83 Indeed, the primary unit cost is 5 in country A (against 10 in country B), whereas unit cost for higher education is 370 in country A (against 100 in country B).

84 As a reminder, the Access Rate to Grade i is computed by dividing the new entrants in grade i (Enrolment – Repeaters) by the population with the theoretical age for grade i.

85 When the schooling profile is not available, the Average Enrolment Rate (AER)² can be used. The AER is the GER x (1 – Repetition Rate), and is capped at 100 percent. Although it is less precise than the schooling profile, the results are close. Also, it is assumed that the transversal data used for a given year are valid in a temporal perspective, be it for the highest level of education attained or for unit costs, meaning that multi-generation data can be used for the analysis of a pseudo-cohort.

86 One year for a simple year of study; several years for a full cycle. Typically, higher education is considered to be a four-year cycle.

87 In other terms, the OB parity line is defined by the equation X_i (resources) = Y_i (population).

88 The Gini coefficient is also equal to: S / Area of the OAB triangle, which is: 100 x 100 / 2 = 5,000. So, the Gini coefficient is: S / 5,000 = (5,000 - S') / 5,000 = 1 – 2S' / (100 x 100).

89 It matches with the age-group of individuals potentially eligible for education, in a broad way.

90 The drop of rural representativity in post-basic education can be interpreted by the fact service supply at those levels of education is very scarce in rural areas compared to urban settings.

91 The Figure 6.9 does not show the Q5/Q1 RRC for higher education because its value is very high. Finding the right scale that allows for representation on the same graph of low and high RRC's values may in some cases be tricky.

92 For the level of income, it is usual to compare each wealth quintile with the poorest quintile on the one hand, and the wealthiest two quintiles to the poorest two, on the other (this second approach is often used to avoid comparing excessively specific population groups).

ANNEXES

GENERAL ANNEXES

ANNEX 0 : BASIC ELEMENTS OF ECONOMETRICS

Sources: Wooldridge, J.M. Introductory econometrics: A modern approach. 2009; Jonhston J. &Di Nardo J.1997. Econometric Methods. 4th edition. Mc Graw Hill.

1. BASIC PRINCIPLES OF ECONOMETRICS

The objective of most empirical studies in economics is to test and quantify possible relationships (or associations) between two or more phenomena. This is the case for instance when wanting to know whether and to what extent a variation in a given variable is associated with a variation/change in another variable. For example, does having an additional year of schooling increase an employee's monthly salary? Or does reducing class size improve students' achievements?

Example : *When seeking to evaluate the effect or impact of a recent education policy (such as the introduction of a new type of teacher training) on school drop-out, the econometric tool will help to test and quantify the association between that type of training and school drop-out. Econometrics will help in this case to check whether or not there is a relationship between the type of training and dropouts.*

The other fundamental interest of econometrics is that it makes it possible to go beyond simple bivariate analysis (meaning between only two variables). Indeed, econometrics provides a framework that allows the analysis of relationships where one variable may be associated with several other variables.

Example : *In order to analyse possible determinants associated with students' achievements, it may be necessary to take into account students' initial level of learning as well as a number of other variables such as the learning environment, class size, teacher qualifications, students' family backgrounds and so on.*

Therefore, in addition to the explanatory variable of **interest** it is absolutely necessary to consider all other (measurable) variables which, a priori, affect the variable to be explained (**dependent variable**). These are commonly called **determinants** or **control** or **explanatory variables.**

Econometric analysis often starts by setting up a **theoretical model** whose aim is to describe the theoretical relationships or transmission mechanisms through which the explanatory variables are assumed to be associated with the **dependent variable.**

Then, an **econometric** or **empirical model** will mathematically translate the relationships described by the theoretical model into one or more equations. This will allow testing the predictions/assumptions and measuring the associations of each of the explanatory variables with the dependent variable, other variables remaining unchanged (Ceteris paribus).

The appropriate estimation technique to be used will depend on the relationship to be analysed, the nature of variables and the type of available data. Econometric literature on regression techniques and their usage is quite abundant. Here, two simple techniques that constitute the basis of all others are presented: (i) the ordinary least squares (OLS) approach, used when the dependent variable is quantitative and the tested model is linear; and (ii) the logistic regression, used when the dependent variable is qualitative.

2. LINEAR REGRESSION MODEL

When seeking to establish the significance and the degree of association between variables, two fundamental questions arise:

1. What is the statistical model that best describes the relationship between the variables to be analysed? For instance, is it more appropriate to use a linear or exponential relationship?
2. Once the right model is chosen, how, using available data, can the model's parameters be estimated?

Formally, assuming that the relationship is linear, the model can be written as follows:

$$Y_i = b_o + b_1X_1 + b_2X_2 + \dots + b_kX_k + E_i$$

Where:
- Y is the dependent or explained variable whose values are determined by those of the explanatory variables X_i;
- $b_o, b_1, \dots, b_K$ are the parameters of the regression model;
- $X_1, \dots, X_K$ is the set of explanatory variables; and
- E (the error term) accounts for the unobserved variables that affect Y and are therefore not considered in the model.

2.1 Estimating a Multivariate Linear Model

A simple case is used here to show how to interpret the regression results of a model estimated by the ordinary least squares (OLS) technique. This is the simplest case and provides a basis for addressing other types of modeling.

It is based on a hypothetical example, seeking to analyse the relationship, if one exists, between an individual's education level and a set of explanatory variables such as age, region, sex, type of place of residence, household wealth quintile. The underlying specification is thus:

Number of years of education completed = function (age, sex, location, region, wealth quintile) where the function is linear.

The results presented below are obtained on a sample of 14,987 individuals aged between 5 and 25 years.

The dependent variable Classph is the highest grade completed by a given individual. It takes the value 0 if the individual never attended school, 1 if he completed the first year, 2 if he completed the second year, etc. The only independent variable to be quantitative here is age, measured in single years, while the others are dummy variables, indicating the individual's characteristics. For instance, for a given individual:

- If q5 takes the value 1, this means that the individual is coming from the group of wealthiest households (and then q1, q2, q3 and q4 take the value 0); if q5 takes the value 0, he/she belongs to one of the other four quintiles.
- If rural takes the value 1, it means that this person lives in a rural area, if it is set to 0, he/she is in an urban area.

The STATA command for this purpose was
reg classph age rural girl region1 region2 region3 region4 region5 region6 q2 q3 q4 q5 if age>=5 &age<=25

q1 (the dummy variable related to the poorest quintile) is not included in the command line because it has been chosen as the reference variable. It means that the other wealth quintile variables will be assessed in reference to q1 (see an example in section 2.2 below).

The output estimated by the software is then as follows:

```
      Source |       SS       df       MS              Number of obs =   14987
-------------+------------------------------           F( 12, 14974) =  693.82
       Model |  88489.1285    12  7374.09404           Prob > F      =  0.0000
    Residual |  159146.877 14974   10.628214           R-squared     =  0.3573
-------------+------------------------------           Adj R-squared =  0.3568
       Total |  247636.005 14986  16.5244899           Root MSE      =  3.2601

------------------------------------------------------------------------------
     classph |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .3158459   .0045551    69.34   0.000     .3069172    .3247745
       rural |  -.6285417   .0955381    -6.58   0.000     -.815808   -.4412754
        girl |  -.9161743   .0534167   -17.15   0.000    -1.020878    -.811471
     region1 |   .1899048   .0942499     2.01   0.044     .0051635     .374646
     region2 |  (omitted)
     region3 |   .0054479   .0949843     0.06   0.954     -.180733    .1916288
     region4 |   .0147129   .0934205     0.16   0.875    -.1684028    .1978285
     region5 |  -.7388333   .0895111    -8.25   0.000     -.914286   -.5633806
     region6 |  -.2518847   .1246324    -2.02   0.043    -.4961795   -.0075899
          q2 |   .3776035   .0788881     4.79   0.000     .2229731    .5322338
          q3 |   1.058212   .0826002    12.81   0.000      .896305    1.220118
          q4 |   1.688892   .1088379    15.52   0.000     1.475557    1.902228
          q5 |    2.60705   .1304683    19.98   0.000     2.351316    2.862784
       _cons |  -.4169592   .1373718    -3.04   0.002    -.6862247   -.1476937
------------------------------------------------------------------------------
```

1 is the number of observations on which the model was estimated. It is important to look at this figure because if it differs from the sample size, it means that some observations were not taken into account in the regression. This can happen when there are missing values in the sample. These missing values must then be dealt with using an appropriate technique that should be specified when discussing the regression results.[93]

2 shows two indicators that play the same role. These are the results of the Fischer test (the value of statistics and their corresponding probability), which measures the statistical significance of the model and indicates whether at least one of the estimated Xi variables is statistically related to the dependent variable. It is common to consider that if the critical probability (Prob> F) is less than 0.05 (5 percent) then at least one of the coefficients is significantly different from zero, which means that at least one of the variables is associated with Y in a statistically significant way (which is the case in the example above). If the critical probability is greater than 0.05, none of the coefficients of the model can be considered different from zero. In this case no conclusion can be drawn about the association of at least one explanatory variable with the variable Y.

3 is called the regression's R^2 (R-squared). This is the proportion of the variance of Y explained by the model. This number can adopt values ranging from 0 to 1. It is also called the explanatory power of the model. Simply put, R^2 is the proportion of the variation in Y that the model explains. The difference between the R^2 and adjusted R^2 is that the latter is adjusted and is hence more reliable. In fact, the unadjusted R^2 increases automatically with the addition of a new variable even if that variable does not add to the significance of the model. In the example above, the adjusted R^2 is 0.3568, which means that the model can explain about 36 percent of differences between individuals' years of schooling completed.

However conclusions should not be hastily reached based only on R^2. The value of R^2 depends on the type of data used. It is common for models using household survey data (micro-level models) to have an R^2 value between 20 percent and 30 percent. The main reason being that micro econometric models cannot take into account all possible explanatory variables, especially those that were not surveyed or other non-measurable individual characteristics. For instance, our example does not take into account a number of characteristics (household size, foster child...) that could have an effect on the number of years of education completed. On the other hand, it is common for macroeconomic models (country-level observations) to have an R^2 value close to 70 percent (see economic growth models for instance).

④ represents the coefficients/estimates of the variables included in the model X_K. These are estimates of degrees of association of X_K with Y as measured by the model. If the value of a significant coefficient (see the two following paragraphs for assessing if the coefficient is significant or not) is positive, it means that an increase in X_K is associated with an increase in Y, all other things being equal elsewhere in the model. If the value of a significant coefficient is negative, it means that an increase in X_K is associated with a decrease in Y, all other things being equal in the model. If, on the contrary, a coefficient is not significant, then it is impossible to determine the effect (positive or negative) of that variable. The absolute value of the coefficient measures the degree of association of the corresponding variable X_K with Y, all other things being equal in the model.

As these measures are derived from a sample, their statistical robustness must be tested and a confidence interval specified. The two columns labeled ⑥ provide the confidence intervals within which the exact values of the coefficients have a 95 percent chance of being found. In practice, confidence intervals are not always used to assess the significance of a model's estimates. There are other indicators that quickly reveal the significance of a coefficient: namely the **t test** statistics and the critical probability of the test on the coefficient ($P > |t|$), also called **p-value**. These indicators are shown in the two columns labeled ⑤. The two indicators are linked, so one can simply use the critical probability to assess the significance of the coefficient. If the probability ($P > |t|$) is less than 0.05 (5 percent), then the variable is statistically significant. If, on the other hand, the critical probability is greater than 0.05, it is impossible to determine if the effect of this variable is statistically significant.

Rather than referring to the p-value of 0.05 (5 percent), other thresholds can be used: 0.01 (1 percent) or 0.10 (10 percent). In such cases, the following indications should be provided:

- "Significant at the 1 percent level" if the probability is less than 0.01; then it is common to represent this significance by three stars (***) next to the coefficient;
- "Significant at the 5 percent level" if the probability is less than 0.05; then it is common to represent this significance by two stars (**) next to the coefficient; and
- "Significant at the 10 percent level" if the probability is less than 0.1; then it is common to represent this significance by one star (*) next to the coefficient.

If the coefficient is not significant, there should be no star next to the coefficient and it is common to add "ns" or "not significant" next to the coefficient.

2.2 Interpretation of coefficients

As an example, two variables to illustrate and verify the model predictions are discussed here:

- ***Age:*** the coefficient of the variable is positive and highly significant (p-value=0.000). The model estimates that, *all other things being equal*, an additional year of age is associated with an average increase of 0.3 years of schooling completed.

• ***Q5:*** the coefficient is positive and highly significant. An individual coming from the richest household would have completed on average 2.6 years more than an individual coming from the poorest quintile (which is used as the reference).

3. LOGISTIC REGRESSION MODEL

Unlike the previous case, in a logistic regression (also known as logit or probit model) the variable *Y* is qualitative. For simplicity's sake, the case where *Y* can only assume two values is presented here: success or failure; literate or illiterate; trained or untrained teacher and so on. In this case the dependent variable *Y* is called a **binary (or dummy) variable** in that it takes either the value of 1 or 0.
Formally, we have:

$P(Y=1)= F(b_o + b_1X_1 + b_2X_2+ \ldots + b_KX_K +E)$

Where F is the logistic distribution function.

Example : The results presented below are derived from a regression of a logistic model relating the variable 'ever attended school' (EAS) with several independent variables such as age, region, education level of the mother, sex and level of household income of the individuals. Mothereduc1 takes the value 0 if individual's mother has no education or incomplete primary schooling and 1 if she at least completed primary school.

The Stata command is as follows:

logit EAS age region1 region2 region3 region4 region5 region6 MotherEduc1 girl q2 q3 q4 q5

The outputs are as follow

```
                                                                              (1)
Logistic regression                                 Number of obs    =      8581
                                                    Wald chi2(12)    =    533.50
                                                    Prob > chi2      =    0.0000 ] (2B)
Log pseudolikelihood =  -2508.248                   Pseudo R2        =    0.1453 ]

------------------------------------------------------------------------------
             |               Robust
(Y) →    EAS |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .2482001   .0181917    13.64   0.000     .2125451    .2838552
     region1 |   .2144456   .2786596     0.77   0.442    -.3317172    .7606083
(X) →region2 |  -.1605081   .2679548    -0.60   0.549    -.6856898    .3646735
     region3 |   -.185191   .2660325    -0.70   0.486    -.7066052    .3362232
     region4 |  -.1575757   .2648406    -0.59   0.552    -.6766537    .3615023
     region5 |  -.4787489    .267219    -1.79   0.073    -1.002488    .0449907
     region6 |  (omitted)
 MotherEduc1 |  -1.035747   .0998549   -10.37   0.000    -1.231459   -.8400346
        girl |  -.3379174    .074322    -4.55   0.000    -.4835858   -.1922489
          q2 |   .3999801    .084419     4.74   0.000     .2345219    .5654383
          q3 |   .8808287   .1031813     8.54   0.000      .678597     1.08306
          q4 |   1.124062   .1775368     6.33   0.000     .7760968    1.472028
          q5 |   1.632027   .3012094     5.42   0.000     1.041667    2.222386
       _cons |   .3522336   .3132978     1.12   0.261    -.2618188    .9662859
------------------------------------------------------------------------------
                    ↑                          ↑                      ↑
                  (4B)                        (5)                    (6)
```

Given that the overall objective of logistic models is the same as the OLS models, some information is the same in both listing tables, such as that labeled 1, 5 and 6 which are interpreted as previously for the linear model. However, some information of the listing is specific to the logistic regression:

2B indicates the significance of the model. If the critical probability is less than 0.05 (5 percent) then at least one of the coefficients is significantly different from zero, which means that at least one of the variables is statistically significant.

4B shows the logistic regression coefficients. The big difference with the OLS approach is that logistic coefficients X_K are interpreted in terms of their association with the probability of *Y taking the value of 1*. More specifically:

- If a coefficient is positive, increasing the variable *X* by one unit (where variable *X* is quantitative), or moving from one category to another (where variable *X* is qualitative) is associated with an increase in the probability that *Y* adopt the value of 1. In the example above, the sign of the coefficient of the variable's *age* is positive, meaning that the increase in students' age is associated with an increase in the probability of being schooled.

- If a coefficient is negative, increasing the variable *X* by one unit (where variable *X* is quantitative), or moving from one category to another (where variable *X* is qualitative) is associated with a decrease in the probability that *Y* adopt the value of 1. In the example above, the sign of the coefficient of the "*girl*" variable is negative, meaning that being a girl is associated with a decreased likelihood of being schooled.

Clearly, handling logistic models is relatively more complex than handling OLS models. Rather than interpreting the coefficients, it is more practical to ask the software to display the **odds ratios** between a situation and its alternative. This allows comparing the degree of association of each explanatory variable with the dependent variable. In practice, this consists of computing an exponential transformation of each coefficient of which the result should be compared to 1.

For instance, in the context of our example:

- The odds ratio calculated for the variable **girls** would be exp(-0.33791740) = 0.71, meaning that a girl has 29% (=1-0.71) less chances of attending school than a boy,

- The odds ratio calculated for the variable **q5** would be exp(1.632027) = 5.11, meaning that a child from richest household is 5 times more likely to have ever attended school than a child from the poorest household,

- The odds ratio calculated for the variable **age** is exp(0.2482001) = 1.28, meaning that an additional year of age increases the chance of having ever attended school by 28%.

Odds ratios can directly be obtained using the '**mfx compute**' post-estimation command available in Stata.

CHAPTER 1 ANNEXES

ANNEX 1.1: DEMOGRAPHIC DATA QUALITY AND CORRECTIONS

Demographic Projections and the Phenomenon of Increasing Single-Age Cohorts

The following table presents an extract of Malian demographic projections, based on the population census of 1998.

TABLE A1.1 - Extract of Malian Demographic Projections, 1998-2015

Age	**1998**	1999	2000	2001	2002	2004	2006	2008	2009	2015
7	**352,441**	361,084	**370,038**	379,319	388,945	409,309	431,296	455,100	467,751	556,264
9	**246,678**	248,809	255,097	261,618	**268,386**	282,717	298,210	315,006	323,941	386,620
13	**226,108**	231,896	237,902	244,135	250,611	264,341	**279,212**	295,365	303,972	364,578
16	**212,268**	217,726	223,392	229,277	235,395	248,382	262,470	277,798	**285,976**	343,753

Source: Mali CSR, 2007.

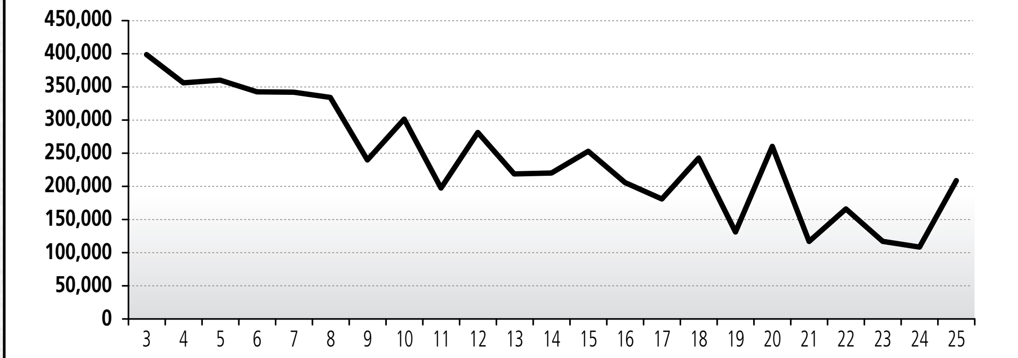
About 370,000 children are estimated to be aged seven years in 2000. Two years later, in 2002, they would be aged nine years; however, according to Table A1.1, there would only be 268,000 of them. This would imply that 100,000 children would have died in the interim, more than a quarter. Four years later, in 2006, the same children would be aged 13 years. However, according to the table, their number would have increased anew by 10,000 to 279,000. Over the following three years, to 2009, a further 7,000 are projected. Thus it is clear that the census-based forecasts are unrealistic.

The quality of demographic projections obviously depends on the relevance of the forecast assumptions formulated and the projection method used, but also on the quality of census data used. This may seem natural, but in many cases the close examination of the quality of the original data is necessary.

In the present case of Mali, the projections were computed by applying a demographic growth rate of 2.8 percent, whatever the age group. Consequently, the issues noticed with the demographic projections are the direct result of the inconsistencies already present in the base year data.

By displaying in a single graph the number of children counted by the 1998 census by age, the curve is very uneven (See Figure A1.1). Although the overall tendency is one of population contraction, a closer look at the higher ages reveals strong variations in the data, on both sides of the general trend. The incoherence noticed in the demographic projections is therefore basically due to the fluctuations in the base year data.

FIGURE A1.1 - Population Aged 3 to 25 Years, Mali, 1998



Source: 1998 Census data.

The Phenomenon of Over-Declaration of Rounded Ages in Census Data

One of the main obstacles to the immediate use of census data lies in the issue of the ages that are declared by survey respondents. Indeed, in many developing countries, there is a lack of birth registration and the age declarations are often wrong, either because individuals voluntarily wish to appear older or younger for personal reasons (tax, administrative, or other), or because they do not in fact know their accurate age and tend to round the number of years to the nearest five. For instance, a person aged 33 years might declare their age as 30 or 35 years.

The previous figure, showing the raw data by single age based on the 1998 census in Mali illustrates this issue perfectly: the number of children declared to be aged 10 years is considerably higher than the numbers of children said to be aged 9 or 11 years. Likewise with youth said to be aged 15 or 20 years. It is necessary to correct this bias to obtain smoothed data by single-age for the census year, and projections.

To use peak-and-trough patterned projections for the elaboration of education policy will lead to erratic estimations of enrolment indicators, resulting in the under or over-estimations of schooling indicators.

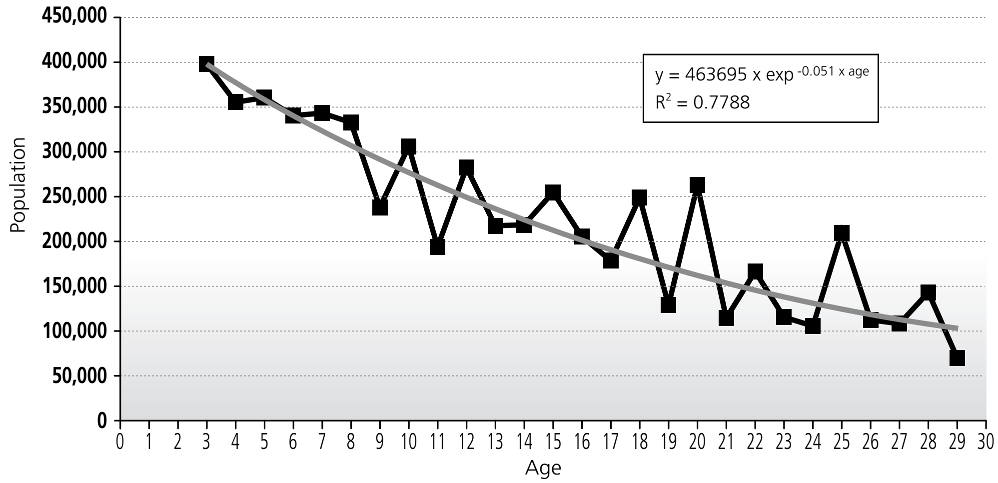
Adjustments to Census Data

Generally, education policy is only interested in school-aged children. It is therefore possible to choose to smooth a single section of population data, corresponding to the population aged 3 to 29 years. The practice involves two stages: smoothing and straightening:

- **Smoothing:** Firstly, a trendline is applied to the data, and its defining equation is recovered. This equation is then used to obtain new population projections by single-age. Different smoothing approaches are possible (exponential, polynomial, logarithmic, and so on). The choice of approach will be determined by the profile of the data and the trendline that best fits this profile. To obtain the best trendline, the R^2 determination coefficient can be used to supply the measure in which the curve obtained equates to the original one. The closer this coefficient is to the value of one, the better the trendline.

A simple approach to carrying out this smoothing exercise consists of using Excel to represent the population curve by age through a scatter plot, and adding a trendline to the graph. The trendline options offer the choice between exponential, linear, logarithmic and polynomial. The displayed R^2 value helps to establish the most appropriate method, choosing that for which R^2 is greatest. The equation can then be displayed on the graph, and used in an Excel formula to reconstitute the data for the smoothed curve. In the case of Mali, the best result is provided by the polynomial trendline, producing an R^2 value of 0.78 (See Figure A1.2).

FIGURE A1.2 - Trendline Applied to the Population Aged 3 to 29 Years, Mali, 1998



Source: World Bank, 2007a (Mali CSR).

- **Straightening:** Despite the inconsistencies in the declaration of rounded ages, the total number of individuals surveyed must be assumed to be correct, and must therefore be equal once the data have been smoothed. The straightening exercise therefore applies to the total population. Firstly, on the basis of the smoothed data, the number of individuals belonging to each age group is calculated. Secondly, to each single-age subtotal, the ratio of the census total over the estimated total is factored in.

Table A1.2 compares the Mali population projections by single-age, with the raw census data, and the numbers obtained by the described smoothing and straightening exercises.

Beyond the distribution of the population by single-age, issues related to the coverage of the census, to the choice of the annual growth rate (and its potential variation over time) and to the projection method can also be raised. The coverage question is difficult to address within the context of an education sector analysis, as the objective is not to question official data, hence the straightening exercise to ensure that the total population figures coincide. However, the other two issues are open to debate.

TABLE A1.2 - Malian Population Data, Raw, Smoothed and Straightened, 1998							
Age	Raw Census Data	Smoothed Data	Straightened Data	Age	Raw Census Data	Smoothed Data	Straightened Data
3	398,663	397,910	402,606	17	181,356	194,849	197,149
4	357,308	378,126	382,588	18	246,402	185,161	187,346
5	363,293	359,325	363,565	19	130,096	175,955	178,031
6	343,242	341,459	345,488	20	263,670	167,206	169,179
7	344,537	324,481	328,310	21	116,909	158,892	160,767
8	335,562	308,347	311,986	22	165,898	150,992	152,774
9	240,634	293,016	296,474	23	118,617	143,484	145,178
10	305,643	278,447	281,733	24	108,823	136,350	137,959
11	196,593	264,602	267,724	25	208,148	129,571	131,100
12	282,221	251,446	254,413	26	113,974	123,128	124,581
13	220,663	238,943	241,763	27	109,856	117,006	118,387
14	221,978	227,063	229,742	28	144,291	111,189	112,501
15	256,406	215,773	218,319	29	71,761	105,660	106,907
16	207,490	205,044	207,464	Total	6,054,034	5,983,427	6,054,034
				Ratio of Real to Smoothed: 1.0118			

Source: World Bank, 2007a (Mali CSR).

Projections of the Total and School-Aged Populations

Projections can be carried out on the basis of fertility, mortality, and migration assumptions. However, this method may be too complex to perform for education sector analysts who are not specialised in demography. Where demographic projections are not available, it is possible to carry out simplified projections on the basis of assumptions made by demographers about the population growth rate. One approach consists of estimating the future school-aged population by applying a growth rate to the current school-aged population.

Table A1.3 displays new projections for Mali's population, based on a forecast growth rate of 3.03 percent, supplied by demographers. While the obtained data can be qualified as clean in as much as they have been obtained through justifiable methods, they cannot be considered to be perfectly exact.

TABLE A1.3 - Extract of Malian Demographic Projections, by Single-Age, Smoothed Data, 1998-2015

Age	1998	1999	2000	2001	2002	2004	2005	2006	2008	2009	2015
7	**328,901**	338,110	**347,577**	357,309	367,314	388,171	399,040	410,213	433,507	445,645	525,954
9	**296,829**	305,140	313,684	322,467	**331,496**	350,320	360,129	370,212	391,235	402,189	474,667
13	**241,762**	248,532	255,491	262,644	269,999	285,330	293,319	**301,532**	318,654	327,577	386,609
16	**207,277**	213,081	219,047	225,180	231,485	244,630	251,480	258,521	273,201	**280,851**	331,462

Source: World Bank, 2007a (Mali CSR).

The data obtained can then be distributed according to gender, regions, provinces, and so on. In many cases however, even where the national projection and gender disaggregation raise no specific issues and are deemed to be relatively reliable, population projections by region or province may embody many and significant mistakes. Indeed, it is difficult to obtain information by area for births, mortality and migrations that enable forecasts to be very precise and accurate.

ANNEX 1.2: CALCULATION OF THE AVERAGE ANNUAL GROWTH RATE

The growth rate is a generic indicator that enables the measurement of the growth of many variables, including population, school-aged population, GDP, the national budget, and so on. The explanation below is applied to GDP, although the same method can be used for any variable.

It is important to distinguish between overall growth, and the annual average growth rate:

Whereas the overall growth between year X and year Y is defined as: $\frac{GDP_Y}{GDP_X} - 1$

The average annual growth rate is defined as: $\left(\frac{GDP_Y}{GDP_X}\right)^{\frac{1}{Y-X}} - 1$

For example, on the basis of Table A1.4 below, the *overall growth* between 1999 and 2005 is estimated as 47.4 percent: (313.3 / 212.6) – 1 = 47.4 %.

TABLE A1.4 - GDP, 1999-2005

	1999	2000	2001	2002	2003	2004	2005
GDP (Constant Prices)	212.6	238.4	258.0	269.7	281.3	291.6	313.3

Source: Authors.

However, the *average annual growth rate* is more commonly used. Note that the average annual growth rate is different to the average of simple annual growth rates. The average annual growth rate for the 1999-2005 period is estimated at 6.7 percent: $(313.3 / 212.6)^{1/(2005-1999)} - 1 = 6.7\%$.

ANNEX 1.3: CURRENT AND CONSTANT PRICES

Table A1.5 provides GDP trend and inflation data for a fictitious country. The analyst would like to calculate GDP growth rate in a way that removes the bias due to inflation (price increase).

TABLE A1.5 - GDP and Inflation Rate, Fictitious Country, 1999-2005				
	Nominal GDP (Current Prices) [a]	**Inflation Rate (%) [b]**	**Consumer Price Index (Ref. 1999) [c]**	**Real GDP (Constant 1999 Prices) [d]**
1999	212.6	8.9	To be determined later.	
2000	238.4	10.2		
2001	258.0	12.2		
2002	269.7	8.5		
2003	281.3	10.2		
2004	291.6	4.4		
2005	313.3	4.7		

Source: Authors.

1. CORRECTION OF INFLATION

Without taking inflation into account, total GDP growth over the 1999-2005 period would amount to 47.4 percent, and the average annual GDP growth rate would be 6.7 percent (see Annex 1.2 for the calculation methodology). The manipulation of financial data is more delicate however, as they combine both volume trends (reflecting real changes in production) and value trends (reflecting price changes, i.e. inflation). When the point of interest is the potential that the growth of national wealth provides, for instance in terms of purchasing power, it is necessary to consider real volume trends (i.e. at constant prices) without the effect of price changes (the effect of inflation).

Column [a] presents the value of GDP in current prices (nominal GDP), combining trends in volume and trends in prices. Column [b] lists the inflation rate for each year, and can thus be used to correct the nominal GDP values. The nominal GDP value for a given year is the nominal GDP value for the previous year multiplied by the growth in volume and the inflation rate.

As an example:

$$\textit{Nominal GDP}_{2000} = \textit{Nominal GDP}_{1999} \times (1 + r) \times (1 + i) ,$$

where r is the growth in volume (real growth) between 1999 and 2000 and i is the inflation rate in year 2000.

Thus, as the inflation rate is known, the real growth is straightforward to calculate, as shown by the following formula derived from the previous one:

$$r = \left(\frac{\textit{Nominal GDP}_{2000}}{\textit{Nominal GDP}_{1999} \times (1+i)} \right) - 1$$

For 2000, i is 10.2 percent, so r is: [238.4 / (212.6 x (1 + 0.102))] – 1 = 0.0176 = 1.76%.

This figure *r* can then be applied to the 1999 nominal GDP value to obtain the 2000 real GDP (in constant 1999 prices). In the above example, real GDP for 2000 is thus: 212.6 x (1 + 0.0176) = 216.3. The same procedure can be carried out for each year to reconstitute the real GDP values and estimate the potential additional national wealth produced, excluding inflation.

2. USE OF PRICE INDEXES

An alternative approach to convert current prices into constant prices is to use a Consumer Price Index (also known as a GDP deflator). Finance administrations generally publish this index. They include a starting or reference point, that is the base year for the calculation of the index, and for which it is normatively set to a value of 100. The index for a given year is then obtained by multiplying the index of the previous year by the multiplicator (1 + i), where i is the inflation rate.

For instance, if 1999 is used as the reference year and given a value of 100, the Consumer Price Index for 2000 will be: 100 x (1+0.102), or 110.2. For 2001, the value of the index will be 110.2 x (1+0.122), or 123.6. Table A1.5 can then be used to estimate the evolution of the consumer price index over the period (See column [c] of Table A1.6). The consumer price index reaches a value of 161.6 in 2005, indicating that prices over the 1999-2005 period increased by 61.6 percent.

TABLE A1.6 - Nominal and Real GDP, Price Index and Inflation Rate, Fictitious Country, 1999-2005

	Nominal GDP (Current Prices) [a]	Inflation Rate (%) [b]	Consumer Price Index (Ref. 1999) [c]	Real GDP (Constant 1999 Prices) [d]
1999	212.6	8.9%	**100.0**	**212.6**
2000	238.4	10.2 %	**110.2**	**216.3**
2001	258.0	12.2 %	**123.6**	**208.7**
2002	269.7	8.5 %	**134.2**	**201.0**
2003	281.3	10.2 %	**147.8**	**190.3**
2004	291.6	4.4 %	**154.3**	**188.9**
2005	313.3	4.7 %	**161.6**	**193.9**

Source: Authors.

The data series for real GDP (or in constant 1999 prices) is then easily obtained for each year by dividing the nominal GDP values (GDP in current prices, column [a]) by the Consumer Price Index (column [c]) and multiplying by 100.

It is interesting to compare the evolution of prices, of 61.6 percent, with that of nominal GDP, which was only 47.4 percent, indicating that in fact, in real terms, production dropped over the period. Indeed, these results offer quite a different image of the evolution of national wealth: (i) real GDP growth is in fact negative, at -8.8 percent [=(193.9 / 212.6) - 1], contrasting starkly with apparent growth of +47.4 percent in nominal terms; and (ii) average annual real GDP growth is -1.5 percent, and not +6.7 percent, as per nominal GDP.

TABLE A1.7 - Nominal and Real GDP, Consumer Price Indexes and Inflation Rate, Fictitious Country, 1999-2005						
	Nominal GDP (Current Prices) [a]	**Inflation Rate [b]**	**Consumer Price Index (Ref. 1999) [c]**	**Real GDP (Constant 1999 Prices) [d]**	**Consumer Price Index (Ref. 2005) [e]**	**Real GDP (Constant 2005 Prices) [f]**
1999	212.6	8.9%	100.0	212.6	**61.9**	**343.6**
2000	238.4	10.2 %	110.2	216.3	**68.2**	**349.6**
2001	258.0	12.2 %	123.6	208.7	**76.5**	**337.2**
2002	269.7	8.5 %	134.2	201.0	**83.0**	**324.9**
2003	281.3	10.2 %	147.8	190.3	**91.5**	**307.5**
2004	291.6	4.4 %	154.3	188.9	**95.5**	**305.3**
2005	313.3	4.7 %	161.6	193.9	**100.0**	**313.3**

Source: Authors.

The use of the consumer price indexes is flexible. For ease of understanding, it may be preferable to present GDP in constant 2005 prices (or in any other year prices). The 2005 consumer price indexes (column [e] of Table A1.7) are obtained by dividing the 1999 consumer price indexes (column [c]) by the 2005 value of the 1999 consumer price index. Again, the real GDP values in constant 2005 prices are obtained by dividing the nominal GDP values (column [a]) by the 2005 consumer price indexes (column [e]) and multiplying by 100.

If the values of the two GDP series differ (the first is expressed in constant 1999 prices, and the second in constant 2005 prices), they nevertheless reflect exactly the same evolution. The last series shows that the evolution of real GDP between 1999 and 2005 is precisely the same as that estimated previously: (313.3 / 343.6) – 1 = -0.088, or -8.8 percent.

ANNEX 1.4: METHODOLOGY OF CALCULATION OF THE COMPOSITE CONTEXT INDEXES

The World Bank (Africa Region/Education Unit) annually gathers data from different sources (World Bank, IMF, UIS, UNAIDS, OECD, and so on) in order to compute and update a comparative context index for all Sub-Saharan African education systems. This context index allows the comparison of countries' education outcomes taking into account differences in country contexts. The context index is made up of two sub-indices: the economic context sub-index and the socio-demographic context sub-index, each computed on the basis of various indicators.

The economic context sub-index includes the following indicators:

- Recurrent revenue excluding grants, as a percentage of GDP (IMF and OECD);
- Official development assistance in education, as a percentage of GDP (including 20 percent of the global budget support, should it exist - OECD and World Development Indicators);
- The share of enrolment in private schools (UNESCO Institute for Statistics);
- GDP per capita (World Bank and OECD); and
- GDP growth for the last three years (World Bank and OECD).

The sociodemographic context sub-index includes the following indicators:

- The demographic pseudo dependency ratio, expressed as the number of children aged 5 to 16 years as a percentage of the total population (UN Department of Economic and Social Affairs);
- The adult (15 years and above) literacy rate (UNESCO Institute for Statistics);
- The HIV/AIDS prevalence rate, for adults aged 15 to 49 years (UNAIDS);
- The under-five mortality rate, per 1,000 live births (World Health Organisation and UNICEF);
- The prevalence of malnutrition (height for age), as a percentage of children under five (World Health Organisation); and
- The urban population, as a percentage of the total population (UN World Urbanisation Prospects).

The eleven indicators are standardised (mean = 50; standard deviation = 10). The result of this calculation for a given country is its relative score, compared with other African countries.

Then, the weighted average (indicators that have greater relevance to the factor analysis are more highly weighted) of the indicators is computed to make up sub-indices and the context index.

Finally, the sub-indices and the context index are standardised [mean = 50 and standard deviation = 10] to avoid negative figures and make them more reliable.

CHAPTER 2 ANNEXES

ANNEX 2.1: ASSESSING INTERNAL EFFICIENCY BY MEANS OF COHORT ANALYSIS

Source: Abstract from Education for All: The Year 2000 Assessment, Technical Guidelines, UNESCO, 1998

The assessment of **internal efficiency** and 'wastage' in education[94] uses techniques similar to those used in cohort analysis in demography. A *cohort* is defined as a group of persons who jointly experience a series of specific events over a period of time. Accordingly, we may define a pupil cohort as a group of pupils who join the first grade of a given cycle in the same school year, and subsequently experience the events of promotion, repetition, dropout or successful completion of the final grade, each in his/her own way.

There are three ways to analyse the internal efficiency of an education system by means of the cohort pupil flow method, depending on the type of data collected: (i) true cohort, (ii) apparent cohort, and (iii) reconstructed cohort.

The ideal way to obtain a precise assessment of educational wastage is through the use of the *true cohort method*. This involves either a tracer (longitudinal) study to monitor the progress of a selected cohort of pupils through the education cycle, or through a retrospective study of school records in order to retrace the flows of pupils through the grades in past years. The true cohort method, however, is costly and time-consuming, and it requires good and reliable school-records with information on individual pupils. For this reason, this method is not yet widely used.

In the absence of individualised pupil information, internal efficiency in education can be assessed through data on enrolment by grade for at least two consecutive years using either the apparent or reconstructed cohort methods.

The *apparent cohort method* is applied when there is no data on repeaters. Then the enrolment in grade 1 in a particular year is compared with enrolment in the successive grades during successive years, and it is assumed that the decrease from each grade to the next corresponds to wastage. This method, the most commonly used so far, produces very approximate estimates of drop-out, and its main weakness is that it assumes that pupils are either promoted or drop-out of the school system. Repetition, a factor of paramount importance, is simply overlooked. However, this method is quite appropriate for countries practicing automatic promotion from grade to grade.

A more pertinent and commonly used method is the reconstructed cohort method, which is less dependent on the availability of detailed data over time. To apply this method, data on enrolment by grade for two consecutive years, together with data on repeaters by grade from the first to second year, are sufficient to enable the estimation of three main flow-rates: <u>promotion</u>, <u>repetition</u> and <u>drop-out</u>. Once obtained, these rates may be analysed first of all by grade to study the patterns of repetition and drop-out. Then they can be used to reconstruct a pupil-cohort flow in order to derive other indicators of internal efficiency. This is illustrated below using data from Guinea.

1. COMPUTATION OF THE FLOW-RATES USING DATA ON ENROLMENT AND REPEATERS

A. Initial data: Enrolment and repeaters by grade in Guinea, 1993 and 1994.

The methodology of the reconstructed cohort flow model is based on the fundamental concept that for pupils enrolled in a given grade in a given year, there can be only three eventualities: (a) some of them will be promoted to the next higher grade in the next school year; (b) others will repeat the same grade in the next school year; and (c) the remaining pupils will drop-out of school in the course of the year.

Grades	**1**	**2**	**3**	**4**	**5**	**6**	**Graduates**
1993 Enrolment	123,702	111,058	95,690	69,630	56,478	41,311	19,735
1994 Enrolment	129,700	113,882	112,433	78,758	62,692	45,429	
Repeaters	33,539	27,067	33,545	22,740	20,476	14,513	

Based on this concept, the sample data above permit the computation of the three flow-rates. For instance, of the 123,702 pupils enrolled in grade 1 in 1993:

1. 33,539 repeated grade 1 in 1994, i.e. 27.1 percent.
2. 86,815 were promoted, i.e. 70.2 percent (113,882 enrolled in grade 2 in 1994 minus 27,067 who repeated that grade in 1994).
3. 3,348 dropped-out, i.e. 2.7 percent (the residual of 123,702 minus 86,815 and minus 33,539).

Thus, the corresponding flow-rates are p = 0.702; r = 0.271; d = 0.027, which add up to 1 or 100 percent.

B. Main flow-rates enabling the derivation of the flow diagram

By applying the same type of computation on a grade-by-grade basis, one can obtain the following flow-rates by grade.

Grades	**1**	**2**	**3**	**4**	**5**	**6**
Promotion rates (p)	0.702	0.710	0.585	0.606	0.547	0.478
Repetition rates (r)	0.271	0.244	0.351	0.327	0.363	0.351
Drop-out rates (d)	0.027	0.046	0.064	0.067	0.090	0.171

2. RECONSTRUCTION OF SCHOOL 'HISTORY': HYPOTHETICAL FLOW DIAGRAM OF THE COHORT THROUGH PRIMARY EDUCATION IN GUINEA, 1993

Based on these above flow-rates, the flow of a fictitious cohort of 1,000 pupils through the primary education cycle can be reconstructed below, based on three assumptions:

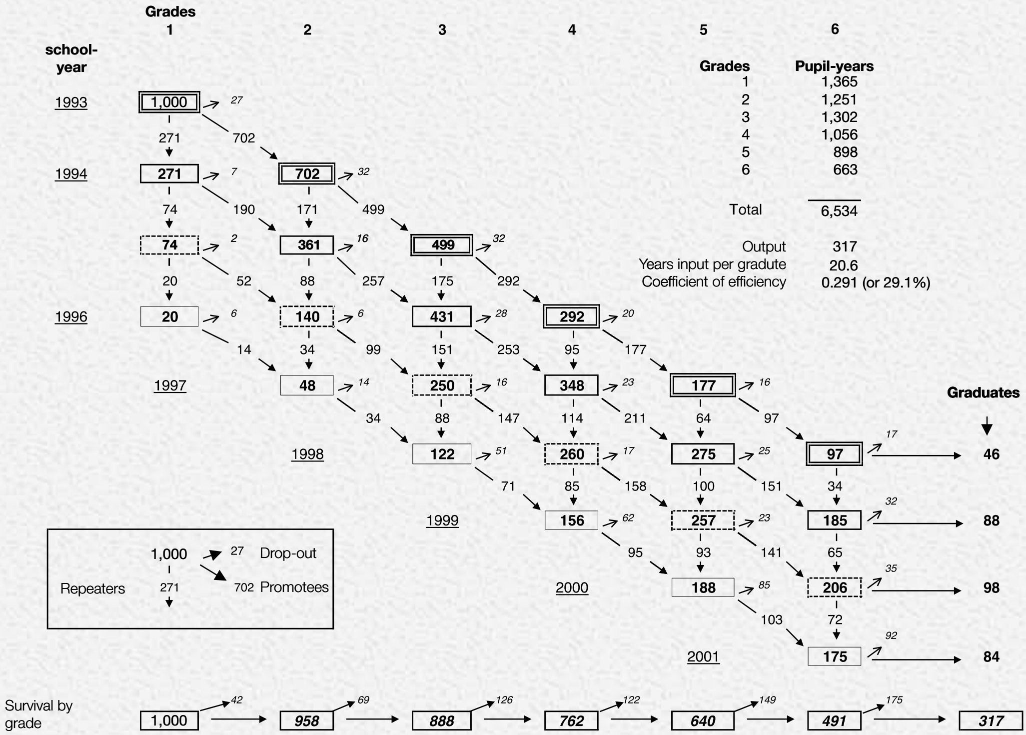
1. that, at any given grade, the same rates of repetition, promotion, and drop-out apply, regardless of whether a pupil has reached that grade directly or after one or more repetitions (hypothesis of homogenous behaviour);
2. that there will be no additional pupils (new entrants) in any of the subsequent years during the life-time of the cohort, other than original cohort of 1,000 pupils;
3. that the number of times any pupil will be allowed to repeat a grade must be well defined.

To reconstruct the history of 123,702 pupils entering grade 1 in Guinea in 1993, it is easier to express this starting cohort as an index of 1,000 pupils, and all operations are consequently translated in 'per thousand' terms. Thus, when applying each flow-rate for grade 1 to this fictitious cohort of 1,000 pupils (instead of the actual 123,702 pupils), one finds that 271 pupils repeated grade 1 (27.1 percent); 27 dropped-out (2.7 percent), and 702 were promoted to grade 2 (70.2 percent). Using the flow-rates for grade 2 on the 702 pupils reaching grade 2, one can derive that 171 repeated grade 2 (24.4 percent); 32 dropped-out (4.6 percent), and 499 were promoted to grade 3 (71 percent) and so on. It may be noted that the first diagonal row in the diagram below (next page) is obtained by multiplying the successive promotion rates for successive grades and successive years. The repetition and drop-out rates are then applied to obtain the second, the third and the fourth rows.

From this flow diagram, one can draw a number of interesting observations. For instance, out of the initial 1,000 pupils entering grade 1, only 46 graduated from the cycle without repeating any grade; 88 graduated with a one year delay, i.e. they repeated one grade; 98 graduated with two years delay, i.e. they repeated twice; and 84 graduated after repeating three times.

In addition, this flow diagram enables the computation of the main indicators of internal efficiency. For example, the figures in the boxes below the diagram give the number of pupils reaching a particular grade, thus enabling the calculation of the **survival rates** by grade. One can observe that 958 out of the 1,000 pupils in the cohort (or 95.8 per cent) reached grade 2. These figures can be easily derived from the upper part of the diagram, by summing the number of drop-outs from each grade and each year and subtracting that sum from the enrolment in the same grade. For grade 1 we obtain 27+7+2+6 = 42 drop-outs, which when subtracted from 1,000 would give 958 survivals. Finally by summing the drop-outs from each grade (42+69+126+122+149+175) we find a total of 683 pupils who dropped out without completing primary education (as graduates). Thus, out of the initial pupil-cohort of 1,000, only 317, or about 32 per cent, graduated from the primary cycle.

Multiplying this number of graduates by the number of grades (317 x 6 = 1,902) would give the ideal number of pupil-years required to produce the graduates. The ratio between the latter and the actual number of pupil-years used by the cohort, i.e. 6534, gives the **coefficient of efficiency** (1,902 ÷ 6,535 = 0.291 or 29 percent). The **years input per graduate** (20.6 years) is obtained by dividing the total number of pupil-years spent by the cohort (6534) by the total number of graduates (317). The years input per graduate can then be compared to the ideal number required, which is simply the duration of the education cycle -- 6 years in this example.



According to the above figures, one may conclude that due to repetition and drop-out, it was necessary to use more than three times the ideal number of pupil-years required to produce the 317 graduates. The **input-output ratio**, which is the reciprocal of the coefficient of efficiency, can be calculated by dividing the years input per graduate by the prescribed duration of the education cycle (i.e. 20.6 ÷ 6 = 3.4). The ideal minimum value of this ratio is 1, meaning that there is no repetition or drop-out.

Reliability of data on enrolments and repeaters. How well the derived indicators describe the way in which a cohort actually progresses through a cycle of education depends on the validity of the assumptions on which this model is based and the reliability of the statistical data available for estimating the flow rates. It is important to note that since data on promotees and drop-outs are generally not directly available, errors in the data available on enrolment and repeaters would affect the estimates derived for these two flows. Three common errors that may distort the flow rates can be described as follows:

1. Over-reporting of enrolment/repeaters (particularly in grade 1). This may be deliberate when there is a financial incentive; for example, if the number of teachers paid by the government is related to the number of pupils enrolled. A different type of over-reporting occurs in countries where parents enroll their children in school at the beginning of the school year, but where a large number of those enrolled do not actually attend school or only attend for a very brief period.

2. Incorrect distinction between new entrants and repeaters. This leads, other things being equal, to an under-reporting of repeaters in grade 1 and to an over-estimation of drop-out from this grade.

3. Yearly variation in the coverage of the data. Assume that, for one reason or another, the data available for year t are complete while those for year t+1 are incomplete. Disregarding other types of errors, this implies that the number of promotees and repeaters in t+1 will be under-estimated and the number of drop-outs over-estimated. If, in addition, the data for school-year t+2 are complete, this will imply that some of the promotees and repeaters that year were not included in the enrolment the previous year, leading to over-estimation of the promotion and repetition rates and under-estimation of the drop-out rate, which may appear negative in some cases.

While the errors discussed under points 1 and 2 above affect mainly the flow rates for the first grade of primary education, incomplete data will naturally distort the rates for all grades. All these types of error can lead to biases in the indicators of internal efficiency. Since the drop-out rate is determined as a residual, it often serves as a test for some of these errors: a negative drop-out rate, particularly, is a sign of errors in the raw data, i.e. reported enrolment and repeaters.

Note: A comparison of the apparent cohort and reconstructed cohort methods shows that neglecting the repetition factor (apparent cohort method) leads to an under-estimation of survival rates and an over-estimation of drop-out.

ANNEX 2.2: CALCULATION METHOD FOR SCHOOL LIFE EXPECTANCY BASED ON GROSS ENROLMENT RATES AND AVERAGE ENROLMENT RATES

Source: Abstract from Methodological Note N°3: Measuring the Educational Coverage of a Country: School-Life Expectancy, Pôle de Dakar, 2004

If the schooling profile is unavailable, an estimate of school-life expectancy can be obtained using the gross enrolment rates. Assuming that the GER represent the proportion of pupils educated in each cycle (which is an erroneous assumption, as we shall see later), we can replicate the reasoning that was described above for the method of calculation using the profile. The proportion of the cohort that leaves school after the primary cycle (and therefore successfully completes the N_{prim} years that make up this cycle) is calculated by the difference between the GER for the primary cycle (those pupils educated at least to primary level) and the GER for the first cycle of secondary education (those who continue their studies after the primary cycle). Using the same logic, an estimate of the proportion of the cohort that reaches the end of the first cycle of secondary education is given by the difference between the GER for the first cycle of secondary education and the GER for the second cycle of secondary education. The proportion of the cohort reaching the end of the second cycle of secondary education is given by the difference between the GER for the second cycle of secondary education and the GER for the final cycle. Finally, the GER for the final cycle gives us an estimate of the proportion of a cohort that successfully completes the maximum number of years of study in the system ($N_{prim} + N_{sec1} + N_{sec2} + N_{he}$).

The formula for the approximate method of calculation using the GER can be written as follows:

$$SLE_{GER} = [(GER_{prim} - GER_{sec1}) \times N_{prim} + (GER_{sec1} - GER_{sec2}) \times (N_{prim} + N_{sec1}) + (GER_{sec2} - GER_{he}) \times (N_{prim} + N_{sec1} + N_{sec2}) + GER_{he} \times (N_{prim} + N_{sec1} + N_{sec2} + N_{he})]$$

$$SLE_{GER} = GER_{prim} \times N_{prim} + GER_{sec1} \times N_{sec1} + GER_{sec2} \times N_{sec2} + GER_{he} \times N_{he}$$

where SLE is the school life expectancy and N_{prim}, N_{sec1}, N_{sec2}, N_{he}, represent the number of years of study in the different cycles (primary, 1st cycle secondary, 2nd cycle secondary and higher education).

Unfortunately, this method suffers from the same drawbacks as those affecting the GER. Just as the GER are artificially inflated by the fact that school year repeaters are counted twice (spending two years in the system for just one year of successfully completed education, see Annex 2.3, then calculations of school-life expectancy using the GER will be similarly affected. In order to correct the effect that repeated school years have on the calculations, it seems appropriate to use a derivative indicator instead of the GER for calculating school-life expectancy. This derivative indicator: a corrected form of the GER that does not include repeated school years, shall be referred to as the Average Enrolment Rate (AER). It can be considered to be the gross enrolment rate minus the repeaters and is calculated for each educational cycle in the following way:

$$AER = \frac{\textit{Non-repeaters}}{\textit{Total population eligible for schooling in the cycle}} = \frac{\textit{Number of pupils - Repeaters}}{\textit{Total population eligible for schooling in the cycle}}$$

$$AER = \frac{\textit{Number of pupils x (1 - \%rep)}}{\textit{Total population eligible for schooling in the cycle}} = GER \times (1 - \%rep)$$

where %rep represents the percentage of repeaters out of the total number of pupils enrolled.

School-life expectancy, without the influence of school year repeaters (as for the original method using the schooling profile) is now calculated in the following way:

$$SLE_{AER} = [(AER_{prim} - AER_{sec1}) \times N_{prim} + (AER_{sec1} - AER_{sec2}) \times (N_{prim} + N_{sec1}) + (AER_{sec2} - AER_{he}) \times (N_{prim} + N_{sec1} + N_{sec2}) + AER_{he} \times (N_{prim} + N_{sec1} + N_{sec2} + N_{he})]$$

$$SLE_{AER} = AER_{prim} \times N_{prim} + AER_{sec1} \times N_{sec1} + AER_{sec2} \times N_{sec2} + AER_{he} \times N_{he}$$

The calculations carried out for countries where schooling profiles are available show that the method using the average enrolment rate gives a very good estimate of school-life expectancy. The differences between the profile method and the average enrolment rate method are not statistically significant.

ANNEX 2.3: MEASURING PROGRESS TOWARDS UNIVERSAL PRIMARY EDUCATION

Source: Abstract from Methodological Note N°1: Measuring the Progress Towards Universal Primary Schooling, Pôle de Dakar, 2004

In April 2000, during the World Education Forum in Dakar, the international community pledged its commitment to take the necessary measures to give all children the opportunity to benefit from a complete programme of primary education by 2015. Such an objective requires that everyone involved has the means to measure the progress made on a regular basis so they can target the problems more effectively and identify the measures that need to be taken in order to bring about improvements. It is thus a question of having a proper understanding of the indicators that are used to obtain a quantitative description of educational coverage, so that mistakes are not made when evaluating the situation in a given country in relation to the stated objective.
The objective of this section is to define certain key indicators of the coverage of an education system, and to specify how they can be interpreted. After examining theoretical examples and real situations, it appears that the rate of access into the last year of primary education (often called the completion rate) is the best indicator for measuring quantitative progress towards the Dakar objective.

1. PROBLEMS WITH USING THE AVERAGE

1.1 Gross Enrolment Ratio (GER)

For a given year, the gross primary enrolment ratio is the ratio between the **numbers of pupils enrolled** in a given year and the total **school-age population** for this year.

● Definition 1

Gross enrolment ratio
The gross enrolment ratio for a particular cycle of education in a given year *t* can be represented by the formula:

$$GER_t = \frac{PE_t}{SAP_t}$$

where: GER_t = *gross enrolment ratio (GER) for a given year*
PE_t = *number of pupils enrolled for a given year*
SAP_t = *school-age population for a given year.*

The GER shows the capacity to accommodate pupils. It describes the extent to which the country is capable of accommodating the numbers of pupils that it should be able to educate in its schools, taking account of the demographic context. Therefore, a GER of 100% means that the country has the physical capacity to provide education for the whole of its school-age population.

When calculating the GER, all the **children enrolled** in the school are taken into consideration, including newly enrolled pupils and those who have to repeat a year, regardless of whether or not these pupils are of official school age. Because of this, a positive change in GER can be due to an increase in simply the number of students repeating and not necessarily due to an increase in the enrolment rate of the school-age population.

● Observation 1

GER and the percentage of pupils who repeat a school year

If NE_t = the total number of newly enrolled pupils and R_t = the total number of pupils who repeat a school year, then $PE_t = NE_t + R_t$. Consequently

$GER_t = \frac{NE_t}{SAP_t} \times \frac{1}{1- PR_t}$ with $PR_t = \frac{R_t}{PE_t}$ being the percentage of school year repeaters for the whole of the cycle.

The GER overestimates a country's educational coverage

Table 1 illustrates two theoretical examples of enrolment in primary school and the impact of these different examples on the calculation of the GER over several consecutive years.

TABLE A2.1 - What is taken into consideration for the consecutive calculations of the GER?

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Pupil 1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6			
Pupil 2	Year 1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 5	Year 6	Year 6

Pupil 1 poses no problems, as after starting primary school in 1996, he/she finishes the cycle in 2001 without repeating a year. He/she therefore accounts for six years in the calculation of the GER, which corresponds to the number of school years they have officially completed. Pupil 2, however, accounts for nine consecutive years in the calculation of the GER because they have repeated several years from 1996 to 2004. Because they are counted twice, pupil 2 and all the other school year repeaters have the effect of artificially inflating the level of the GER.

1.2 The Net Enrolment Ratio (NER)

For a given year, the net primary enrolment ratio is the relationship between the number of pupils of official school age who are enrolled and the total school-age population for this year.

● Definition 2

Net enrolment ratio

The net enrolment ratio for a given year t can be defined by the following formula:

$$NER_t = \frac{PSAE_t}{SAP_t}$$

where: NER_t *= net enrolment ratio (NER) for a given year*
$PSAE_t$ *= number of pupils of official school age enrolled for a given year*
SAP_t *= school-age population for a given year*

The NER is an indicator of **participation**: it shows what proportion of the official school-age population is actually enrolled in school.

The major disadvantage of this indicator is that it only accounts for the education of those **children who are within the official age-range for schooling**, thus excluding all the children who enter the system either after or before the official age. This can be accompanied by errors of measurement due to a lack of accuracy concerning the real ages of the pupils: in certain African countries, it is common practice to change the ages of children on the civil status register.

Table 2 illustrates the cases of three children who could attend the primary education cycle at different ages, in a country where the theoretical age for attending the cycle is 6 – 11 years.

TABLE A2.2 - Theoretical illustration of the extent of the age range possible for pupils attending the primary cycle

Ages	5	6	7	8	9	10	11	12	13	14	15	16
Pupil 1		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6					
Pupil 2	**Year 1**	Year 2	Year 3	Year 4	Year 5	Year 6						
Pupil 3						Year 1	Year 2	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**

Key
- not accounted for when calculating the NER
- accounted for when calculating the NER

What effects do these different ages for starting and finishing the cycle have on the calculation of the NER?

- For pupil 1, there is no problem: entering Year 1 at the official age of entry (6 years) and leaving the cycle at 11 years of age without ever repeating a year, this pupil will therefore be included in the calculation of the NER throughout his or her schooling.

- Pupil 2 also completes the educational cycle without interruption but starts attending school before the official age. The calculation of the NER will not take this pupil into account during Year 1, because at the time he or she is only 5 years age (and not 6).

- The final example concerns the case of a pupil who starts school at 10 years of age (a very common occurrence in Africa), and also has the misfortune of having to repeat a year. He or she thus leaves the cycle five years after the official leaving age and more than two thirds of his or her education will not be accounted for in the calculation of the NER.

Therefore, the NER underestimates educational coverage: it does not take into account the whole or a part of the schooling of individuals who enter the system too early or too late and/or who have to repeat one or more classes, **even if they eventually complete all six years of the primary education cycle. In the example presented, while all three pupils successfully achieve the Dakar objective, only one of them is included in the calculation of the NER throughout the entire duration of his or her schooling.**

Thus, this indicator cannot be regarded as an indicator of universal primary schooling, as the Dakar objective requires that all children complete the entire cycle of primary schooling irrespective of their age. The children who are outside the official age of attendance should therefore not be omitted.

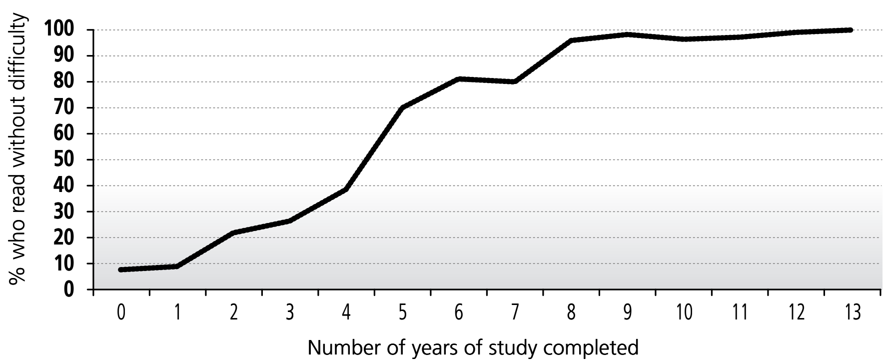
Lastly, the GER and the NER have the disadvantage of giving an average value over the whole of the cycle, and are not suited to describing the school lives of individual pupils. However, such a description appears to be of paramount importance: indeed, in addition to measuring the proportion of children who start school (access), it is important to be able to measure the proportion of pupils who stay there until the end (retention). Access to this information concerning the problems of access and retention in the education system will enable planners to adapt their political approaches accordingly.

Thus, it is necessary to have recourse to a specific indicator.

2. THE NEEDS FOR CAPTURING COMPLETION

The objective of universal primary schooling requires that all children complete a full cycle of primary education. Certain studies, especially those using data from household surveys, show that on average, a bare minimum of six years of schooling is essential if a person is to acquire a permanent level of literacy (see Figure A2.1).

FIGURE A2.1 - Cameroon – proportion of 22-44 year-olds able to read without difficulty in relation to the number of years of study completed



Source: Cameroon, data from MICS 2000 survey.

2.1 Schooling profiles

A schooling profile for a cycle of primary education is given by the series of the **access rates** to the different classes in the cycle. This indicator is calculated in relation to one or more **reference populations**, for whom the aim is to measure their access to the different classes.

The first point of the profile is the **apparent intake rate (AIR)** (the ratio between the number of new entrants in the first year of primary education and the total population of children who are of official primary school entrance age). The last point of the profile is **the access rate to the last year of the cycle:** the proportion of a given cohort of children reaching the final year of primary school. It is possible to use three complementary methods of calculation to obtain different types of indicators:

- **The longitudinal method** makes it possible to describe the progression through school of the cohort to which the children who are currently enrolled in the last year of the cycle belong, as it provides the access rates to each of the classes during the course of the past cycle;

- **The cross section method** provides information about current access rates with reference to the total populations of children in the age groups eligible to attend each of the classes in the cycle;

- **The pseudo longitudinal method** (or zigzag method) gives an illustration of the predicted access rates for the children who have just started school, based on the current patterns of progression between the classes.

● Definition 3

Schooling profiles

A primary education cycle is considered to be of duration τ. $NE_{j,t}$ is the number of newly enrolled pupils in class *j* for year *t*; $P_{a(j),t}$ represents the total population of the official age to attend class *j*, for year *t*.

- **The longitudinal profile** is given by the series of the access rates $(AR_{j,t-\tau+j}^{Long})_{j=1,\dots,\tau}$

where $AR_{j,t-\tau+j}^{Long} = \dfrac{NE_{j,t-\tau+j}}{P_{a(1),t-\tau+1}}$;

- **The cross section profile** is given by the series of the access rates $(AR_{j,t}^{CS})_{j=1,\dots,\tau}$

where $AR_{j,t}^{CS} = \dfrac{NE_{j,t}}{P_{a(j),t}}$;

- **The pseudo longitudinal profile (or zigzag)** is given by the series of the access rates $(AR_{j,t}^{ZZ})_{j=1,\dots,\tau}$

where $AR_{1,t}^{ZZ} = AIR_t = \dfrac{NE_{1,t}}{P_{a(1),t}}$ and $AR_{j,t}^{ZZ} = AIR_t \times \prod_{1<h\leq j} \dfrac{NE_{h,t}}{NE_{h-1,t-1}}$, $\forall j = 2,3\dots,\tau$.

Whatever method is used, and thus for any of the populations considered, the profile makes it possible to view the progress through school of one or more cohorts of children. Firstly, the access rate can be ascertained by measuring the intake to the primary cycle against the total population that is officially eligible to start primary school. In addition, the subsequent access rates to the different classes in the cycle can be used to provide information about the size of the dropout rate during the course of the cycle.

Lastly, these profiles have the advantage that their measurements are not affected by pupils repeating a year, which frees this category of indicators from the bias that the rate of repeating school years can introduce into measurements of school enrolment. In this case, the children's progress through school is recorded in terms of years actually completed, with no account taken of repeated years.

2.2 Using the access rate in the final year as the Primary Completion Rate (PCR)

The final point of the profile can be viewed as an indicator of completion of primary education. Just as the three methods used in the calculation of a profile needs to be interpretated in three different ways, the access rates in the final year that are calculated by the three different methods are three different indicators. The longitudinal method gives the completion rate of pupils who began the cycle a few years earlier, taking into account the conditions of progression between each class observed. The cross section method provides roughly the same indicator, calculated with reference to the total population that is currently of the official age for attending the final year. As for the zigzag method, it allows us to have an idea of what the completion rate for the cycle might be in several years' time, taking account of the apparent intake rate and the current conditions of progression between each class.

It is certainly true that there are problems with using the access rate in the final year as a measure of completion because this indicator only gives us information about the number of pupils who enrol for the final year. It is implicitly supposed that there is very little student mortality in the final year of primary education. In spite of this limitation, it represents the only credible and widely available source of information, giving a snapshot of the enrolment at a particular moment in the final year of school.

The access rate in the final year as calculated by the cross section method is the indicator retained within the Global Partnership for Education for the measurement of the progress made towards universal primary schooling.

2.3 Why not use the pass rates in national examinations as measures of completion?

There are several disadvantages to using this measurement. First of all, it supposes that a diploma is the only valid outcome of an educational cycle. Thus, a pupil who does not manage to obtain the primary school-leaving certificate could consider that he or she has not completed a full cycle of primary education! In addition, the results in national examinations are strongly dependent on the methods used for marking/evaluation. They cannot be regarded as an internationally comparable measurement of the pupils' real achievement, as the examination is sometimes used as a means of regulating the number of pupils who advance to the next cycle.

3. WHAT ARE THE POSSIBLE ERRORS? A THEORETICAL EXAMPLE

The objective of universal primary schooling requires that the correct indicator is chosen for measuring the progress made towards the 2015 objective. The NER clearly appears to be out of the question, as it only focuses on the education of pupils who are of school age, and therefore omits a considerable number of children, even if they successfully complete a full cycle of primary education. Therefore, can the GER be used as a primary indicator of enrolment and retention? The answer is no, because situations which differ considerably in terms of access, retention, completion and repetition of school years can give the same value for the GER.

The same GER value can be arrived at for situations that are very different in terms of access, retention and repetition of school years.

● Observation 2

An interesting comparison

Going back to the findings of Observation 1, we arrive at:

$$GER_t = \frac{NE_t}{SAP_t} \times \frac{1}{1 - PR_t}$$

However, $NE_t = \sum_{j=1}^{\tau} NE_{j,t} = \tau \times \overline{NE_{.,t}}$ and $SAP_t = \sum_{j=1}^{\tau} P_{a(j),t} = \tau \times \overline{P_{.,t}}$, *where* $\overline{NE_{.,t}}$ refers to the average of the number of new entrants to each year of the cycle and $\overline{P_{.,t}}$ refers to the average of school-age population for each year of the cycle.

We can therefore rewrite the GER in the following way: $GER_t = \frac{\overline{NE_{.,t}}}{\overline{P_{.,t}}} \times \frac{1}{1 - PR_t}$

Furthermore, if we consider that there is a reasonably regular pupil dropout rate throughout the course of the cycle, we can write: $\overline{NE_{.,t}} \approx \frac{NE_{1,t} + NE_{\tau,t}}{2}$.

Therefore, we can consider that: $GER_t \approx \frac{1}{2} \times \frac{NE_{1,t} + NE_{\tau,t}}{\overline{P_{.,t}}} \times \frac{1}{1 - PR_t}$

Given that $\frac{NE_{1,t}}{\overline{P_{.,t}}} \approx \frac{NE_{1,t}}{P_{a(1),t}} = AIR_t$, the apparent intake rate for year t,

and $\frac{NE_{\tau,t}}{\overline{P_{.,t}}} \approx \frac{NE_{\tau,t}}{P_{a(\tau),t}} = PCR_t = AR_{\tau,t}^{CS}$ the access rate in the final grade of primary school (completion rate) calculated for year t using the cross section method, we arrive at the following relationship :

$$GER_t \approx \frac{AIR_t + PCR_t}{2} \times \frac{1}{1 - PR_t}$$

As Observation 2 shows, the GER is greater when

- the apparent intake rate is high,
- the primary completion rate is high
- **a high proportion of pupils repeat a school year!**

This is illustrated by the three theoretical cases shown in Table 3.

TABLE A2.3 - Theoretical cases showing Apparent Intake Rate, Primary Completion Rate, Percentage of Repeaters, and Gross Enrolment Ratio

	GER	AIR	PCR	PR
Case 1	**100**	100	100	0
Case 2	**100**	95	55	25
Case 3	**100**	60	60	40

The first "ideal" case shows a system with no problems: 100 percent access, perfect retention and no repetition of school years. The GER is 100 percent. In the second case, the GER is also 100 percent: but while access is relatively good, there is a big problem with regard to retention, since there is a PCR of only 55 percent. The value of the GER is artificially inflated by the fact that high numbers of pupils repeat school years. In the final case, the system is characterised by poor access and good retention (all of the children who start school remain there until the end) but, with a disproportionately high rate of repetition, the GER is also 100 percent!

Therefore, the GER alone cannot provide an overall measure of educational coverage, as it does not reveal the problems relating to access and retention. **Countries striving to achieve the Dakar objectives, in particular universal primary schooling, which was identified as one of the millennium objectives, may find it beneficial to use the PCR rather than the GER.**

ANNEX 2.4: THE SCHOOLING PROFILES

Source: Abstract from Methodological Note N°2: How to Elaborate and Interpret Schooling Profiles, Pôle de Dakar, 2004

In the category of educational coverage indicators, schooling profiles have the advantage of providing information that goes beyond a simple average figure taken over the whole of an educational cycle. These profiles make it possible to summarise the state of coverage by providing a "picture" of access at the beginning of a cycle and retention during the course of the cycle, thus providing information that is fundamentally important for a precise analysis of the state of educational provision. In the following sections, we propose to illustrate the concept of schooling profiles by describing the different methods of calculation that are possible, and how the corresponding results can be interpreted, taking account of the advantages and disadvantages of using different sources of data.

1. GENERAL

1.1 Definitions

A schooling profile for a particular cycle of education results from the **access rates** to the various grades in this cycle. This indicator is calculated in relation to one or more **reference populations**, cohorts of births for whom the aim is to measure their access to the different classes.

The first point of the profile is the **apparent intake rate (AIR)**, defined as the ratio between the number of new entrants (or pupils who are not repeating a school year) in the first grade of the cycle and the population of the children who are of the official age to enter this cycle. Its calculation is **invariant**, whatever method is used.

The final point of the profile is the **access rate to the final grade of the cycle** (often called **completion rate**), which is the proportion of a given cohort of children reaching the final grade

All the points in between are the **access rates** to the different grades, which for each grade measure the extent of the educational system's coverage in relation to the total population of children for which it should be able to provide education at these different levels.

• Notations

A school cycle is considered to be of duration $\tau \in N^+$
The school year *t-1/t* is simply noted as year t.

For year *t* and grade *j*, the following can be noted:

- $NE_{j,t}$ number of new entrants (or pupils who are not repeating);
- $PE_{j,t}$ total number of pupils educated;
- $R_{j,t}$ total number of pupils who repeat a grade, defined by; $PE_{j,t} - NE_{j,t}$
- $\%R_{j,t}$ percentage of repeaters, defined as the ratio $\frac{R_{j,t}}{PE_{j,t}}$
- $a(j)$ theoretical age of attendance;
- $P_{a(j),t}$ total population of children having the theoretical age of attendance;
- $AR_{j,t}$ access rate to the grade.

Three distinct methods can be used to construct a schooling profile. Each one produces a specific interpretation indicator, referring to one or more different cohorts of children.

● Definition

Schooling profile

A schooling profile is defined as the series of the access rates to the different grades. $(AR_{j,t})_{j=1,\dots,\tau}$

Some of these methods call upon the concept of the effective promotion rate, defined for any given year and any given class as the ratio between the new entrants to the class in the current year and the new entrants to the preceding class in the preceding year.

● Definition

Effective promotion rate

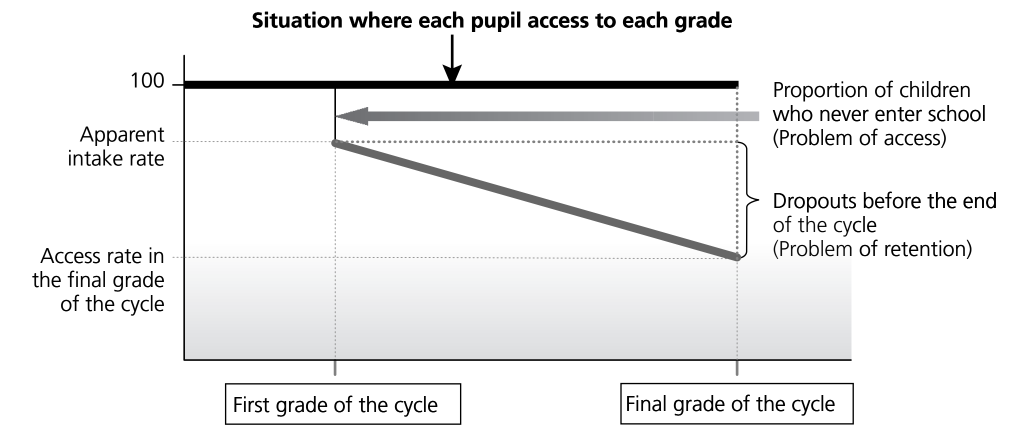
The effective promotion rate to grade *j* in year *t* ($EPR_{j,t}$) is defined by: $EPR_{j,t} = \frac{NE_{j,t}}{NE_{j-1,t-1}}$, $\forall j = 2,\dots,\tau$

Such a rate, being based only on the new entrants from one grade to another, gives an approximation of the proportion of children in a given class who will **one day** reach the next one.

1.2 Why is a profile useful?

Each grade has a corresponding access rate: therefore, it is easy to give a graphical representation of the series of points obtained. Indeed, a chart is the clearest way of summarizing the information contained within a profile. As shown in Figure A2.2, the resulting representation makes it possible to view the level of schooling for each grade. Furthermore, by seeing the numbers of pupils who never enter school and the proportion of children who, after starting school drop out before the end, one also has access to information that is fundamentally important to the issue of access/retention.

FIGURE A2.2 - Schooling profile chart



2. CHOOSING METHODS OF CALCULATION FOR EACH TYPE OF INDICATOR

Let us consider a primary cycle of six years' duration for which the following educational statistics are available: **new entrants by grade (pupils who are not repeaters), in thousands.**

Years School	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
1999	170					
2000		168				
2001			165			
2002				165		
2003	**190**	**185**	**180**	**175**	**163**	155
2004	**200**	**185**	**182**	**178**	**173**	**160**

The theoretical age range for attending this cycle is 6-11 years and in addition, we have the following data concerning the population per age group (in thousands of children).

Years	6 Years	7 Years	8 Years	9 Years	10 Years	11 Years
1999	249					
2004	***250***	248	245	243	240	235

Taking this information into account, we can calculate three different indicators, thus allowing three different questions to be answered.

2.1 What were the access rates to the different grades for pupils currently at the end of the cycle?

Such a question leads us to follow the progress through school of the cohort of children who were of the official age to enter school six years earlier and to examine the reference population's access rate to each grade throughout the past cycle. **For this, the cohort method (also called longitudinal method, see Annex 2.3) is used.**

In our example the data needed for applying this method is underlined in the two tables above.

● Definition

Cohort schooling profile (or longitudinal profile, see Annex 2.3)
The cohort profile for date t is defined by the series of the access rates to the different grades in the cycle $(AR^{C}_{j,t-\tau+j})_{j=1,\dots,\tau}$ where

$$AR^{C}_{j,t-\tau+j} = \frac{NE_{j,t-\tau+j}}{P_{a(1),t-\tau+1}}, \ \forall j = 1,\dots,\tau$$

The reference population is the total population of children who were 6 years old in 1999 ($P_{6,1999}$), and therefore of the official age to attend the first grade of primary school in that year, i.e. 249,000 children.

The apparent intake rate is calculated by dividing the total number of new entrants to grade 1 **six years ago** ($NE_{1,1999}$) by the total population of the official age to attend grade 1

$$AR^{C}_{1,t-\tau+j} = AIR_{1999} = \frac{NE_{1,1999}}{P_{6,1999}} = \frac{170}{249}$$

The following points of the profile are obtained by dividing the number of new entrants to each grade by this same population. For example, the access rate to grade 4 in 2002 ($AR^{C}_{4,2002}$) is calculated by dividing the number of new entrants to grade 4 in 2002 ($NE_{4,2002}$) by the reference population.

$$AR^{C}_{4,2002} = \frac{NE_{4,2002}}{P_{6,1999}} = \frac{165}{249}$$

Thus, out of the 249 000 children who should have entered grade 1 in 1999, there were only 165,000 new entrants to grade 4 in 2002, i.e., **a 66 percent access rate to grade 4.**

Consequently, the cohort schooling profile for pupils enrolled in the final grade in 2004 is given by the following series of access rates to the different grades:

$AR^{C}_{1,1999}$	$AR^{C}_{2,2000}$	$AR^{C}_{3,2001}$	$AR^{C}_{4,2002}$	$AR^{C}_{5,2003}$	$AR^{C}_{6,2004}$
$\frac{170}{249} = 68\%$	$\frac{168}{249} = 67\%$	$\frac{165}{249} = 66\%$	$\frac{165}{249} = 66\%$	$\frac{163}{249} = 65\%$	$\frac{160}{249} = 64\%$

For each grade in the primary education cycle, each point of the profile calculated in this way represents the proportion of pupils in a given cohort who eventually gained access to the grade in question. We therefore have access to the most accurate information possible for the pupils who finish the cycle in 2004.

At this stage, one notices that each access rate is actually obtained by multiplying the intake rate by the effective promotion rate noted in the series for each year until the particular year for which it is being calculated.

For example, the effective promotion rate to grade 2 in 2000 ($EPR_{2,2000}$) is the ratio between the new entrants to grade 2 in 2000 (168 000) and the new entrants to grade 1 in 1999 (170 000). With reference to the apparent intake rate for the series (AIR_{1999}), we arrive at the access rate to grade 2 in 2000 as calculated by the cohort method.

$$AIR_{1999} \times EPR_{2,2000} = \frac{NE_{1,1999}}{P_{6,1999}} \times \frac{NE_{1,2000}}{NE_{1,1999}} = \frac{170}{249} \times \frac{168}{170} = \frac{168}{249} = \frac{NE_{2,2000}}{P_{6,1999}} = AR^{C}_{2,2000}$$

● Observation

Relationship between the cohort profile and the effective promotion rate

$$AR^{C}_{j,t-\tau+j} = \frac{NE_{j,t-\tau+j}}{P_{a(1),t-\tau+1}} = \frac{NE_{1,t-\tau+1}}{P_{a(1),t-\tau+1}} \times \prod_{1<h\leq j} \frac{NE_{h,t-\tau+h}}{NE_{h-1,t-\tau+h-1}} = AIR_{t-\tau+1} \times \prod_{1<h\leq j} EPR_{h,t-\tau+h}, \forall j = 2,\ldots,\tau$$

There are two disadvantages associated with the cohort method. Firstly, even if the results are largely independent of demographic data, they are strongly dependent on the quality of enrolment data, because it is necessary to have access to enrolment statistics over a long period (six years). Secondly, the access rates calculated for the first grades of the cycle are relatively old: thus, with regard to access as well as retention, one does not have the most up to date snapshot of the state of the school system (the apparent intake rate for a series ending in 2004 relies on enrolment and demographic data going back to 1999!)

2.2 What are the current access rates to the different grades?

The cross section (also called transverse, see annex 2.3) method allows us to answer this question. **If we consider the most recent year for which enrolment and demographic data are available**, we compare the current number of new entrants into each grade with the total population of children who are of the theoretical age to attend that grade.

In our example, the data needed for the implementation of this method is in the highlighted cells of the tables above.

● Definition

The cross section (or transverse) profile

The cross section schooling profile for a given year t is defined by the series of the access rates to the different grades in the cycle $(AR^{CS}_{j,t})_{j=1,\dots,\tau}$ where:

$$AR^{CS}_{j,t} = \frac{NE_{j,t}}{P_{a(j),t}}$$

Here there is not one but several reference populations, which are the total populations of children who are officially of the age to attend each of the grades of the cycle in 2004: the population of 6 year-olds in 2004 for attending grade 1, the population of 7 year-olds in 2004 for attending grade 2, etc.

First, we calculate the apparent intake rate for 2004. Then we divide the number of new entrants to grade 1 in 2004 ($NE_{1,2004}$) i.e., 200 000 pupils, by the population of children who are theoretically of the age for attending grade 1 in this same year ($P_{6,2004}$), i.e., 250 000 children:

$$AIR_{2004} = AR^{CS}_{1,2004} = \frac{NE_{1,2004}}{P_{6,2004}} = \frac{200}{250}$$

The access rates to the following grades are then obtained using the same calculation formula. For example, the access rate to grade 4 for 2004 is calculated by comparing the number of new entrants to grade 4 in 2004 ($NE_{4,2004}$) with the population of children who are of the official age for attending grade 4 in this same year, i.e. the population of children who are 9 years old in 2004 ($P_{9,2004}$).

$$AR^{CS}_{4,2004} = \frac{NE_{4,2004}}{P_{9,2004}} = \frac{178}{243}$$

For the 2004 academic year, the following cross section profile is obtained[95]:

AIR_{2004}	$AR^{CS}_{2,2004}$	$AR^{CS}_{3,2004}$	$AR^{CS}_{4,2004}$	$AR^{CS}_{5,2004}$	$AR^{CS}_{6,2004}$
$\frac{200}{250} = 80\%$	$\frac{185}{248} = 75\%$	$\frac{182}{245} = 74\%$	$\frac{178}{243} = 73\%$	$\frac{173}{240} = 72\%$	$\frac{160}{235} = 68\%$

In this way and for each grade, we can calculate the proportion of new entrants in relation to the entire population of children who are of the age to attend this grade (i.e., that the education system should be able to accommodate for this level of education). This method thus provides a **snapshot** of the current level of access to each grade in the cycle.

However, this method mixes cohorts of different pupils: therefore, the resulting profile does not trace the progress through school of the same pupils. In addition, it requires the use of both enrolment statistics and population data. Thus, this method is used when there is a reasonable degree of confidence in the demographic data. If there are found to be repeated examples of projections based on old and/or non-corrected data, we can resort to using the cross section method after correction of the demographic base by appropriate techniques (smoothing for example, see annex 1.1).

2.3 How do we predict the progress through school of the new entrants to the cycle?

We can use the current access rate to grade 1 and the most recent information regarding promotion to the different classes in an attempt to evaluate the future access rates to the different grades in the cycle for the population of children who are currently of the official age for starting school. A schooling profile can then be constructed using the pseudo cohort (or pseudo longitudinal) or zigzag method. Starting from the observation of the effective promotion rates for the two most recent academic years, we can examine what the survival rates might be like for the new entrants to the school.

In our example, the information necessary for the implementation of this method is shown by the data in **bold type** in the two tables above.

● Definition

The pseudo cohort (or pseudo longitudinal) or zig zag schooling profile

The pseudo cohort profile for date t is defined by the series of access rates to the different grades.

$(AR^{ZZ}_{j,t})_{j=1,\dots,\tau}$ where $AR^{ZZ}_{1,t} = AIR_t = \frac{NE_{1,t}}{P_{a(1),t}}$ and $AR^{ZZ}_{j,t} = AIR_t \times \prod_{1<h\leq j} \frac{NE_{h,t}}{NE_{h-1,t-1}}$

The reference population is made up of children who are of the official age to enter school in the most recent school year to date i.e. the population of 6 year-olds in 2004 ($P_{6,2004}$).

For the most recent year, the apparent intake rate is calculated by dividing the number of new entrants into grade 1 by the total reference population:

$$AIR_{2004} = AR^{ZZ}_{1,2004} = \frac{200}{250} = 80\%$$

The next step is to calculate the effective promotion rates to the two school years under consideration. For example, the promotion rate to grade 4 in 2004 (noted as $EPR_{2,2000}$) will be obtained by dividing the new entrants to grade 4 in 2004 (178 000) by the number of new entrants to grade 3 in 2003 (180 000). Therefore, for our example, the series of promotion rates is as follows :

$EPR_{2,2004}$	$EPR_{3,2004}$	$EPR_{4,2004}$	$EPR_{5,2004}$	$EPR_{6,2004}$
$\frac{185}{190} = 97\%$	$\frac{182}{185} = 98\%$	$\frac{178}{180} = 99\%$	$\frac{173}{175} = 99\%$	$\frac{160}{163} = 98\%$

Following this, each access rate is calculated by multiplying the apparent intake rate by the series of effective promotion rates for each grade up to the grade in question.

AIR_{2004}	$AR^{ZZ}_{2,2004}$	$AR^{ZZ}_{3,2004}$	$AR^{ZZ}_{4,2004}$	$AR^{ZZ}_{5,2004}$	$AR^{ZZ}_{6,2004}$
$\frac{200}{250} = 80\%$	80%x97% = 78%	80%x97%x98% = 77%	80%x97%x98% x99% = 76%	80%x97%x98% x99%x99% = 75%	80%x97%x98%x99% x99%x98%= 74%

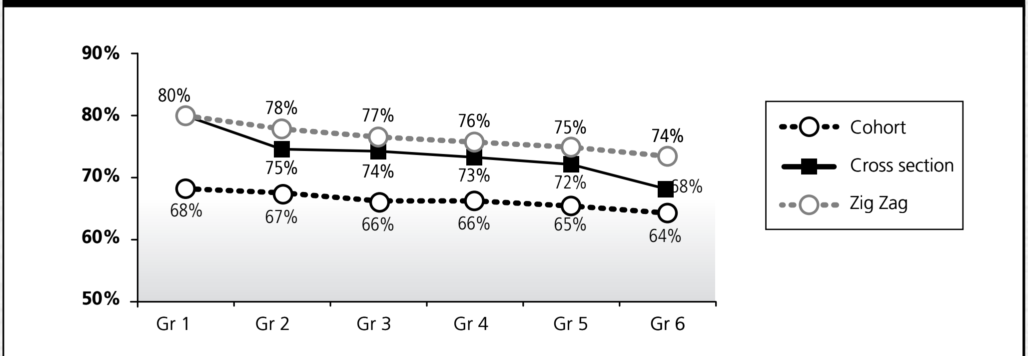
The access rate to the first grade is the one that is observed for the current year. The access rate to the second grade is the rate that might exist in one year's time, if the conditions for progression between grade 1 and grade 2 remain unchanged. By successive iterations, the access rate to grade 6 is the proportion of children who will reach the end of the primary education cycle **in five years' time**, if the conditions of progression between the grades remain stable. This measure is therefore an estimate of the access in the final grade, taking into account the current promotion rates.
The method of calculation used is identical to that used for the cohort method, except for the fact that only two consecutive academic years are used. This allows us to have a prospective view of the progress through school of the children who have just entered the cycle, showing how the current educational conditions could influence the probable levels of access and retention in the future. Therefore, the access rate at the end of the primary cycle does not refer to the current situation, but rather to what could be observed in five years' time, if the conditions for promotion remain unchanged. It should also be noted that, as for the cohort method, this method only uses demographic data in the calculation of the first point of the profile.

3. SPECIAL REMARKS

3.1 Complementarity of the methods

Each method provides a specific indicator. Therefore, these methods are not interchangeable, as illustrated in figure A2.3.

FIGURE A2.3 -Illustration of the results obtained by the three methods of calculation



However, it should be noted that the apparent intake rate is exactly identical for the zigzag and cross section methods:

$$AR_{1,t}^{CS} = AR_{1,t}^{ZZ}$$

This is the current apparent intake rate, reflecting the system's capacity to accommodate pupils in the first grade in relation to the total population that it should be able to accommodate.

The access rate to last grade of the cross section profile is about the same as that obtained by the cohort method. The numerator is the same (new entrants to the last year of the cycle over the most recent year) whereas the reference population is slightly different: for the cohort method, the population of children who were of the official age to enter school 6 years previously is used, whereas the cross section method refers to the population of children who qualify to attend the last grade of school in the current year. The two methods are bound to give very close results, with very little difference between the population of 6 year-olds 6 years ago and the population of 11 year-olds today (apart from adjustments due to death and the balance of migration).

$$AR^{C}_{\tau,t} \approx AR^{C}_{\tau,t}$$

This is the current access rate in the final school year, noted in relation to the cohort of children who are of the official age to attend the final class in the cycle.

3.2 Schooling profiles and survival profiles

Instead of applying the previous methods to the population of children as reference, it is possible to apply them to only those who entered school. Then, the profiles are named survival profiles instead of schooling profiles.

● Definition

Survival profiles
A survival profile for a particular cycle is given by the series of survival rates for the different classes $(SR_{j,t})_{j=1,\dots,\tau}$

The first point of the survival profile is always fixed at 100 percent, as 100 percent of pupils did indeed enter school at a given time in the past! The survival rates are the other points on this profile. These are obtained by multiplying the series of effective promotion rates to each grade, calculated by the cohort or pseudo cohort methods.

Going back to our example, the survival rate for grade 5 in 2004 is obtained by the zig zag method in the following way:

$$SR^{ZZ}_{5,2004} = 100 \times EPR_{2,2004} \times EPR_{3,2004} \times EPR_{4,2004} \times EPR_{5,2004}$$

Although using a survival profile does not provide any information about access to a particular cycle (in reference to a cohort of births), it does, on the other hand, provide information about retention. Therefore, this indicator proves to be very useful, especially when there are doubts about the quality of the demographic data, as it does not need demographic data at all.

● Definition

Cohort survival profile
The cohort survival profile at date t is defined by the series of survival rates for the different school years $(SR^{C}_{j,t-\tau+j})_{j=1,\dots,\tau}$

$$SR^{C}_{j,t-\tau+j} = \frac{NE_{j,t-\tau+j}}{NE_{1,t-\tau+1}}$$

Pseudo cohort survival profile
The pseudo cohort survival profile at date t is defined by the series of survival rates for the different school years $(SR^{ZZ}_{j,t-\tau+j})_{j=2,\dots,\tau}$

$$\underset{1<h\leq j}{SR^{ZZ}_{j,t}} = \prod_{1<h\leq j} \frac{NE_{h,t}}{NE_{h-1,t-1}}$$

CHAPTER 3 ANNEXES

ANNEX 3.1: TECHNICAL NOTE ON THE ADJUSTMENT OF THE SHARE OF RECURRENT EXPENDITURE BY EDUCATION LEVEL ACCORDING TO STANDARD CYCLE DURATIONS

Depending on countries, the duration of primary education usually ranges from four to eight years and secondary education varies from four to seven years. To compare the distribution of expenditure by level of education across countries, it is necessary to recalibrate expenditure data according to each education system's structure. The recalibration is a way of estimating what the distribution of expenditure by level of education would be if each country had the same structure (the most common structure in African countries is often used, of six years of primary and seven years of secondary). For comparative purposes and because fully disaggregated data are not available for all countries, regrouping some subsectors is often necessary. For instance, preschool and literacy can be included with the primary education level, and TVET can be included with secondary education. The calibration is thus performed on the basis of the three main levels of education: primary education, secondary education and higher education.

The calibration consists of assuming proportionality between the cost of a cycle and its length. Assuming a country's primary and secondary education cycles respectively last for *Dp* and *Ds* years, and a country spends *P*, *S* and *H* percent of its education budget on primary, secondary and higher education respectively, if a country's primary cycle is to be calibrated to a referential duration of six years, its expenses would be:

$$P6 = P \times \frac{6}{Dp}$$

Similarly, if a country's secondary cycle is to be calibrated to a referential duration of seven years, its expenses would be:

$$S7 = S \times \frac{7}{Ds}$$

Because these adjusted percentages do not add up to 100 anymore, it is necessary to perform a final step in the calibration. It is important to note that despite the recalibration between primary and secondary, the share of the expenditures spent on higher education remains unchanged. Hence, *P6* and *S7* are recalibrated using the same coefficient, in order for their sum to equal (100% - *H*). Thus, where *P6** and *S7** are the final calibrated percentages for primary and secondary their durations should be in line with the referential durations of six and seven years respectively:

$$P6^* = P6 \times \frac{100\% - H}{P6 + S7} \text{ , and } S7^* = S7 \times \frac{100\% - H}{P6 + S7}$$

The recalibration of the data is summarised in Table A3.1.

TABLE A3.1 - Methodology for Recalibration of the Share of Recurrent Expenditure by Cycle to a 6–7 Years Structure

	Share of Expenses (Non-Calibrated)	**Duration (Years)**	**Estimated Share of Expenses for a 6-7 Years Structure**	**Final Calibrated Share of Expenses**
Primary	*P*	*Dp*	$P6 = P \times \frac{6}{Dp}$	$P6^* = P6 \times \frac{100\%-H}{P6 + S7}$
Secondary	*S*	*Ds*	$S7 = S \times \frac{7}{Ds}$	$S7^* = S7 \times \frac{100\%-H}{P6 + S7}$
Higher	*H*		*H*	*H*
Total	***100 %***		***P6+S7+H (≠100 %)***	***100 %***

ANNEX 3.2: SAMPLE QUESTIONNAIRE TO COLLECT DATA ON INTERNATIONAL AID FROM DEVELOPMENT PARTNERS

Note that the following questionnaire should be adapted to national contexts.

Questionnaire for Technical and Financial Education Partners

Partner: ....

Please provide the following information for each education project or program you support.
Name of the Project/Program: ....
Implementation Type (Executed by your institution, Executed by the government, Budget Support, etc.): ....
Total Amount Committed:..
Period:..

Approximate Distribution of Funding Provided, by Education Level:

Level	Pre-Primary	Primary	General Secondary	TVET	Higher	Non-Formal
Share (%)						

Main Activities:

Area	Planned Amount	Planned Quantities
Pedagogical Material		.... Textbooks .... School Kits
School Construction		.... Classrooms .... Laboratories .... Technical Institutes
Pre-Service Teacher Training		.... Teachers
Capacity Development		
Other :		

Amounts Disbursed:

Year	2007	2008	2009	2010	2011
Amount					

Planned Disbursement Calendar:

Year	2012	2013	2014	2015	2016
Amount					

		School construction		Capacity building		Teacher training		Pedagogical materials		Other :	
Level	**Year**	**Amounts**	**Quantity**	**Amounts**	**Quantity**	**Amounts**	**Quantity**	**Amounts**	**Quantity**	**Amounts**	**Quantity**
Pre-Primary	2012										
	2013										
	2014										
	2015										
	2016										
Primary	2012										
	2013										
	2014										
	2015										
	2016										
General Secondary	2012										
	2013										
	2014										
	2015										
	2016										
TVET	2012										
	2013										
	2014										
	2015										
	2016										
Higher Education	2012										
	2013										
	2014										
	2015										
	2016										
Non-Formal	2012										
	2013										
	2014										
	2015										
	2016										
Total											

ANNEX 3.3 : METHODOLOGY FOR THE CONSOLIDATION OF FINANCIAL DATA

The collection and consolidation of data related to education funding is a complex but necessary task. The analysis requires gathering the expenditure executed for the entire education system on the one hand, and to be able to reconstitute this spending for the different education levels, by type of spending (salaries, operational costs, goods and services, transfers and so on) and by source on the other.

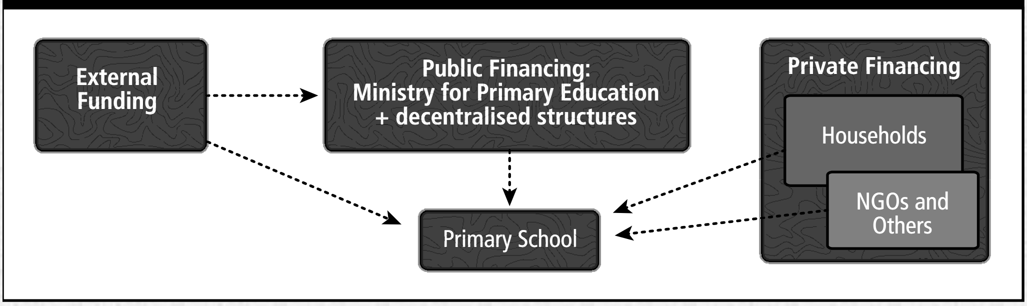
This data does not exist in a format that is ready to use. Indeed, many countries have three or four education ministries, and centralised education information systems are rare. Usually each ministry has its own statistical service. It is also common that a given ministry covers various education levels (preschool, primary and secondary for instance) and that expenditure need to be distributed among these levels. Finally, there are often inconsistencies in given data according to their source.

As a result, before the analysis of education costs and funding, an important process of data collection and consolidation must take place. This technical annex aims to understand the various steps of this process to produce the indicators and financial tables required for the write-up of the chapter on costs and financing.

1. EDUCATION FUNDING FLOWS

The starting point of this process will be to understand and map out the various sources of education funding. In most cases the government (public resources) provides the main source of funding. It is important to remember to include, when they exist, not only the central level but also the decentralised public institutions. Public resources are followed by private resources that may come from families (household spending) or other private entities (NGOs, faith-based organisations and so on). Finally, external funding from development partners may either be provided through the government budget (budget support) or through specific project financing.

FIGURE A3.1 -Illustrative Example of Funding Flows for a Primary School



2. DATA SOURCES

To be able to process and consolidate the financial data, the raw data must first be obtained. They may be obtained from the different divisions of the education ministries (planning and statistics,

TABLE A3.2 - Description of Commonly Available Cost and Funding Documents and Data and their Respective Sources

Data to Collect	Source (According to each Country's Institutions)	Comments
1. Executed / Committed Expenditure for each Education Ministry and decentralised structure	• Administrative and financial departments of each of the education ministries, of other ministries who implement specific vocational trainings and of decentralised services • Database of the finance ministry (in some countries the budget division that consolidates executed/committed ministry expenditure)	In some countries, significant vocational training is provided by ministries other than those in charge of education (for instance, nurse training may be provided by the ministry of health). It is key to include the cost and financing of such training, regardless of the country's institutional arrangements.
2. Number of Personnel and Payroll Data	• Human resource department of each education ministry, providing data on numbers of teaching and non-teaching staff by role and status, and annual salaries • School census database and university files, providing data on teaching and non-teaching staff working in schools/universities • Ministry of finance payroll data, providing information on the monthly salaries of education sector staff • Inspection reports (start and end of school year), providing data on administrative and teaching staff collected by pedagogical divisions of education ministries	It is important to compare the data from different sources and understand any differences. For instance, school databases only include staff working in schools, but not administrative staff working for decentralised services or at the central level. It is also common that ministry of finance payroll data classes administrative staff with teacher status as teaching staff. Community or temporary staff (particularly in universities) are often paid on transfer and subsidy budget lines. It is therefore necessary to estimate their payroll on the basis of data obtained from school databases and university files.
3. External Funding	• Information from development partners (See Annex 3.2 for a sample questionnaire) • International aid data consolidated by the OECD/DAC • Data from the planning ministry or the administration that monitors international aid	In the case of budget support, external funding is included in the government budget
4. Household Spending	• Databases of household and consumption surveys, provided by their operators (often the national statistics institute)	
5. Public Finance and Macroeconomic Data	• Finance ministry for data on government income and expenditure (table of financial operations), GDP, etc. • International Monetary Fund data	

administration and finance, human resources, and pedagogy), from the budget division of the finance ministry, from the ministry of planning or from national statistical institutes (See Table A3.2).

It is also sometimes possible to obtain, directly from the schools, some information on resources and expenses (financial accounts, statistical tables from school census, etc) which allow for a documentation of the resources or subsidies perceived or mobilised locally, and of the use made of these resources.

3. PROCESSING THE EXECUTED EXPENDITURE FILE

The executed/committed expenditure file may assume different forms according to the data available for each country. Table A3.3 is based on the expenditure file of the Ministry of Preschool and Primary

TABLE A3.3 - Example of an Education Ministry's Expenditure File (Abstract), Benin, 2011

Destination (i)		Nature (ii)		Budget (iii) (Thousands)		Classification (iv)		
Code	Title	Code	Title	Allocated	Committed	Level	Nature	Destination
6243004412 00	District Education Office (Borgou)	62992	Various Operational Costs (Government)	13,722	13,676	PS+PE	GS	DS
6242039411 00	Department of Education and Cooperation	6131	Compensation (Government)	4,501	0	PS+PE	TS	ADM
6242039411 00	Department of Education and Cooperation	6499	Other Recurrent Transfers (Government)	65,985	32,985	PS+PE	GS	ADM
6243002412 00	District Education Office (Atacora)	6131	Compensation (Government)	246,744	107,124	PS+PE	TS+NTS	DS
6244003453 00	National Institute for Research in Education	6211	General Supplies (Government)	7,682	3,840	IST	GS	ADM
6242040423 00	Teacher Training School ALLADA	6311	Subsidies to Schools and Universities (Government)	76,100	76,100	SE	SUB	PS
6242008411 00	Department of Exams	6499	Other Recurrent Transfers (Government)	15,268	940	PE	GS	ADM
6240001411 00	Common charges	613292	Remoteness Bonus (Government)	1,677,458	1,677,458	PS+PE	TS	PS
6244005423 00	School canteens	6499	Other Recurrent Transfers (Government)	1,500,000	972,768	PE	CAN	GS
6241001411 00	Minister's office	6111	Basic Salaries (Government)	38,158	0	PS+PE	TS	ADM

Source: Benin CSR, 2012.
Note: Table A3.3 presents a sub-section of the Benin 2010 Ministry of Primary Education expenditure report.

Education of Benin for school year 2010. The procedure followed does however apply to every possible configuration, whether a country has one or several education ministries.

Table A3.3 presents the raw data (in the unshaded cells) by budget line, showing: (i) the code and title of the destination of expenditure; (ii) the code and title of the nature of expenditure; and (iii) the initially allocated budget and the amounts effectively committed.[96] This latter information constitutes a reasonable estimation of executed expenditure.

It is also worthy of note that some expenditure may concern various teaching levels. So although generally there is no ambiguity over the final destination of spending, some budget lines can nevertheless relate to both administrative and pedagogical expenses. This is the case of local education authorities at the regional and provincial level.

On the basis of this data file, the aim is to categorise each budget line according to the following subsections, which has been performed in the shaded cells of Table A3.3 above:

Level of Education	Nature of Expenditure	Destination of Expenditure
PS: Preschool PE: Primary PS+PE: Preschool and Primary* SE: Secondary IST: In-service Training	TS: Teacher Salaries NTS: Non-teacher Salaries TS+NTS: All Salaries GS: Goods and Services LMS: Learning Materials and Supplies CAN: Canteens SUB: Subsidies for Recurrent Costs ** INV: Investments SSS: Scholarships and Other Social Support	PS: Public Schools ADM: Central Administration DS: Decentralised Services, including School Catchment Areas (ADM) DSS: Decentralised Services and Schools ST: Student Teachers

Note: * Breakdown formula is to be defined for EM and EP. ** Breakdown formula to be defined between NTS, GS, LMS and CAN.

Once this codification is completed, a pivot table can be used in Excel to obtain a result similar to that presented in Table A3.4.

TABLE A3.4 - Reclassified Public Expenditure Data, Benin, 2011

Millions of CFAF	Preschool	Primary	Preschool and Primary (To Distribute)
Personnel	**2,753**	**60,687**	
Salaries	2,753	60,687	
Operational Costs	**813**	**17,413**	**1,992**
Goods and Services	456	9,557	**1,992**
Transfers	311	6,902	
Equipment	46	954	
Capital Expenditure	**666**	**14,672**	
National	410	9,029	
International	256	5,643	
TOTAL	***4,232***	***92,772***	***1,992***

Table A3.4 is transitory in that it contains amounts still to be distributed between the education levels. This will be done with the help of a breakdown formula, as described in Box A3.1 below drawn from the Swaziland CSR, 2009.

BOX A3.2
USE OF A BREAKDOWN FORMULA TO DISTRIBUTE ADMINISTRATIVE EXPENDITURE BY LEVEL

A breakdown formula is a set of coefficients for each level, which are applied to the multilevel spending that can be distributed among each of these levels. To illustrate this method, data from the Swaziland CSR, 2009 enable the use of the spending specifically pertaining to each level as the coefficients for the breakdown of funding.

Distribution of Administrative Expenditure by Level, Swaziland, 2009

	Specific Spending by Level (Si)	Initial Shares (Si/TS)	Breakdown Coefficients (Ci)	Multilevel Spending by Level (MSi)	Total Spending by Level (TSi)	Final Shares (TSi/TS)
ECCD	0.1	0.0%	0.0%	0.0	0.1	0.0%
Primary	526.2	35.4%	38.9%	51.7	577.9	38.9%
Lower Secondary	374.9	25.3%	27.7%	36.8	411.7	27.7%
Upper Secondary	138.3	9.3%	10.2%	13.6	151.9	10.2%
TVETSD (Formal)	28.5	1.9%	2.1%	2.8	31.3	2.1%
ABET/TVETSD	7.3	0.5%	0.5%	0.7	8.0	0.5%
Teacher Education	32.8	2.2%	2.4%	3.2	36.0	2.4%
Higher	243.8	16.4%	18.0%	23.9	267.7	18.0%
Other	(MS) 132.7	8.9%	-	-	-	-
Total	**(TS) 1,484.5**	**100.0%**	**100.0%**	**132.7**	**1,484.6**	**100.0%**

Source: CSR Swaziland, 2009, and authors' calculations.

When the specific spending S_i is known for each level *i* as well as the total multilevel spending *MS*, the C_i breakdown coefficients for each level can be obtained by dividing the specific spending S_i for a given level by the total of the different levels' specific spending (which is total spending *TS* minus the multilevel spending *MS*):

$$C_i = \frac{S_i}{TS - MS}$$

The share of multilevel spending pertaining to each level *i* (MS_i) is then equal to the breakdown coefficient C_i applied to the multilevel spending, and the total spending attributable to the level *i* is obtained by adding this share to the level's specific spending:

$$MS_i = C_i \times MS, \text{ and } TS_i = S_i + MS_i$$

When the teaching staff payrolls by level PS_i are known, where *PS* is total payroll spending, the breakdown coefficients will be obtained as follows:

$$C_i = \frac{PS_i}{PS},$$

The share of multilevel spending MS_i attributable to each level *i* and the total spending pertaining to each level will be obtained in the same fashion:

$$MS_i = C_i \times MS, \text{ and } TS_i = S_i + MS_i$$

Finally, this process is repeated for each ministry to reach a consolidated table covering the entire education system, such as in Table A3.5 below.

TABLE A3.5 - Distribution of the Education Sector Recurrent Budget, by Level and Type of Expenditure, Benin, 2010

Millions of CFAF	Salaries					Capital Expenditure	TOTAL
	Salaries	Goods and Services	Equipment	Transfers	Scholarships		
Preschool and Primary	***63,440***	***12,005***	***1,000***	***7,213***		***15,337***	***98,996***
Preschool	2,753	1,253	46	311		666	5,029
Primary	60,687	10,752	954	6,902		14,672	93,967
Secondary and TVET	***41,225***	***4,873***	***1,248***	***636***	***233***	***640***	***48,855***
Lower Secondary	25,690	1,489	761	217			28,157
Upper Secondary	13,049	766	387				14,202
Technical 1	708	748	28	105	206		1,795
Technical 2	1,674	1,771	67	249	27		3,788
Vocational	103	99	4	65			271
Higher	**10,646**	**2,302**	**132**	**5,261**	**8,169**	**582**	**27,093**
TOTAL	**115,312**	**19,179**	**2,381**	**13,110**	**8,402**	**16,560**	**174,944**

4. PROCESSING OF PAYROLL AND PERSONNEL NUMBERS

Usually, the expenditure file does not provide enough information to breakdown staff numbers according to their role, status and respective salaries. Very often a single block of personnel expenditure is isolated from other expenditure. This is where information obtained from the school database, start and end of school year inspection reports, human resource data and payroll data from the finance ministry is useful.

This task is often complex however, in as much as some staff can work at various education levels. For instance, a secondary teacher may have upper and lower secondary classes. Furthermore, in a school offering various levels (lower and upper secondary for example), the director and administrative staff in general effectively work for all the levels offered. Similarly, the central service personnel of the education ministry work for all the levels under the ministry's responsibility.

A methodological approach leading to a reasonable estimation of this disaggregation is therefore necessary. Table A3.6 illustrates the result sought after processing staff number and payroll data. The objective is to be able to establish for each level: (i) the number of staff and their respective payroll burden; (ii) the distribution of teaching ("chalk in hand") and non-teaching staff in schools; and (iii) the distribution of central (ministry level) and decentralised administrative staff. This information is laid out in the table by column.

For each of the mentioned categories, personnel should be distributed according to their status, considering that the different types of status vary from country to country. Typically, they may include: (i) civil servants; (ii) contract staff (under central or local contracts); (iii) temporary staff; and (iv) community staff (teachers paid by families or with government subsidies). These categories are laid out in the lines of the table.

TABLE A3.6 - Table Template for Salary Expenditure and Staff Numbers, by Role, Status and Level

	Number of Staff				Payroll			
	Schools		Administration		Schools		Administration	
	Teachers	Non-Teaching	Central	Decentralised	Teachers	Non-Teaching	Central	Decentralised
Primary								
Civil Servants								
Contract Staff								
Central Contracts								
Local Contracts								
Temporary Staff								
Other								
Lower Secondary								
Civil Servants								
Contract Staff								
Central Contracts								
Local Contracts								
Temporary Staff								
Other								
Upper Secondary								
Etc.								

The methodology used to reach the above distribution of salary expenditure depends on the nature and comprehensiveness of available basic information. In this instance the approach is applied to the public sector, for which the basic required information is available. It is based on the consolidation of personnel numbers by education level on the one hand, and on the elementary available information on salaries effectively paid on the other. This approach requires the use of the following data sources:

Finance Ministries Payroll Data:
- Personnel expenditure/education ministry payroll data; and
- Payroll department database on monthly salaries paid to active education ministry employees.

Education Ministries:
- Human resource departments' personnel data;
- School census data;
- Inspection report data (start and/or end of school year); and
- Data from the administrative and finance departments.

The following rules should be observed in terms of prioritizing data sources:

i. For information on teaching staff ("chalk in hand") and non-teaching staff working in schools (teachers on placement and others) it is advisable to use school census data that is usually provided by the planning division of the education ministry (or its equivalent). Data can be crossed with that in inspection reports to ensure its comprehensiveness. Referential salary data for these staff categories should preferably be obtained from the budget department of the finance ministry or from the education ministry's human resource department;

(ii) For central and decentralised administrative and support staff, the best source of data is the education ministry's human resource department;

(iii) Data on temporary and contract-based staff is available through school census data, university personnel files and the education ministry's human resource division. Their salary data is often available from the division of financial affairs of the education ministry and finance ministry budget data; and

(iv) Data from the payroll department also play a crucial role in the consolidation of payroll data.

An example of this exercise, based on the Central African Republic in 2007 is offered below.

EXAMPLE A3.1 Consolidation of Teaching and Non-Teaching Staff Numbers, by Level, CAR, 2007

The distribution of teaching and non-teaching personnel by education level is here based on three data sources: (i) the Division of Statistics, Planning and School Mapping (DSPCS); (ii) the Human Resources Department, and inspector reports; and (iii) the Payroll Department (ONI database).[97] The consolidation of this data according to the above source priority rules leads to the following result.

TABLE A3.7 - Distribution of Teaching and Non-Teaching Staff by Status and Role, CAR, 2007

	Teachers "Chalk in Hand"				Non-Teaching Staff		
	Civil Servants	Parent Teachers/ Volunteers	Temporary Teachers	Total	Administrative Staff	School Support Staff	Total
Preschool	43	59	0	102	98	17	115
Primary (Basic 1)	2,085	2,482	0	4,567	848	169	1,017
Secondary	399	0	623	1,022	358	76	434
Lower	293	0	197	490	113	24	137
Upper	96	0	104	200	25	7	32
TVET	19	0	17	36	73	36	109
Higher (excluding ENS)	162	0	568	730	64	140	204
Teacher Training for Primary	19	0	17	36	73	36	109
Teacher Training for Secondary	14	0	26	40	6	15	21
Total	**3,111**	**2,541**	**1,535**	**7,187**	**1,912**	**686**	**2,598**

Source: School data (DSPCS), Payroll data (ONI), Human Resource and academic inspections data.

On the basis of consolidated staff numbers, the estimation of the distribution of the payroll burden can be carried out by level.

Processing the ONI Salary Database

The ONI file on monthly salaries paid to education ministry employees includes the following variables: Data Entry Number, Credential Number ("Matricule" in Figure A3.2), Surname ("Nom"), Name ("Prénom"), Grade, Job ("Emploi"), Gross Salary ("Brut") and Net Salary ("Net"). Among these variables, mainly three will be of use in the process of consolidation of the payroll: Grade, Job and Gross Salary.

FIGURE A3.2 - Screenshot of the ONI Database, CAR, 2007

	A	B	C	D	E	F	G	H
1	Ordre_Dep	MATRICULE	NOM	PRENOM	GRADE	EMPLOI	BRUT	NET
2	1	10010H	XXX	GUY EUGENE	ASSISTANTS	CHEF DEPART.(A)	355969	303534
3	2	80753F	XXX	JOEL	CHANCELIER	INSTITUTEUR	121124	107475
4	3	10954V	XXX	DAVID	ADMINISTRATEUR CIVIL ADJC	AGENT DE BUREAU	118728	101980
5	4	12090J	XXX	SIDONIE	INTERPRETE	CHEF DE SERVICE	183000	161030
6	5	12595F	XXX	CHARLES B.	ADMINISTRATEUR CIVIL	POSITION DE STAGE	108324	94675
7	6	84388X	XXX	ANDRE	AGENTS DE L'ENSEIGNEMEN	INSTITUTEUR	73238	64640
8	7	89998R	XXX	JACQUELINE	EMPLOYE DE BUREAU SPEC	AGENT DE BUREAU	66503	61943
9	9	88427D	XXX	SEBASTIEN	MAITRES EPS JEUN SPORTS	MAITRE EDUCAT.PHYS. ET SP	104754	93233
10	10	89313Y	XXX	ALEXIS	ASSISTANTS	ASSISTANT (UNIVERSITE)	315669	244944
11	11	15342Y	XXX	SAMUEL	AGENTS TECHNIQUES DE LA	CHEF DE SERVICE	183000	156640
12	12	20599G	XXX	FRANCOIS	TECHNICIENS D'ART DRAMAT	CHEF DE SERVICE	193300	177352
13	13	20730R	XXX	OMER	ADMINISTATEURS DE PRESS	DIRECTEUR DE SERVICE	312800	287721
14	14	25604F	XXX	ALBERT	ADMIN CIVIL PPAL	ASSISTANT (UNIVERSITE)	352267	284543

The Grade category is the employee's socioprofessional category whereas Job is the effective role or function. This distinction is necessary as some trained teachers are found working as administrative assistants or head of service; as such they do not teach and should be accounted for as non-teaching staff. Many more examples of such staff re-assignments exist.

Processing staff data involves three practical steps:

(i) Use the ONI database to create a pivot table to distribute staff and salary data according to the Job variable;

(ii) In the obtained synthesis table, qualify each Job category as Teaching (Tea), School-based Non-Teaching (Ntea) and central and decentralised services (Serv); and

(iii) Distribute each qualified Job category by education level: central administration, primary, lower secondary, upper secondary, TVET, higher education.

Table A3.8 presents an abstract of the result of this reclassification.

TABLE A3.8 - Status and Number of Education Personnel (Abstract), by Occupation, Gross Salary and Level, CAR, 2007				
Job	**Number**	**Gross Salary (CFAF)**	**Classification**	**Level**
Community Development Officer	1	112,402	Services	Admin
Senior Officer	21	1,877,890	Teachers	Primary
Accounting Assistant	1	419,834	Non Teachers	Higher
Roneo-Typist	6	546,556	Services	Admin
University Lecturer Assistant	49	14,940,340	Teachers	Higher
Sanitation Assistant	2	186,096	Services	Admin
Administrative Attaché	240	25,116,111	Services	Admin
Other Executive staff	57	2,207,805	Services	Admin
Librarian	4	393,312	Non Teachers	Lower Sec./Upper Sec./Higher
Deputy Head Teacher in Secondary	64	12,178,200	Non Teachers	Lower/Upper Secondary
Mail Officer	9	878,264	Services	Admin
Clerks	9	1,000,826	Teachers	TVET

On the basis of the comprehensive version of Table A3.8, a pivot table helps to consolidate the different expense categories by level. When expenses are shared across various levels (such as for lower and upper secondary and higher) a breakdown formula based on the specific payroll burden for each of the levels must be defined, as previously explained.

Finally, it is possible to reach a consolidated distribution of the payroll by level and type of teaching and non-teaching staff.

TABLE A3.9 - Consolidated Payroll (Gross Salary) Data, by Type and Level, CAR, 2007					
Thousands of CFAF	**Teachers "Chalk in hand"**	**School-Level Support Staff**	**Decentralised Services**	**Central Services**	**Total**
Preschool	42,403	84,467	32,848		159,719
Primary	2,878,474	1,010,411	392,938		4,281,824
Lower Secondary	618,264	341,054	511,582		1,470,901
Upper Secondary	465,909	122,358	183,537		771,805
TVET	134,186	23,487	35,230		192,905
Teacher Training for Primary	31,584	181,119			212,704
Teacher Training for Secondary	52,930	22,834			75,764
Higher (excluding ENS)	622,041	234,994			857,036
Central Administration				940,642	940,642
Total	**4,845,794**	**2,020,726**	**1,156,136**	**940,642**	**8,963,299**

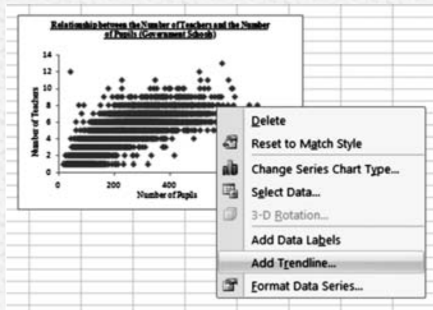
Finally, the total payroll amount obtained on the basis of payroll data may be slightly lower or higher than that indicated in the budget department files (executed expenditure). In this case, an adjustment coefficient may be used to adjust the obtained disaggregated payroll figures to ensure that their total matches the budget figures that are the reference in the matter. When the difference is significant, a detailed comparative revision of both sources should ensure the identification of the gaps.

CHAPTER 4 ANNEXES

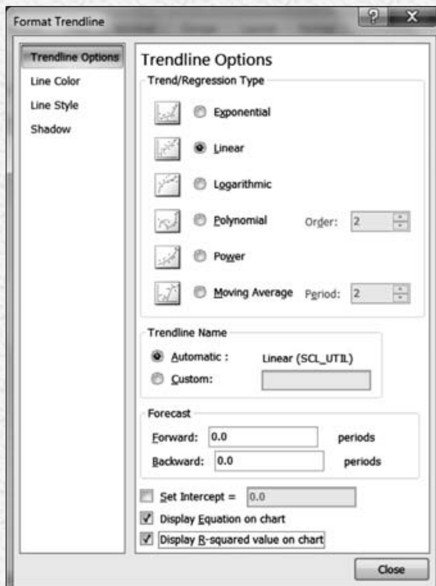
ANNEX 4.1: CALCULATION OF THE R^2 DETERMINATION COEFFICIENT WITH AN EXCEL-TYPE SPREADSHEET

To determine the R^2 coefficient on the basis of a scatter chart presenting the number of enrolled students and the number of teachers in each school, the following steps should be followed in the Excel spreadsheet:

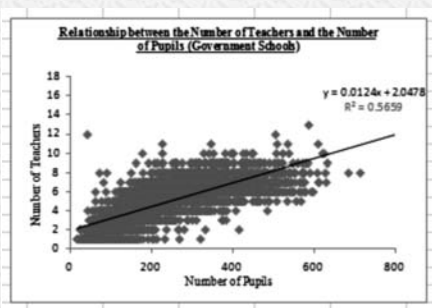
- Right click on the scatter chart
- In the menu that appears, choose the *Add Trendline* option



- In the following menu:
  - Choose *Linear*
  - Check the *Display Equation on chart* option
  - Check the *Display R-Squared value* on chart option
  - Close the window



As a result of these steps, the graph will display the regression line for the scattered values and its defining equation, as well as the value of the R^2 coefficient:



ANNEX 4.2: TEACHERS' SOCIO-PROFESSIONAL CONTEXT: DIMENSIONS TO CONSIDER

Source: Authors' compilation based on the TTISSA guide to the analysis of the teaching issue.

	Dimensions	Indicators
1. Professional and social context		
1.1 Teachers' job satisfaction - Whether or not teachers like their job	1.1.1 Levels of teachers' job satisfaction	Proportion of teachers who would choose the same profession again
		Proportion of teachers who would like to change schools
		Teachers' average number of days of absence per month
	1.1.2 Factors contributing to or hindering satisfaction	Causes for teachers' job satisfaction or dissatisfaction
	1.1.3 Teachers' professional ambitions	Teachers' professional aspirations
1.2 Social context in which teachers operate - The larger social and organi-sational environment in which teachers operate, beyond the school setting	1.2.1 Main education stakeholders in the country Government, PTAs, communities,NGOs, national education councils, develop-ment partners, religious organisations, private sector, media, teachers' professional associations, teachers' unions	Description of the stakeholders: Name of the organisation or body; contact details; mission and mandate; financing; membership: number and profile of members, membership criteria, membership cost; major activities; organisational and operational structure– at the national and local levels
	1.2.2 Stakeholders' knowledge of the education policy frameworks and benchmarks	Extent of stakeholders' awareness of: the EFA goals; the ILO/UNESCO recommendations concerning the status of teachers; World Teacher's Day; a national education plan or program; a national policy, strategy or plan concerning for teachers
		Extent to which stakeholders have been informed or consulted with respect to these frameworks
	1.2.3 Teacher participation in social dialogue: • Climate for socialdialogue • Mechanisms • Contents	Whether or not the country has ratified the ILO Conventions
		Existence of mechanisms/bodies for information sharing, consultation, negotiation and dispute resolution between education authorities and teachers
		Nature and contents of meetings/ consultations/negotiations between government and teacher unions/ associations over the past school year
		Agreements reached between government and teacher unions/ associations over the past school year
	1.2.4 Major points of conver-gence and divergence between stakeholders regarding education issues	Nature of points of convergence and divergence (including school violence)
		Government position on points of divergence
		Whether or not social dialogue is used to discuss points of divergence
		Anticipated resolution and outcomes

	Dimensions	Indicators
2. "Social Dialogue in Education" Context - "All forms of information sharing, consultation and negotiation between governments, teachers and their democratically elected representatives in teachers' organisations, and other social partners in education"		
2.1 Social education stakeholders	2.1.1 Main education stakeholders	• Stakeholders involved in main disputes and settlements in past school year • Stakeholders involved in existing social dialogue mechanisms • Existing students' and parents' associations, including rural parents' associations; existing private schools' principals' associations • Main NGOs in the education sector
	2.1.2 Roles, responsibilities and representativity of stakeholders	• Mission and mandate of organization • Roles and responsibilities of organizations as perceived by organisation's representative • For associations, unions and NGOs: major activities; financing • For associations and unions: number and profile of members; membership criteria; year of creation
2.2 Teachers' participation in education policy decisions	2.2.1 Recognition of teachers' rights to form organisations and to bargain collectively	• Ratification of the ILO Conventions No. 87, 98, 151 and 154 • Existence of laws on freedom of association, collective bargaining and strikes • Government and teachers' representatives' awareness of the ILO/UNESCO Recommendations concerning the Status of Teachers
	2.2.2 Teachers' knowledge and teachers' involvement in determining the main education policy frameworks	• Teacher's representatives' awareness of: the EFA goals; a national education plan or program; a national policy, strategy or plan concerning teachers • Means whereby they were informed • Teacher representatives' knowledge of the main ideas of these frameworks • Means whereby teacher representatives informed members about these frameworks • Participation of teacher representatives in information sharing, consultation and negotiation activities concerning these frameworks • Nature of information sharing, consultation, negotiation activities and tasks of teacher representatives
	2.2.3 Perception of teachers' involvement in education policy decisions	• Opinion of teacher representatives on teachers' voice in education policy decisions • Opinion of teacher representatives on the link between national level decisions and teachers' preoccupations • Vision that government representatives have of the impact on decisions and reforms of teachers' unions/organisations

	Dimensions	Indicateurs
2. "Social Dialogue in Education" Context - "All forms of information sharing, consultation and negotiation between governments, teachers and their democratically elected representatives in teachers' organisations, and other social partners in education"		
2.3 Social dialogue mechanisms	2.3.1 Dispute settlement "tradition"	• Means whereby main disputes between government and teachers' unions/associations have been settled in the past school year • Anticipated resolution of current main disputes according to main education stakeholders • Existence of acts of violence, harassment or intimidation against teacher union officials and members, and against government officials and members
	2.3.2 Nature of existing social dialogue mechanisms	• Existence of formal structures/ mechanisms/bodies for information sharing, consultation, negotiation and dispute resolution, involving education authorities, teacher unions/ organisations and, if so, other stakeholders • For each mechanism: level (local, regional, national), goals, stakeholders involved • For each mechanism: nature of activities and issues addressed over the past school year
	2.3.3 Effectiveness of existing mechanisms	• Outcomes or agreements reached over the past school year • Stakeholders' perception of effectiveness of the mechanism • Whether social dialogue mechanism is used to discuss major points of divergence
2.4 Major points of convergence and divergence	(Choice of dimensions to be made according to the country context)	• Issues on which an agreement was reached between government and teachers' unions/organisations over the past school year • Current demands from teacher unions/ organisations and from main education stakeholders • Stakeholders' position on EFA principles and on themes identified by the diagnosis (including financial constraints) • Government's position on points of divergence
2.5 Capacity for social dialogue	2.5.1 Technical capacity for teacher unions/ organisations to negotiate	• Training on research, policy and policy analysis • Training on social dialogue and negotiation
	2.5.2 Capacity for teacher organisations to communicate outcomes to their members	• Means whereby teachers' representatives communicate with members
	2.5.3 Government's information sharing and communication capacities	• Existence of an information sharing structure managed by education authorities • Existence of communication plans concerning education policy issues • Information sharing and communication methods, channels and recipients • Professional profile of persons in charge of information sharing and communication • Budget allocated to information and communication activities concerning education policy issues

ANNEX 4.3: SAMPLE QUESTIONNAIRE TO APPRAISE THE SOCIO-PROFESSIONAL TEACHING CONTEXT (TO BE ADAPTED TO EACH COUNTRY CONTEXT)

Source: Teacher Union questionnaire used in the preparation of the Benin TTISSA report (UNESCO, Dakar 2011).

To be completed by the interviewer

Interview date: ....

Name of the person interviewed: ....

Position/role in the union: ....

Telephone :..........

e-mail : ....

Contact details of the union you represent: ....

This survey is fully confidential. It is part of a diagnosis of the teaching issue in Benin. In particular, it aims to appraise the socio-professional context in which Beninese teachers practice. Your perspective of the situation is very important.

Part I: General Union Data

1.1- What is the full name of your union?..........

1.2- Please indicate its year of creation: ....

1.3- What education levels does your union cover?
(Tick the appropriate box/boxes)

	Public		Private	
Preschool:	yes	no	yes	no
Primary:	yes	no	yes	no
General Secondary:	yes	no	yes	no
TVET:	yes	no	yes	no
Higher and university:	yes	no	yes	no
Other :				

Please explain :

....

1.4- Approximately how many members does your union have?..........

1.5- Do members have to pay a fee? (Tick the appropriate box) ☐ yes ☐ no

If so, what is the amount of the annual fee? ....

What share of members effectively pay their annual fee? (Tick the appropriate box)

- ☐ Over 75%
- ☐ 50%
- ☐ Between 50% and 75%
- ☐ Between 25% and 50%
- ☐ Under 25%

1.6- Who can join your union?

....

....

....

1.7- - Is your union affiliated to a national/regional/international federation?

(Tick the appropriate box) yes no

If so, which one(s) (Always indicate if they are national/regional/international):

....

....

....

1.8- How does your union reach decisions?

....

....

....

1.9- What media does your union use the most to communicate with its members and share information with them?

....

....

....

1.10- On what occasions does your union communicate with its members?

....

....

....

1.11- What objectives does your union pursue?

....

....

....

1.12- What other kind of issues is your union interested in?

....

....

....

1.13- Do you feel that your union's issues of interest are considered in education policies?

(Tick the appropriate box)

- [ ] Yes, all of them
- [ ] Yes, some of them
- [ ] No

If so, on what basis?
(Tick the appropriate box)

- [ ] Very often
- [ ] Often
- [ ] Occasionally
- [ ] Rarely

Part II: Knowledge of the Main Education Policy Frameworks and Strategy Papers

2.1- Have you heard of the Education for All objectives defined during the Dakar forum, 2000? (Tick the appropriate box) [yes] [no]

If not, go to question 2.2.

2.1.1- If so, can you mention some of the objectives or their key focus areas?
a. ....
b. ....
c. ....
d. ....

2.1.2- Do you think your union members know of or have heard of these objectives?
(Tick the appropriate box) [yes] [no]

2.1.3- If so, in what proportion?
(Tick the appropriate box)
- [ ] Over 75%
- [ ] Between 50% and 75%
- [ ] 50%
- [ ] Between 25% and 50%
- [ ] Under 25%
- [ ] Don't know

2.2- Are you aware of a national Education for All programme or of the Programme for the Development of the Education Sector in Benin?
(Tick the appropriate box) [yes] [no]
If not, go to question 2.3

2.2.1- If so, which of the two ....

2.2.2- Was your union informed about it or consulted?
(Tick the appropriate box) [yes] [no]

If so, how? ....

2.2.3- What is your union's position with respect to this programme?
(Tick the appropriate box)
- [ ] Very favourable
- [ ] Favourable
- [ ] Not very favourable
- [ ] Unfavourable

2.2.4- Why?
....
....

2.3- Is your union aware of the ITO/UNESCO recommendations on teaching working conditions?
(Tick the appropriate box) [yes] [no]

If not, go to question 2.4.

2.3.1- If so, which ones? ....
....
....

2.3.2- Have you ever used them or referred to them in your negotiations with the government? (Tick the appropriate box) ☐ yes ☐ no

2.3.3- To what end? ....

2.4- Do you know of the International Teachers' Day? (Tick the appropriate box) ☐ yes ☐ no

If not, go to question 2.5.

2.4.1- If so, does your union participate in this event?(Tick the appropriate box) ☐ yes ☐ no

2.4.2- How? (Tick the appropriate box or boxes)

☐ Demonstrations ☐ Organisation of seminaries

☐ Parades ☐ Other

Please explain: ....

2.4.3- Does your union participate in official events organised for the International Teachers' Day? (Tick the appropriate box) ☐ yes ☐ no

If not, why? ....

2.5- Is your union consulted with respect to the elaboration of teaching policies, strategies, or action plans? (Tick the appropriate box) ☐ yes ☐ no

If so, which ones?...

How often? (Tick the appropriate box)

☐ Very often

☐ Often

☐ Occasionally

☐ Rarely

2.6- Is your union consulted with respect to the elaboration of the key education sector plans and programmes? (Tick the appropriate box)

If so, which ones?...

How often? (Tick the appropriate box)

☐ Very often

☐ Often

☐ Occasionally

☐ Rarely

2.7- Do you consider that your union is involved in the elaboration and determination of education policy? (Tick the appropriate box) ☐ yes ☐ no

If so, which ones? (Tick the appropriate box)

- ☐ Very often
- ☐ Often
- ☐ Occasionally
- ☐ Rarely

2.8- How would your union like to be involved in the elaboration and definition of education policy?

....
....
....

Part III: Consultation and Social Dialogue

3.1- Are you aware of the existence of a structure or institutional mechanism for consultation and social dialogue in the education sector?
(Tick the appropriate box) ☐ yes ☐ no

If not, through what mechanism does your union participate in education sector consultation and social dialogue?

....
....
....

3.2- Who are the key players that coordinate this mechanism? (Tick the appropriate box/boxes)

☐ Government	☐ PTAs
☐ Teachers unions	☐ Development partners
☐ Other unions	☐ Others

Which ones?..

3.3- Do you feel that the issues of interest to your union are sufficiently well discussed within this mechanism? (Tick the appropriate box) ☐ yes ☐ no

3.4- What are the five most important points of divergence between your union and the government in the negotiations that the mechanism harbors?

- Point 1 ....
- Point 2 ....
- Point 3 ....
- Point 4 ....
- Point 5 ....

3.5- What is the government's position on each of these points?

- Point 1 ....
- Point 2 ....
- Point 3 ....
- Point 4 ....
- Point 5 ....

3.6- How are differences resolved within the mechanism?

(Tick the appropriate box)

☐ Usually by consensus
☐ Usually by vote
☐ Other

Which other..........

3.7- How are you informed of the discussions held and the decisions reached within this mechanism?

....

....

3.8- How would you judge this mechanism, given the issues that your union is interested in?

(Tick the appropriate box)

☐ Very appropriate
☐ Appropriate
☐ Not very appropriate
☐ Inappropriate

3.9- What expectations does your union have of the existing consultation and social dialogue mechanism?

....

....

3.10- Are you aware of the existence of other teacher unions in your subsector?

(Tick the appropriate box) yes no

If so, how many are there approximately?

3.11- Have you established alliances with other national teacher unions?

(Tick the appropriate box) yes no

3.12- Do you meet with other teacher unions to discuss teaching issues?

(Tick the appropriate box) yes no

3.13- How would you qualify the relationship between your union and other teacher unions with respect to the type of issues you are interested in?

(Tick the appropriate box)

☐ Very close ☐ Not very close
☐ Close ☐ Distant

3.14- How do you perceive the multiplicity of teacher unions in your subsector?

....

....

3.15- Would you favour a regrouping of teacher unions?
(Tick the appropriate box) ☐ yes ☐ no

If so, on what terms?
....
....

3.16- How do you ensure that your views, claims and demands are heard?
....
....

3.17- Through whom do you make your views, claims and demands known?
....
....

3.18- What pressure mechanisms do you usually use when your claims are not satisfied?
(Tick the appropriate box)
☐ Strikes
☐ Demonstrations
☐ Other

Please indicate...

3.19- Has your union participated in a strike (or strikes) over the last two school years?
(Tick the appropriate box/boxes) ☐ yes ☐ no

3.19.1- If so, how many strikes have you joined?
3.19.2- How long was the shortest strike? (In days)
3.19.3- How long was the longest strike (In days)
3.19.4- What were the main claims? (Mention the 5 key claims)
....
....

3.19.5- Were these claims satisfied? (Tick the appropriate box/boxes)
☐ Yes, all of them
☐ Yes, some of them
☐ No

3.19.6- What were the five key achievements of the last strike?
....
....

3.20- Today, what are the three main claims of your union?
a. ....
b. ....
c. ....

This survey is over. Thank you for your availability. Your answers will be very useful and will enable us to improve our knowledge and understanding of the socio-professional context that teachers face in Benin.

ANNEX 4.4: MODELISATION OF PRIMARY EDUCATION RESULTS

Source: Extract translated from World Bank, 2007d (Chad CSR).

Several models have been elaborated at the school level, with school performance being appraised through three variables: retention, repetition, and the end of primary cycle exam (CEPE) success rate.

	Retention		Repetition		CEPE SuccessRate
	M1	**M2**	**M3**	**M4**	**M5**
Constant	+ 0.339 ***	+ 0.330 ***	+ 0.306 ***	+ 0.025 ***	+ 0.657 ***
% of Repeaters	- 0.427 ***	- 0.402 ***	-	-	- 0.290 ***
Area of Residence					
Rural (Ref.)	-	-	-	-	-
Urban	-	-	- 0.019 *	-	+ 0.035 ns
Type of School					
Government (Ref.)	-	-	-	-	-
Private	+ 0.090 ***	+ 0.076 ***	- 0.080 ***	- 0.098 ***	+ 0.002 ns
Community	+ 0.075 ***	+ 0.084 ***	- 0.025 ***	- 0.021 **	+ 0.019 ns
Type of School Building					
% of classrooms built with permanent or semi-permanent materials	- 0.011 ns	- 0.017 ns	- 0.019 **	- 0.024 ***	+ 0.016 ns
School Feeding Programme					
WFP support	-	-	-	-	0.192 ***
Teaching Conditions					
School's PTR	+ 0.001 ***	+ 0.001 ***	-	-	-
Share of Students in Multi-Grade Classes	- 0.087 ***	- 0.090 ***	+ 0.006 ns	+ 0.007 ns	- 0.028 ns
Index of Classroom Furnishing	+ 0.093 ***	+ 0.089 ***	- 0.016 *	-	-
Share of Students with a Seat/Desk in Good Condition	-				+ 0.106 ***
Number of Textbooks (Language + Math) per Student	+ 0.028 **	+ 0.025 *	+ 0.010 *	+ 0.011 *	+ 0.040 *
Teachers					
% of Female Teachers	+ 0.100 **	+ 0.075 *	- 0.045 **	- 0.076 ***	- 0.044 ns
Distribution of Teachers by Qualification					
% with the CEPE or none	-		-		
% with the BEPC (O' Level equivalent)	- 0.001 ns		- 0.031 ***		
% with the Baccalaureate or above	- 0.088 ***		- 0.074 ***		
Distribution of Teachers by Status					
% of Civil Servant Teachers		-		-	-
% of Civil servant Assistant Teachers		+ 0.027 ns		+ 0.055 ***	- 0.032 ns
% of Teachers that are Community Hired		- 0.007 ns		+ 0.036 **	- 0.056 ns
Distribution of Teachers by Age					
% of Teachers under 30 years	-	-	-	-	-
% of Teachers between 31 and 49 years	- 0.030 *	- 0.040 **	- 0.003 ns	- 0.006 ns	+ 0.014 ns
% of Teachers over 50 years	- 0.428 ns	- 0.054 ns	- 0.018 ns	+ 0.017 ns	- 0.037 ns
Number of Observations (Schools)	1,371				330
% of the Variance Explained by Each Model	11.9	11.2	16.7	15.1	24.5

Key Findings

- There are only small differences according to whether schools are in rural or urban areas;

- Retention during the primary cycle seems to be better and repetition less frequent in private and community schools than in government schools;

- The PTR is poorly associated with retention (it has no significant correlation with the frequency of repetition or the probability of success at the CEPE exam);

- The availability of textbooks is highly associated with the three performance dimensions; and

- School feeding is very positively associated with exam success rates.

ANNEX 4.5: CORRELATION OF STUDENT AND TEACHER CHARACTERISTICS WITH LEARNING OUTCOMES

Source: Extract translated from World Bank, 2006a (Mauritania CSR).

The models have been developed on the basis of a national assessment of students' learning achievements organised by the national pedagogical inspection of basic education (primary).

		National student learning assessment organised by the pedagogical inspection of primary education, 1999								
Year		**Grade 2**			**Grade 4**			**Grade 6**		
Variables		**Arabic**	**French**	**Math**	**Arabic**	**French**	**Math**	**Arabic**	**French**	**Math**
Reference	Active Variable									
Individual Students' Characteristics										
Boy	Girl	0	0	- - -	0	0	0	- - -		0
Other	Lives with Parents				+ + +	+ + +	+ +	+ +		+
Other	Parents are Educated	+ + +	+ + +	+ + +	0	0	+ + +		+ + +	+ + +
Other	Over 2 years in a Mahadra								+	+ + +
Other	Not enrolled in Mahadra	- - -	- - -		+ +	+ + +	0	+ +	+ +	+ +
Other	Repeater				- - -	0	- - -			
No	Repeated Grade 1	0	-	-						
Individual Teachers' Characteristics										
Woman	Man	-	0	0	0	- -	0	- - -		0
Age (Years)		0	+ + +	0	0	- - -	- - -	+ + +	+ + +	+ + +
Inactive	Active	+ +	+ + +	+ + +	+ + +	+ + +	+ + +	-	+ + +	0
Other	From the Area				+	0	0	- - -	0	+ + +
Other	From the District	+	- -							
Other	Not Involved Locally				0	+ +	+ + +	- - -	0	0
Does not Participate	Participates in Local Life	+ +	+							
Characteristics of Teachers' Training/Education										
Other	No Mahadra Attended				- - -	0	- - -	0	0	+ + +
Other Qualification	Baccalaureate				+ + +	+ + +	+ + +	- -	0	+ + +
Other	Primary Teacher				- - -	- - -	- - -			
Ongoing Training	No Ongoing Training	0	0	- -	+ + +	- - -	+ + +	+	0	- - -
Graduated 3 Yrs ago	Graduated 1 Yr ago				- -	0	- - -	+ + +	- - -	0
	Graduated 2 Yrs ago				- - -	0	- - -	0	- - -	- - -
	Graduated 4+ Yrs ago	- - -	-	- - -	0	0	- - -	+ + +	- - -	0
Under 9 months	9 Months or More in Teacher Training	0	- - -	+ + +						
No	Headmaster		- - -	- - -						

Note: +++ (- - -) Positively (negatively) significant at the 1% level;
++ (- --) Positively (negatively) significant at the 5% level;
+ (-) Positively (negatively) significant at the 10% level; 0 not significant.

Key Findings

- Girls face greater learning difficulties than boys, especially in math;

- The presence and education of parents is associated with better progress by students;

- Attending a Koranic school (Mahadra) is effective;

- The practice of repetition is negatively associated with school results; and

- Male teachers' performance in ensuring their students' progress is below that of their female counterparts in Grade 2 and Grade 6 Arabic and in Grade 4 French.

ANNEX 4.6: CALCULATION OF SCHOOL INDICES (THE PERFORMANCE INDEX, RESOURCES INDEX AND EFFICIENCY INDEX), BASED ON THE EXAMPLE OF THE GAMBIA

The indicators included in index calculations are the same for all levels (school, district and region) with the exception of the GER which is added at the district and regional levels.

Performance Index

The table below summarises the weights and indicators used to calculate the performance index. Thresholds for each indicator are calculated based on school quintiles. The performance index is the (weighted) average of the points given to all indicators factored in the index.

TABLE A4.1 - Performance Index Calculation

Indicators	Methodology (X= Indicator)	Weight
Dropout Rate between Grade1 and Grade 6	1.00 point when X < 10 % 0.75 points when 10 % ≤ X < 30 % 0.50 points when 30 % ≤ X < 50 % 0.25 points when 50 % ≤ X < 70 % 0.00 points when X ≥ 70 %	1
Dropout Rate between Grade7 and Grade 9	1.00 point when X < 10 % 0.50 point when 10 % ≤ X < 30 % 0.25 point when 30 % ≤ X < 50 % 0.00 point when X ≥ 50 %	1
NAT Grade 3 English (% of correct answers)	1.00 point when X >33 % 0.75 points when 28 % < X ≤ 33 % 0.50 points when 26 % < X ≤ 28 % 0.25 points when 24 % < X ≤ 26 % 0.00 points when X ≤ 24 %	1
NAT Grade 3 Math (% of correct answers)	1.00 point when X > 36 % 0.75 points when 30 % < X ≤ 36 % 0.50 points when 27 % < X ≤ 30 % 0.25 points when 24 % < X ≤ 27 % 0.00 points when X ≤ 24 %	1
NAT Grade 5 English (% of correct answers)	1.00 point when X > 37 % 0.75 points when 32 % < X ≤ 37 % 0.50 points when 28 % < X ≤ 32 % 0.25 points when 26 % < X ≤ 28 % 0.00 points when X ≤ 26 %	1
NAT Grade 5 Math (% of correct answers)	1.00 point when X > 35 % 0.75 points when 30 % ≤ X < 35 % 0.50 points when 27 % ≤ X < 30 % 0.25 points when 25 % ≤ X < 27 % 0.00 points when X ≤ 25 %	1

GABECE Aggregate scores in 4 subjects (Best possible=4, Worst=36)	1.00 point when X < 31 0.75 points when 31 ≤ X < 32.5 0.50 points when 32.5 ≤ X < 33.5 0.25 points when 33.5 ≤ X < 34.5 0.00 points when X ≥ 34.5	4
GABECE English score (Best possible=1, Worst=9)	1.00 point when X < 8.1 0.75 points when 8.1≤X < 8.6 0.50 points when 8.6≤X < 8.7 0.25 points when 8.7≤X < 8.9 0.00 points when ≥ 8.9	1
GABECE Math score (Best possible=1, Worst=9)	1.00 point when X < 8.2 0.75 points when 8.2≤X < 8.6 0.50 points when 8.6≤X < 8.8 0.25 points when 8.8≤X < 8.9 0.00 points when X ≥ 8.9	1
GABECE Sciences score (Best possible=1, Worst=9)	1.00 point when X < 7.3 0.75 points when 7.3≤ X < 7.8 0.50 points when 7.8≤ X < 8.1 0.25 points when 8.1≤ X < 8.4 0.00 points when X ≥ 8.4	1
GABECE Social and Economic Science score (Best possible=1, Worst=9)	1.00 point when X< 7.4 0.75 points when 7.4 ≤X < 8.0 0.50 points when 8.0 ≤X < 8.4 0.25 points when 8.4 ≤X < 8.5 0.00 points when X ≥ 8.5	1
GER Lower Basic School (Primary)	1.00 point when X >110 0.75 points when 96 < X ≤110 0.50 points when 82 < X ≤ 96 0.25 points when 67 < X ≤ 82 0.00 points when X ≤ 67	2
GER Upper Basic School (Lower Secondary)	1.00 point when X > 83 0.75 points when 62 < X≤ 83 0.50 points when 49 < X≤ 62 0.25 points when 31 < X≤ 49 0.0 points when X ≤ 31	2

Note: NAT: the National Assessment Test;
GABECE: The Gambian Basic Education Certificate Examinations.

Resources Index

The table below summarises the weights and indicators used to compute the resources index. Thresholds for each indicator are calculated based on quintiles (schools are distributed into 5 groups according to the value achieved for the indicator considered). The resources index is the (weighted) average of the points given to all indicators factored in the index.

TABLE A4.2 - Resources Index Calculation		
Indicators	**Methodology (X= Indicator)**	**Weight**
Student-Teacher Ratio	1.00 point when $X < 18$ 0.75 points when $18 \leq X < 25$ 0.50 points when $25 \leq X < 31$ 0.25 points when $31 \leq X < 37$ 0.00 points when $X \geq 37$	1
% Qualified Teachers	1.00 point when $X > 75\,\%$ 0.75 points when $60\,\% < X \leq 75\,\%$ 0.50 points when $50\,\% < X \leq 60\,\%$ 0.25 points when $40\,\% < X \leq 50\,\%$ 0.00 points when $X \leq 40\,\%$	1
Number of Students per Textbook (Math)	1.00 point when $X \leq 1$ 0.75 points when $1 < X \leq 1.4$ 0.50 points when $1.4 < X \leq 1.9$ 0.25 points when $1.9 < X \leq 2.7$ 0.00 points when $X > 2.7$	1
Number of Students per Textbook (English)	1.00 point when $X \leq 1$ 0.75 points when $1 < X \leq 1.3$ 0.50 points when $1.3 < X \leq 1.7$ 0.25 points when $1.7 < X \leq 2.5$ 0.00 points when $X > 2.5$	1
Number of Students per Seat	1.00 point when $X \leq 1$ 0.75 points when $1 < X \leq 1.5$ 0.50 points when $1.5 < X \leq 2$ 0.25 points when $2 < X \leq 3$ 0.00 points when $X > 3$	0.25
Number of Students per Desk	1.00 point when $X < 1.2$ 0.75 points when $1.2 \leq X < 1.8$ 0.50 points when $1.8 \leq X < 2.3$ 0.25 points when $2.3 \leq X < 3.4$ 0.00 points when $X \geq 3.4$	0.25
Power Equipment (Electricity/Solar/Generator)	1 if at least one 0 if none	0.5
Hardship	0 points if Yes 1 point if No	1
Poverty Index (District Level)	Mean by District of: Household Wealth Quintile Divided by 5. Scale varies between 0 and 1	1

Efficiency Index

To keep the efficiency index between zero and one, it is calculated as follows:

$$\textit{Efficiency index} = \frac{\textit{Performance Index - Ressources Index + 1}}{2}$$

ANNEX 4.7: COMPUTATION OF THE SCHOOL VALUE-ADDED INDICATOR

Various studies on the determinants of learning outcomes has shown that students' initial levels and school contexts are the most influential factors. Consequently, to truly determine what a school brings to its students' success, it is preferable to compute a value-added indicator. By definition, the added value may be estimated as the difference between the result achieved by a school and the result that school was expected to achieve given its characteristics (contextual and student characteristics).

$$\mathbf{AV}_i = \mathbf{Ro}_i - \mathbf{Re}_i$$

Where:
- AV_i is the value added by school *i*
- Ro_i is the result observed for school *i*; and
- Re_i is the expected result for school *i*.

If the observed result is easy to obtain in as much as it is a school's score in an assessment or exam, to propose a value for the expected result is more complex. In practice, various approaches exist but the fairest consists of using the estimates from an econometric model that includes context variables to predict the results schools should achieve (expected value), given the characteristics of their student population and the context they operate in.

The variables here are those the school has no influence over (students' personal characteristics, the school's geographical area and so on). Thus the result obtained can vary from one school to another according to the chosen variables.

ANNEX 4.8: SCHOOL PROFILE, BASED ON THE EXAMPLE OF THE GAMBIA

Ministry of Basic & Secondary Education
Directorate of Planning
Based on the information collected from the school by the CMs

SCHOOL PROFILE 2009/10

School Name : Albion **District :** Banjul

Local Management : Government

School Code : 10002
School Type : LBS
No of Students : 663

Context-Resources

Hardship	No	Multigrade	No	Double Shift	No	Electricity	Yes

Raw Data	School
Number of seats	262
Number of desks	262
Number of classrooms	15
Of wich are permanent	15
Number of teachers	18
Of which are qualified	M
Number of Maths textbooks	582
Number of English textbooks	540

	Average Public Schools			
Indicator	**School**	**District**	**Region**	**Gambia**
Nb of students per seat	2.5	2.0	2.7	3.0
Nb of student per desk	2.5	1.9	2.9	1.6
% of permanent classrooms	100%	100%	100%	99%
Student teacher ratio	37	28	35	18
% of qualified teachers	M	71%	70%	64%
Nb of students per Maths textbook	1.2	2.2	3.6	3.1
Nb of students per English textbook	1.1	2.2	3.9	2.9

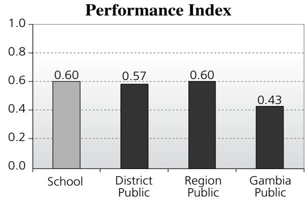
Performance

LOWER BASIC EDUCATION	Average Public Schools			
NAT (%of Correct Answers)	**School**	**District**	**Region**	**Gambia**
G3 English	26%	29%	30%	27%
G3 Maths	29%	34%	32%	29%
G5 English	33%	35%	35%	30%
G5 Maths	27%	30%	31%	29%
Drop-out rate G1-6	0%	21%	21%	43%

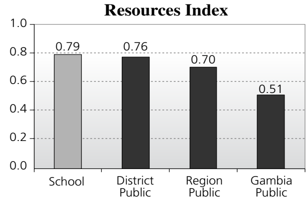
UPPER BASIC EDUCATION	Average Public Schools			
GABECE Scores (Core Subjects)	**School**	**District**	**Region**	**Gambia**
Aggregate	NA	31.5	32.5	33.0
English	NA	7.9	8.2	6.3
Maths	NA	8.5	8.6	7.9
Sciences	NA	7.2	7.7	6.8
SES	NA	7.8	8.0	7.1
Drop-out rage G7 -9	NA	3%	3%	25%

Indices

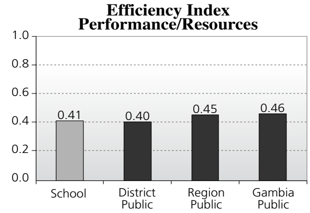
Performance Index



Resources Index



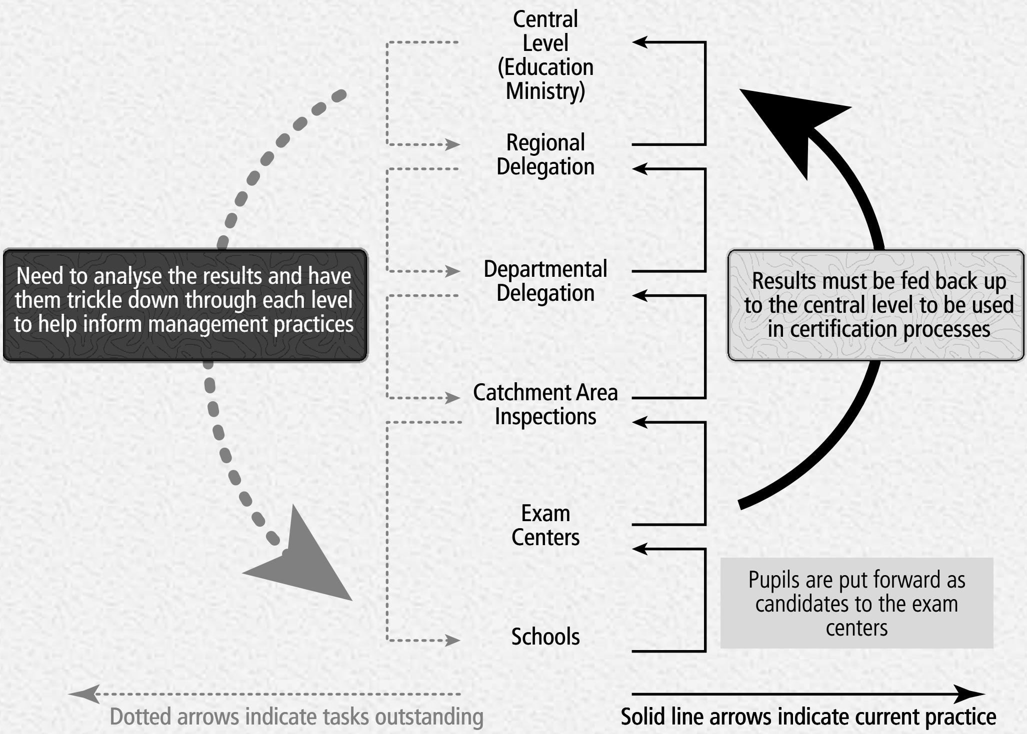
Efficiency Index Performance/Resources



Note: NA: Not Applicable; M: missing information

ANNEX 4.9: FLOW OF EXAM RESULT INFORMATION, CAMEROON

Source: Authors' conception based on interviews with education system stakeholders.



CHAPTER 5 ANNEXES

ANNEX 5.1: METHODOLOGY FOR THE ESTIMATION OF NET INCOME, EXPECTED INCOME AND RATES OF RETURN

Earnings Functions

To estimate the rates of return of education, a standard approach consists of the use of the Mincer model, based on the following equation:

$$Ln(Y_i^*) = \eta_0 + \eta_1 E_i + \eta_2 E_i^2 + \sum_{k=1}^{K} \eta_{3k} D_{ki} + \sum_{j=1}^{J} \eta_{4j} X_{ji} + u_i \qquad (1)$$

Where, Y_i^* is the individual annual income (or salary), E_i the number of years of work experience, D_{ki} = 1 if the person i has the degree D_k (or has reached the level of education k) or = 0 otherwise, X_{ji} is the sector of the main earning activity, and u_i is a random term and is supposed to be Gaussian (normal distribution). The η parameters are generated by the model itself.

In the case of Mali, by using the ELIM, 2006 data the following model is obtained. All the parameters of the model are significant at the usual level (one percent). The determination of the model is fairly good, with an R^2 value close to 20 percent.

TABLE A5.1 - Results of the Econometric Estimation (Based on Malian ELIM 2006 Data)

Variable	Reference	Coefficient
Basic 1	No education	0.0369
Basic 2		0.2611
General Secondary and TVET		0.7531
Higher		1.2991
Years of Experience		0.0177
Years of Experience Squared		-0.0003
Man	Woman	0.2384
Modern Public Sector	Informal Agriculture	0.7206
Modern Private Sector		0.3630
Informal (Other than Agriculture)		0.4766
Constant		11.8583

The estimated coefficients describe the net impact of education on earnings, all other things being equal; the effect is for instance isolated from that of the number of years of experience of the sector of work. Once the earnings function has been estimated, the next step will be to simulate average income according to the level of education.

- **Simulation of the Logarithm of Average Income by Level of Education and Deduction of Average Income by Level of Education**

On the basis of the earnings model and explanatory variables estimated above, the logarithm for the average earnings of workers according to their level of education can be estimated, holding other variables constant (equal to their averages). The earnings function estimated by this second model is:

$$\begin{aligned} Ln(Y) = {} & 11.8583 + 0.0369 \text{ (Basic 1)} + 0.2611 \text{ (Basic 2)} + 0.7531 \text{ (Secondary)} \\ & + 1.2991 \text{ (Higher)} + 0.0177 \text{ (Years of experience)} \\ & - 0.003 \text{ (Years of experience squared)} + 0.2384 \text{ (Man)} \\ & + 0.4766 \text{ (Non-agriculture informal sector)} + 0.7206 \text{ (Public sector)} \\ & + 0.3630 \text{ (Private sector)} \end{aligned} \tag{2}$$

The average of each of the other explanatory variables on the sample used to estimate the earnings function is provided in Table A5.2.

TABLE A5.2 - Average of Explanatory Variables Other than the Number of Years of Education

Experience	Experience Squared	Man	Non-Agricultural Informal Sector	Public Sector	Private Sector
19.2564	521.7487	0.4699	0.2392	0.0399	0.0710

The logarithm for simulated earnings is therefore the sum of a fixed factor and a factor that varies according to the highest level of education attended:

$$\begin{aligned} Ln(Y) = {} & 12.3455 + 0.0369 \text{ (Basic 1)} + 0.2611 \text{ (Basic 2)} \\ & + 0.7531 \text{ (Secondary)} + 1.2991 \text{ (Higher)} \end{aligned} \tag{3}$$

TABLE A5.3 - Logarithm of Simulated Annual Income by Level of Education

No Education (Ref.)	12.3455	= 12.3455
Basic 1	12.3455 + 0.0369	= 12.3824
Basic 2	12.3455 + 0.2611	= 12.6066
Secondary	12.3455 + 0.7531	= 13.0986
Higher Education	12.3455 + 1.2991	= 13.6446

The simulated income takes the variance of the error term *u* of equation (1) into account in equation (4), where *S* represents the standard deviation of the residual of the mincer model. $S^2/2$ is here equal to 0.4865.

$$Y_{simulated} = \text{Exp}\left([Ln(Y)]_{simulated}\right) \times \text{Exp}\left(\frac{S^2}{2}\right) \tag{4}$$

TABLE A5.4 - Simulated Annual Income According to the Level of Education

	Simulated Income (a)	
No Education (Ref.)	= Exp. (12.3455+ 0.4865)	373,995
Basic 1	= Exp. (12.3824+ 0.4865)	388,045
Basic 2	= Exp. (12.6066+ 0.4865)	485,599
Secondary	= Exp. (13.0986+ 0.4865)	794,167
Higher Education	= Exp. (13.6446+ 0.4865)	1,371,000

Calculation of Rates of return

On the basis of the simulated income, the rate of return of level *k* in comparison to the previous level *k-1* is obtained by dividing the additional income attributable to level *k* by the additional cost involved in pursuing schooling at that level. This cost includes both the opportunity cost of the income lost due to the pursuit of education, estimated as the annual income of individuals having completed the level *k-1* and the direct cost of education at level *k*.

Furthermore, the estimated income to be derived from level *k* for an individual following level *k-1* should take into account the risk of not finding employment upon completion of level *k*.

The rate of return of level k would then be computed as:

$$R_{k/k-1} = \frac{\pi_k \overline{Y}_k - \pi_{k-1} \overline{Y}_{k-1}}{N_{k-1/k}\, \pi_{k-1} \overline{Y}_{k-1} + N_k C_k + (A_{k-1} - D_{k-1})\, C_{k-1}} \quad (5)$$

Where π_k is the employment rate (1 – the unemployment rate of recent school leavers) of individuals having completed level *k* and $\overline{Y}_k$ is the simulated income for individuals with level *k* education.

C_k is the annual cost of training;
A_k is the total theoretical duration of level *k*;
D_k is the average length of education for individuals having attained level *k*;
N_k is the average length of education for individuals not attaining level *k*;
$N_{k-1/k}$ is the average number of additional years of education followed by individuals having attained level *k* (compared to those having attained level *k-1*), computed as the difference between the average number of years of education held by each;

The indicators for the length of education are estimated on the basis of survey data (See Table A5.5).

TABLE A5.5 - Employment Rate, Length of Workers' Education and Annual Cost of Training, by Level[98]

Level of education	π_k	$\overline{Y}_k$	D_k	A_k	N_k	$N_{k-1/k}$	C_k	
							Private (Households)	Public
No Education	98.3%	373,995	0.0	0.0		0	0	0
Basic 1	96.1%	388,045	4.2	6.0	4.2	4.2	5,908	32,113
Basic 2	92.5%	485,599	8.1	9.0	2.1	3.8	7,999	59,288
Secondary	84.3%	794,167	11.4	12.0	2.4	3.4	25,604	286,388
Higher Education	74.6%	1,371,000	15.5	-	3.5	4.1	33,996	379,481

Source : Author's calculations on the basis of ELIM, 2006 data.

Formula (5) enables one to calculate both the social and the private returns on investment. In the estimations used here, the difference between the two is mainly due to the direct costs Ck considered. For the private rate of return, the direct cost is limited to the cost of training supported by families (as estimated in Chapter 3), whereas the social return on investment also considers the public unit costs (also estimated in Chapter 3) in addition to private costs.

Thus the rate of return of Basic 1 education (compared to having no education) can be computed in the following way:

The expected additional annual income is equivalent to 5,284 (388,045 x 96.1%)-(373,995 x 98.3%).

The costs related to the pursuit of primary education are estimated as:
- 1,558,714 of opportunity costs (373,995 x 98.3%) x 4.2;
- 25,052 private costs of training [5,908 x 4.2] + [0 x (0-0)]; and
- 143,393 public costs of training [32,113 x 4.2] + [0 x (0-0)].

The social rate of return for Basic 1 education is thus estimated at 0.31 percent (5,284 / (1,558,714 + 25,052 + 143,393)) whereas the private rate of return is 0.33 percent (5,284 / (1,558,714 + 25,052)).

ANNEX 5.2: THE MAIN TYPES OF SURVEY USED IN LABOUR MARKET ANALYSIS

In the context of the improvement of information tools for the monitoring of poverty, many countries have developed broad surveys for the measurement, monitoring and evaluation of poverty. Some such surveys include a specific module on employment and income, which provides various measures of the correlation between education and work indicators (access to work, employment and income by level and so on). The most common surveys are described here.

Demographic Censuses usually collect information relating to homes/accommodation, sociodemographic characteristics (including age, gender, civil status), the status and area of residence, fertility, education, activities and employment. The main objective of censuses is to update the demographic, social and economic profile of the country's inhabitants. Collection is nation-wide and comprehensive, and the results are available down to the smallest available geographic/administrative area.

Household Living Condition Surveys are carried out with variable regularity, depending on the country. The themes covered include, among others: income, spending, health, employment, agriculture and access to basic social services. The main objective of such surveys is to monitor and evaluate households' general living conditions and the poverty reduction programme's impact in particular. Surveys have nationwide coverage (on the basis of a sample) and the results are representative at the regional level and by area of residence (urban/rural).

Core Welfare Indicator Questionnaire Surveys[99] (or quick poverty monitoring and evaluation surveys), cover among other themes: access to education and health, the degree of satisfaction with and the level of access of populations to basic social services, employment, nutrition, wealth and home characteristics. CWIQs are relatively recent tools, launched in the mid-1990s, and are on track to being carried out regularly in many countries. Such surveys have two main objectives: (i) to provide valuable household-level information to enable the elaboration and evaluation of socioeconomic development policies; and (ii) to provide a mechanism for the straightforward and regular follow-up of different socioeconomic population groups.

Demographic and Health Surveys (DHS), conducted about every five years, cover themes pertaining to education and enrolment, accommodation, health and fertility behaviours, child health (anthropometrics) and the availability of community services. In some countries they also include an employment module. The main objective of DHS surveys is to provide information on demographic and health characteristics. Their coverage is national (on the basis of a sample) and the results are usually available by region and area of residence (urban/rural).

Multiple Indicator Cluster Surveys[100] were developed to measure progress towards the goals established by the World Summit for Children of 1990. These types of surveys are now common in developing countries. They cover issues relating to accommodation, hygiene, education, child labour and maternal and child health.

Employment Surveys provide a good knowledge of the workplace. Such surveys are key statistical tools, providing a plethora of information on the labour market and its evolution: the share of the active population, the number and rate of unemployed, the characteristics of workers, the characteristics of school leavers or work leavers and so on. They provide data on the structure of the labour market by profession, on the activities of women and/or children, on the length of work contracts and on unstable positions. All European Union countries are committed to carrying out an employment survey every three months.[101] Some developing countries carry out an employment survey every year.

1-2-3 or 1-2 Type Surveys are used in developing countries to appraise the state of the labour market. They owe their name to the three interlinked phases, on: (i) employment; (ii) the informal sector; and (iii) poverty. They therefore touch on the informal sector, income and consumption, in addition to employment (current and past context, unemployment, conditions of activity). 1-2-3 surveys also include a module on democracy and governance, that enables a quantified appraisal (and disaggregated by type of institution) of governance, both from the perspective of the efficiency of the state administration and from that of the confidence of households in public institutions. Such surveys are therefore also very useful to evaluate civic and social behaviour.

Tracer Surveys (See Annex 5.4).

ANNEX 5.3: SELECTION OF A REPRESENTATIVE SAMPLE FOR THE ANALYSIS OF THE STATUS OF EDUCATION SYSTEM LEAVERS IN THE WORKPLACE[102]

SELECTION OF A SAMPLE OF ACTIVE INDIVIDUALS HAVING RECENTLY LEFT EDUCATION

The data most commonly used for such analyses are drawn from household surveys, which by nature are not conceived to provide information on education system leavers. It is however possible, on the basis of household survey data, to build a representative sample of active individuals who recently finished their education. It is common to consider individuals having left school or university in the last ten years. To do so, a variable is computed that estimates the time spent in the workplace:
Duration = age – (official school age for starting school + number of years of education)

On this basis, a sample can be selected according to the duration of an individual's status as active. If the sample composed of individuals who have been active for up to ten years is too large, the set cut-off duration can be reduced. It is however advisable to ensure that the sample obtained is representative.

REPRESENTATIVITY OF THE SAMPLE OF ACTIVE INDIVIDUALS HAVING RECENTLY LEFT EDUCATION

The sample obtained above should be checked for representativity, especially if there is an interest in generalizing (inferring) the results of the descriptive analysis (unemployment rate, job status analysis and so on). If the sample is found to not be representative, the results should be adjusted by calibration weighting. The procedure involves two steps: (i) the determination of the actual structure of all individuals having recently finished their education; and (ii) the calibration weighting of the sample of individuals obtained according to the actual structure.

(i) Determination of the Actual Structure of Recent Education Leavers

Chapter 2 of this guide offered an approach to the construction of cross section (or transverse) schooling profiles for a given year. On the basis of this profile, and as illustrated by Table A5.6 below, the highest level attained by the enrolled individuals can be obtained.

TABLE A5.6 - Distribution of a Pseudo Cohort of 100 Youth, by Terminal Education Level				
Education Level		**Schooling Profile**	**Highest Level of Education Attained (%)**	
No Education			23.6 = 100 – 76.4	23.6
Incomplete Primary	Grade 1	76.4	12.9 = 76.4 – 63.4	45.8
	Grade 2	63.4	6.9 = 63.4 – 56.5	
	Grade 3	56.5	10.2 = 56.5 – 46.3	
	Grade 4	46.3	9.2 = 46.3 – 37.1	
	Grade 5	37.1	6.6 = 37.1 – 30.5	
Complete Primary	Grade 6	30.5	12.8 = 30.5-17.7	12.8
Lower Secondary	Grade 1	**17.7**	5.3 = 17.7 – 12.4	9.6
	Grade 2	**12.4**	2.4 = 12.4 – 10.0	
	Grade 3	**10.0**	1.3 = 10.0 – 8.7	
	Grade 4	**8.7**	0.6 = 8.7 – 8.1	
Upper Secondary	Grade 5	**8.1**	1.4 = 8.1 – 6.7	5.8
	Grade 6	**6.7**	0.0 = 6.7 – 6.7	
	Grade 7	**6.7**	4.4 = 6.7 – 2.3	
Higher		2.3	2.3	2.3
Total			-	100.0

The column for the highest level of education attained represents the distribution by level of education leavers (the leavers' profile by level). This profile provides the actual structure of the population of education leavers for a given year.

If the analysis covers a number of years, the actual structure of the population of education leavers can be obtained for that period through the estimation of the average schooling profile of education leavers for each of the years considered. This average profile is the simple average of each of the percentage distribution shares of leavers for each level. Table A5.7 provides an example of how to obtain the average schooling profile on the basis of the last five years cross section schooling profiles (See the last column of Table A5.7).

TABLE A5.7 - Determination of the Average Schooling Profile for Education Leavers, over 5 Years

	Year 1	Year 2	Year 3	Year 4	Year 5	**Average FiveYear Profile**
No Education	20.0	17.0	17.0	16.0	14.0	**16.8**
Primary	50.0	45.0	40.0	40.0	39.0	**42.8**
Lower Secondary	20.0	25.0	28.0	30.0	32.0	**27.0**
Upper Secondary	7.0	9.5	11.0	9.3	10.2	**9.4**
Higher	3.0	3.5	4.0	4.7	4.8	**4.0**

Each item of the last column is obtained as the simple average of the shares of the same row. For instance, the average share of individuals without education over five years is 16.8 percent, or (20+17+17+16+14)/5. The last column represents the actual structure of the population of education system leavers over the five year period considered.

(ii) Calibration Weighting

To reduce potential bias when the household survey data sample of individuals is not coherent with the actual structure of education system leavers, calibration weighting is performed. The weighting is a simple procedure enabling the calibration of a sample according to one or more specific criteria. The following paragraphs demonstrate how this was done, in the case of Sao Tomé and Principe, for 2010.

Weighting of the Education Leavers' Sample in Sao Tomé and Principe, 2010

In Sao Tomé and Principe, the average profile of education system leavers over the last ten years was estimated as table 5.8 shows:

TABLE A5.8 - Average Schooling Profile of Education Leavers, over 10 Years, Sao Tomé and Principe, 2010

	No Education	Primary	Secondary	Higher	Total
Average Schooling Profile	20.4	24.0	53.0	2.6	100.0

Source: Pôle de Dakar, 2012 (Sao Tomé et Principe CSR) and authors' calculations.

The sample of active individuals recently having finished their education (over the past ten years) extracted from the OIF, 2010 household survey is structured as per Table A5.9.

TABLE A5.9 - Structure of Newly Active Individuals (up to 10 Years), Sao Tomé and Principe, 2010

	No Education	Primary	Secondary	Higher	Total
Number	620.0	886.0	272.0	8.0	1786.0
Weight in the Survey	34.7	49.6	15.2	0.5	100.0

Source: Authors' calculation on household survey data (IOF, 2010).

The structure of the survey sample of newly active individuals (TableA5.9) is clearly different to the structure of education leavers as per the average schooling profile (Table A5.8). Calibration weighting is therefore used to remove the bias from the sample selection.

There are in fact 24 percent of primary school leavers (Table A5.8), but the sample includes 49.6 percent of active individuals with primary education as highest level attended (Table A5.9). A coefficient of 24/49.6 (=0.48) should thus be applied to the data for this group of individuals. The full procedure is explained in Table A5.10.

TABLE A5.10 - Calibration Weighting of the Survey Sample of Newly Active Individuals, Sao Tomé and Principe, 2010

	No Education	Primary	Secondary	Higher
Weighting Coefficient	20.4/34.7=0.59	24/49.6=0.48	53/15.2=3.5	2.6/0.5=5.2

Source: Authors' calculation on household survey data (IOF, 2010).

Practically speaking, a weighting variable is created that has a value of 0.59 when individuals have no education, 0.48 when they have completed primary, 3.49 when they have completed secondary and 5.2 when they have higher education. All the computations of descriptive statistics are then carried out with these weighting coefficients.

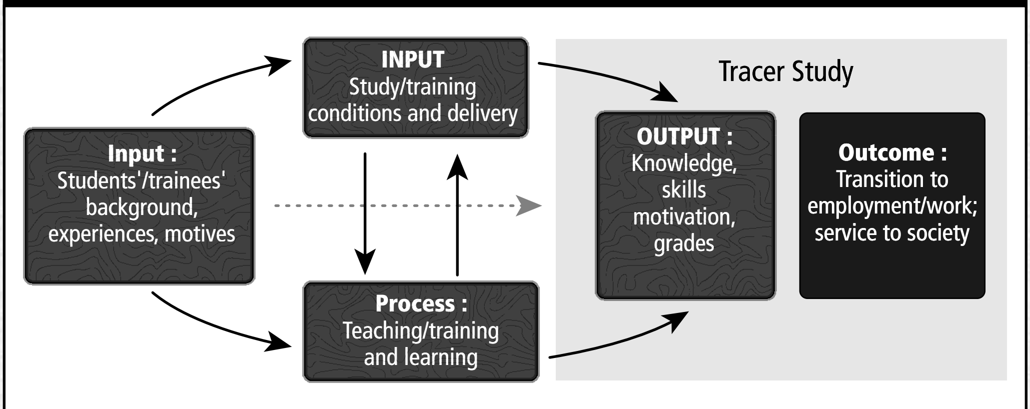
ANNEX 5.4: GRADUATE TRACER STUDIES

A tracer study, sometimes also called graduate/completer survey, is a tool to measure the relevance and effectiveness of those terminal education/training programmes that are intended to lead graduates/completers into employment. Hence, it is a tool mainly used for the evaluation of higher education (HE) as well as technical and vocational education and training (TVET).

Tracer studies are management tools for planning and monitoring of HE and TVET provision (i.e. which courses to drop, add or change), they assist in revising curricula, and they may help monitor the delivery of education and training. They provide information on the value of HE and TVET programmes in the labour market, and as such can also be used as a marketing tool targeting students and parents, as well as political decision-makers. As such, tracer studies enable one to conduct an external evaluation of education and training programs, but at the same time also provide a feed-back tool to the TVET/HE institution.

Tracer studies have been used in educational analysis for many decades. Notably in TVET, they have gained importance over recent years. Examples of more recent tracer studies include the *Tracer Study on the Employment Outcomes of Vocational Training Graduates* of 2010, commissioned by the Botswana Training Authority, and the *Tracer Study of TEVET and Higher Education Completers in Malawi* of 2009, conducted by Pfeiffer and Chiunda on the behalf of the World Bank and GTZ as part of the CSR Malawi. The above-mentioned studies include questionnaires that can be used for further guidance. A good introduction into the methodologies and implementation practicalities of tracer studies is provided by Schomburg (Center for Research on Higher Education and Work at the University of Kassel/Germany) in the *Handbook for Graduate Tracer Studies* published in 2003.

FIGURE A5.1 - Tracer studies in higher education and TVET analysis



Source: Adapted from Schomburg, 2003.

The design of a tracer study depends on the specific analytical questions, the country context and the intended scope of the analysis. Tracer studies are often used to generate initial or continuous information about sector-wide efficiency questions to inform HE and TVET policy-making and planning processes. On the other hand, it has also become more common to initiate tracer studies as an institutional monitoring tool conducted directly by HE/TVET institutions (consequently targeting only graduates from that particular learning institution).

Usually, the core of a tracer study is comprised of a survey of graduates/completers.[103] Such surveys are intended to collect data to measure external efficiency indicators, such as:

1. Employment/unemployment rates;
2. Employment outcome (formal/informal sector, public/private sector, economic sector; wage/self-employment; whether graduates/completers are employed in the occupational field they were trained for);
3. Income of graduates/completers;
4. Duration of job search after completion of education/training;
5. Promotion and income raises when in employment.

A graduate survey would usually also collect retrospective data on (individuals' perceptions of) the quality and usefulness of the education/training received, to be used in the analysis of the quality of inputs and the teaching/learning process.

Often, the graduate survey is complemented by an employer survey and/or a survey of teachers and instructors to collect expert opinions about the relevance of the outputs of education and training. Employer surveys establish the satisfaction with the competence level of graduates and completers, and may also inform about skills needs and shortages. A number of design issues need to be carefully considered before planning a tracer study. These include, for example:

Scope of Programmes:
Tracer studies may be conducted for individual institutions or programmes, for a selected group of courses/programmes, or comprehensively for the entire HE and/or TVET sub-sectors in a country. The latter approach is often chosen if no previous tracer studies have been conducted and information on external efficiency is generally too weak to inform sector planning.

A comprehensive national tracer study targeting different provider systems may be conducted to generate comparable data on different educational levels and delivery options. This may be particularly interesting in the TVET sector, where a broad range of rather different delivery modes usually co-exist. A tracer study may be limited to certain subjects/occupations. The 2009 tracer study in Malawi, for example, excluded training in the health sector and teacher training on the basis that such training mainly targets public sector employment. Including higher education and TVET graduates/completers, as the 2009 Malawi study did, may produce useful comparative data on the two alternative educational streams.

Time Line
As a general rule, at least 5 cohorts of graduates should be included to obtain sufficient data for an analysis of promotion and income development trends and capture the impact of possible reform efforts in previous years. If only one cohort is included, the tracer study will be methodologically easier and less complex, although no information on career development issues would be generated. Panel graduate surveys have also been conducted, for instance by the University of Kassel's Center for Research on Higher Education and Work.

Sample Size
The particular advantage of a tracer study is the possibility to obtain detailed labour market outcome data across different subjects/occupations and provider systems. This requires, however, a minimum sample size in order to avoid insignificant case sizes. It is generally recommended to set the sample size as high as possible, where it is not possible to survey the entire graduate population. The sample size of accompanying employers' or teachers'/instructors' surveys is usually much smaller.

Resource Requirements
Tracer studies are a complex and methodologically challenging undertaking. Particularly in developing countries, they often target individuals that may not be approachable through electronic media. They therefore require considerable efforts and creativity to trace completers, often involving directly travelling to their work places. Similar difficulties may occur with obtaining base-line data on sample completers. A tracer study therefore requires considerable time to be completed (not less than three months), and considerable financial resources. In its Handbook for Graduate Tracer Studies, the University of Kassel estimates the usual duration to be one year, divided into three stages of four months each, covering survey design, data collection and data analysis. Less complex studies may be accomplished in less time.

Tracing Methodologies
Tracing graduates in less developed countries is a challenge in itself, notably in the case of TVET graduates, who are usually more scattered in the labour market and more often found in less formal employment. Therefore, tracing methodologies have to be carefully designed in accordance with the specific country context and pre-tested before going to scale.
HE and TVET institutions are often located at central and urban locations drawing students from all over the country. Graduates often move to other places after completion of the training. Also, the graduation often marks the start of adult life for young people with the consequence that they change addresses, contact data or even names.
Finding the right tracing methodologies in order to obtain a reasonable response rate and to minimise biases in the sample requires a large degree of persistence and flexibility in the methodology. Tracing methods may include telephone interviews (if initial phone contacts are available from the educational institutions), physical visits to potential employers (such as large companies, public services), visits to employment clusters (in the informal sector) or public announcements in the media. Email tracing is another option, more feasible in the case of higher education than TVET. The success of recent attempts to trace completers by SMS has been limited; the response rates remained low and the scope of questions that could be administered with this methodology was rather limited.[104] Often a snowball system, whereby one successfully traced respondent guides the researcher to a peer, may be appropriate.

Control Groups
A tracer study gains significance once a control group is included, such as school leavers of general secondary education if the tracer study targets post-primary TVET completers. However, defining and tracing the appropriate control group and avoiding bias adds considerably to the complexity of tracer studies.

ANNEX 5.5: INTERVIEW CHECKLIST FOR THE QUALITATIVE ANALYSIS OF EDUCATION SECTOR INSTITUTIONAL STEERING MECHANISMS FOR THE EDUCATION-TRAINING BALANCE (TO BE ADAPTED TO COUNTRY CONTEXT)

I. Review of the different mechanisms and legal and institutional frameworks established in the education/training sector for the steering of the education-employment balance and related issues;

II. Missions and activities carried out by each of the services and/or institutions of the ministry of education, or under its authority;

III. Relevance of the activities and services provided by these institutions with respect to the missions' objectives;

IV. Procedure of capitalisation of the results of the activities carried out by these institutions within the education sector;

V. Relationship between these institutions and other state entities responsible for the oversight of employment issues and the collection of relevant data, and relationships with peer institutions in other countries;

VI. Existence of an information system within these institutions to follow-up on school leavers' and university graduates' careers;

VII. Existence of specific tools for the implementation of missions and activities (reports, studies, surveys and so on);

VIII. Relevance of the profiles/skills of the individuals working in these institutions or responsible for the missions and activities;

IX. Appropriateness of the financial and human resources at the disposal of these institutions;

X. Consultation framework between these services and other stakeholders and players; and

XI. Difficulties faced by these institutions.

CHAPTER 6 ANNEXES

ANNEX 6.1: CLASSIFICATION OF COUNTRIES ACCORDING TO PRIMARY ENROLMENT GENDER DISPARITIES, COMPARING THE ABSOLUTE GAP AND THE GENDER PARITY INDEX

For the following ten francophone countries the absolute gap between the primary level gross enrolment rates for boys and girls has been computed in Table A6.1, and juxtaposed with the gender parity index.

TABLE A6.1 - Gender Disparities in Primary Enrolment, Absolute Gap and GPI, 10 Sub-Saharan African Countries

	Gross Enrolment Rate (%)		Gap	GPI
	Girls	Boys	(Girls – Boys)	(Girls / Boys)
Benin	86.1	111.2	25.2	86.1/111.2=0.77
Burkina Faso	46.5	59.3	12.8	46.5/59.3=0.78
Côte d'Ivoire	63.4	80.1	16.7	0.79
Guinea	70.7	86.9	16.2	0.81
Madagascar	130.8	136.2	5.4	0.96
Mali	56.1	71.2	15.1	0.79
Mauritania	93.3	95.0	1.6	0.98
Niger	37.1	51.8	14.7	0.72
Senegal	74.1	77.9	3.8	0.95
Togo	92.1	110.2	18.0	0.84

The table offers the following insight: three countries' gaps between the GERs of boys and girls are substantially less significant than for other countries: in Mauritania, Senegal and Madagascar, girls' GERs are less than 6 percentage points short of boys' GERs. In most other countries, the difference is generally over 15 percentage points, and in the case of Benin, it even reaches 25 percentage points.

TABLE A6.2 - Country Classification According to Gender Disparities in Primary Enrolment, Absolute Gap and GPI, 10 Sub-Saharan African Countries				
Countries (ranked according to gender gaps)	**Gender Gap in GERs**		**Countries (ranked according to gender parity index)**	**Gender Parity Index**
Mauritania	1.6		Mauritania	0.98
Senegal	3.8		Madagascar	0.96
Madagascar	5.4		Senegal	0.95
Burkina Faso	12.8		Togo	0.84
Niger	14.7		Guinea	0.81
Mali	15.1		Côte d'Ivoire	0.79
Guinea	16.2		Mali	0.79
Côte d'Ivoire	16.7		Burkina Faso	0.78
Togo	18.0		Benin	0.77
Benin	25.2		Niger	0.72

Furthermore, countries that are still far from reaching universal primary education (where GERs fall substantially short of 100 percent), systematically coincide with those where gender disparities are significant, as measured by the GER gap. On the other hand, the relationship is less obvious for countries approaching UPE, some of which appear to have a low level of gender disparity (Mauritania and Madagascar) whereas for others the gender gap in GERs is considerable (Benin and Togo).

In Table A6.2, the countries have been ranked into lists, on the one hand according to their total gender gap in GERs, and on the other according to the GPI. In both instances, the countries with the least level of gender disparities are at the top of the list.

The ranking of countries where the disparities are lowest (Mauritania, Senegal and Madagascar) vary little according to the indicator used. On the other hand, for the countries where the total gap is high, the classification changes substantially. Togo for instance, has one of the greatest absolute gaps, despite being ranked in fourth position according to the gender parity index.

The differences can be explained by the fact that in computing a ratio between the respective enrolment rates of boys and girls, the **gender parity index normalises the gap between both values, relating it to the general level of the GERs.** Therefore, an absolute gap of five percentage points translates into a lower GPI if the GERs are low (such as is the case of Niger), than if the GERs are high (as in the case of Togo).

ANNEX 6.2: THE RESPECTIVE WEIGHTS OF SCHOOLING STAGES IN EXPLAINING GLOBAL DISPARITIES IN THE ENROLMENT OF DIFFERENT GROUPS

The analysis of disparities can also be approached through the review of the schooling careers of diverse groups of pupils, to identify the respective weights of certain schooling stages in explaining overall enrolment disparities. This approach can be very helpful in terms of policy recommendations, as the enrolment situation of a given group (girls, rural children, the poor, and so on) may be more critical at certain levels and grades, such as lower secondary enrolment, or primary progression, leading to different conclusions.

To establish when the disparities are created, it will be necessary to reconstitute the schooling careers of different groups, focusing on the key points of their education (access, retention, transition). Different groups' schooling careers can thus be characterised by a series of probability ratios for each of the main stages of their education. The example used here seeks to explain the disparities between girls and boys in terms of completion of the upper secondary cycle.

To establish the probability of girls completing upper secondary ($p^{(SC)}{}_G$), relative to the probability of boys completing the cycle, the equation must be a function of probabilities of primary access (PA), primary retention (PR), the primary to lower secondary transition (PST), lower secondary retention (LSR), the lower secondary to upper secondary transition (UST) and upper secondary retention (USR). Thus, where G is girl, B is boy:

$$\frac{p^{(SC)}{}_G}{p^{(SC)}{}_B} = \frac{p^{(PA)}{}_G}{p^{(PA)}{}_B} \times \frac{p^{(PR)}{}_G}{p^{(PR)}{}_B} \times \frac{p^{(PST)}{}_G}{p^{(PST)}{}_B} \times \frac{p^{(LSR)}{}_G}{p^{(LSR)}{}_B} \times \frac{p^{(UST)}{}_G}{p^{(UST)}{}_B} \times \frac{p^{(USR)}{}_G}{p^{(USR)}{}_B}$$

By converting each of the two expressions of the equation to logarithms, a comparable equation is reached, although additive rather than multiplicative:

$$Log\,\frac{p^{(SC)}{}_G}{p^{(SC)}{}_B} = Log\left[\frac{p^{(PA)}{}_G}{p^{(PA)}{}_B} \times \frac{p^{(PR)}{}_G}{p^{(PR)}{}_B} \times \frac{p^{(PST)}{}_G}{p^{(PST)}{}_B} \times \frac{p^{(LSR)}{}_G}{p^{(LSR)}{}_B} \times \frac{p^{(UST)}{}_G}{p^{(UST)}{}_B} \times \frac{p^{(USR)}{}_G}{p^{(USR)}{}_B}\right],\ or$$

$$Log\,\frac{p^{(SC)}{}_G}{p^{(SC)}{}_B} = Log\,\frac{p^{(PA)}{}_G}{p^{(PA)}{}_B} + Log\,\frac{p^{(PR)}{}_G}{p^{(PR)}{}_B} + Log\,\frac{p^{(PST)}{}_G}{p^{(PST)}{}_B} + Log\,\frac{p^{(LSR)}{}_G}{p^{(LSR)}{}_B} + Log\,\frac{p^{(UST)}{}_G}{p^{(UST)}{}_B} + Log\,\frac{p^{(USR)}{}_G}{p^{(USR)}{}_B}$$

This latter formulation provides the required disaggregation. Table A6.3 presents the results obtained in the case of Gabon.

TABLE A6.3 - Respective Weights of each Education Level in the Gender Gap throughout Schooling Careers, Gabon, 2004/05

	Primary Access	Primary Retention	Primary to Secondary Transition	Lower Secondary Retention	Transition to Upper Secondary	Upper Secondary Retention	Secondary Completion
Girls (%)	0.987	0.873	0.882	0.582	0.632	0.539	0.151
Boys (%)	0.989	0.875	0.896	0.654	0.727	0.644	0.237
Ratio (Girls/Boys)	0.998	0.998	0.984	0.890	0.869	0.837	0.635
Log (Ratio Girls/Boys)	-0.0009	-0.0010	-0.0068	-0.0507	-0.0608	-0.0773	-0.1975
Weight in Explaining the Gap	**0.4%=-0.0009 /-0.1975**	**0.5%=-0.0010 /-0.1975**	**3.5%**	**25.7%**	**30.8%**	**39.1%**	**100%**
Cumulated Weights	**0.4%**	**0.9%= 0.4%+0.5%**	**4.4%**	**30.1%**	**60.9%**	**100%**	

Source: Authors' calculations based on the *Enquête Gabonaise pour l'Évaluation et le Suivi de la Pauvreté* database, 2005.

According to the calculations, although the gender disparity in secondary completion is significant, the gap was already considerable in lower secondary (it was virtually nil in primary). Indeed, 26 percent of the gender gap in terms of secondary completion is in fact explained by the gender gap in lower secondary retention; 31 percent is explained by disparities in the transition to upper secondary; and 39 percent is due to retention in the upper secondary cycle.

However, given that this type of analysis does not have a chronological dimension; it is not possible to conclude categorically that girls drop out of school more than boys as they progress through their schooling careers. Indeed, the primary enrolment and secondary completion situations indicated by the table apply to different cohorts of children. That said, the picture provided at a given point in time of an education system's disparities nevertheless points to likely future disparity risks, and enables the undertaking of preventive or corrective action to avoid them.

ANNEX 6.3: MODELING/SIMULATION OF THE SCHOOLING PROFILE ACCORDING TO THE SOCIOECONOMIC CHARACTERISTICS OF CHILDREN

Household surveys allow deepening the analysis of disparities through simulations on certain parameters (while holding others constant). The simulations are performed with econometric regressions that estimate the net effect (all other things being equal) of each of the chosen parameters on the phenomenon under scrutiny. They also enable one to predict how the phenomenon may evolve on the basis of assumptions as to how the parameters are likely to change.

An illustration based on the Madagascar CSR is offered below. The simulations relate to disparities in the probability of completing the primary cycle according to area of residence and household wealth, specifically for children who live more than 30 minutes away from the nearest school.

Given that the measured variable is dichotomous (children either complete primary or do not), the most appropriate prediction method is the logistical regression. This enables one to estimate the probability of the occurrence of an event according to the value of the explanatory variables. The 5 to 17 years age group is used as reference, to ensure that as many children as possible are covered by the analysis[105]. The results are presented in Table A6.4.

All other things being equal, in the context of being far from school, children from the poorest two quintiles have a 21 percent probability of completing primary, 17 percentage points lower than children from the wealthiest quintile. Similar gaps also exist between rural and urban children, the former being systematically disadvantaged, whatever their household wealth.

TABLE A6.4 - Simulation of Primary Retention According to Area of Residence and Household Wealth, for Children Living More than 30 Minutes from School, Madagascar, 2005

	Q1_2	Q3_4	Q5	All
Urban	**23%**	**38%**	**48%**	**33%**
Rural	**14%**	**21%**	**28%**	**17%**
All	**21%**	**28%**	**38%**	**25%**

Source: Madagascar CSR, 2008; data from the Priority Household Survey, 2005 (based on logistical regression models).

ANNEX 6.4: EQUITY IN THE DISTRIBUTION OF EDUCATION INPUTS

Absolute gaps, parity indices, scatter charts, maps, and other approaches can be used to illustrate the disparities in the allocation of education resources (teachers, textbooks, desks, and so on) between geographical areas, catchment areas, or schools. Other approaches such as the variation coefficient or the correlation coefficient can also be used, and are discussed briefly here.[106]

THE VARIATION COEFFICIENT

The variation coefficient measures the variability of a variable around its average value. More precisely in the case of equity in the distribution of education resources, the variation coefficient enables the study of the variability of resources (measured for instance by the average expenditure by pupil and by school, the pupil-teacher ratio, the average number of textbooks by student and by school, and other indicators) according to the identity or characteristics of their beneficiary (schools, inspection academies, regions, and so on).

The coefficient is calculated as the ratio between the standard deviation of a given indicator and the average value of the indicator:

Variation coefficient = $\frac{SD_x}{Average_x}$, where x is an indicator measuring education resources,

and the standard deviation SD_x is the square root of the variance of x:

$$SD_x = \sqrt{\frac{1}{n}\sum_{i=1}^{n} (xi - \bar{x})^2}$$

Where perfect equity prevails, the variation coefficient will be equal to zero. Indeed, in this situation, all beneficiaries receive the same amount of resources, equal to the average amount, and the standard deviation is therefore nil. The greater the difference between the variation coefficient and zero, the greater the inequality. This coefficient has the advantage of being comparable between countries, regions, or any geographical division.

TABLE A6.5 - Equity in the Pupil-Teacher Ratios (PTRs) of Schools in Regions A and B

Region A		Region B	
School	**PTR**	**School**	**PTR**
A1	40	B1	40
A2	45	B2	42
A3	23	B3	47
A4	60	B4	43
A5	50	B5	41
Average	= (40+45+23+60+50)/5 = 43.6	Average	= (40+42+47+43+41)/5 = 42.6
SD	$\sqrt{1/5x((43.6-40)^2+(43.6-45)^2 +(43.6-23)^2 + (43.6-60)^2 +43.6-50)^2)}$ = 12.2	SD	$\sqrt{1/5x((42.6-40)^2+(42.6-42)^2 +(42.6-47)^2 + (42.6-43)^2 +42.6-41)^2)}$ = 2.41
Variation Coefficient	= 12.2/43.6=0.28	Variation Coefficient	= 2.41/42.6=0.06

Table A6.5 compares the pupil-teacher ratios (PTRs) for five fictitious schools in each of two regions A and B. The variation coefficient for Region A is 0.28 (= 12.2 / 43.6), whereas the coefficient for Region B is 0.06 (= 2.41 / 42.6), which demonstrates that the distribution of teachers among schools is more equitable in Region B than in Region A.

THE CORRELATION COEFFICIENT OR R^2

The correlation coefficient enables the study of the intensity of the relationship between two variables. This coefficient can be useful because it can measure the link between a region's need for resources and the allocation of resources received, for instance. Regions with sub-standard enrolment performance might be expected to receive more resources than those who do not have an enrolment issue. The correlation coefficient will verify this, by calculating the relationship between an enrolment indicator (such as a completion rate) and an indicator measuring the level of resources allocated.

The coefficient of correlation between two variables is calculated by dividing the covariance of the variables by the product of their standard deviations. The coefficient ranges between -1 and 1. The closer it is to the extreme values of -1 and 1, the stronger the correlation between the variables. If the coefficient is equal to -1 or 1, the two variables are perfectly correlated, meaning that the strength of the link between them is maximal. When negative, one of the variables is inversely related to the other, and when positive, both variables change in the same direction. A correlation coefficient of zero indicates that the variables are completely independent, and any change in one has no impact on the other[107].

ANNEX 6.5: STRUCTURAL DISTRIBUTION OF PUBLIC EDUCATION EXPENDITURE WHEN SCHOOLING PROFILE DATA IS UNAVAILABLE

In the example illustrated here, the Average Enrolment Rate (AER, see Annex 2.2) is used. The AER is calculated by dividing the number of non-repeating enrolled children in the cycle by the population of the theoretical age-group for that cycle.

The first step is to estimate adjusted unit costs, UC, for each cycle, by dividing the public recurrent expenditure by the total number of students (in public and private schools). Then, the analysis continues with the calculation of the distribution of individuals by terminal schooling level (column 5 in Table A6.6 below). This share, for a given cycle, is estimated by the AER for that cycle minus the AER for the following cycle. Thus, 67 percent of primary aged children are enrolled in primary (column 4), and 30 percent are enrolled in secondary. Therefore, 37 percent (= 67 - 30) of children ended their schooling in primary; for 37 percent of children, primary is their terminal schooling cycle. Likewise, 30 percent of the theoretical age-group are enrolled in lower secondary, against 12 percent in upper secondary. Therefore, for 18 percent (= 30 - 12), lower secondary is the terminal level.

Secondly, the analysis must determine the amount of public resources consumed by pupils, for each cycle (column 6). This is equal to the recurrent unit cost of one year of teaching at that cycle (column 2) multiplied by the number of years required to complete the cycle (column 3). So for the primary cycle that lasts six years, the public resources consumed by a pupil who completes the cycle (assuming they do not repeat) are GF 50,292 x 6 years, or GF 301,752. For lower secondary, unit costs are GF 94,308 x 4 years = GF 377,232.

The cumulated amount of public resources consumed by each terminal level is obtained by adding the resources required for a given level to those required to reach the previous level (column 7) Thus, for a child that dropped out of school at the end of lower secondary, the government spent six years of primary education unit costs, or GF 301,752 (column 6), plus four years of lower secondary unit costs, or GF 377,232. In total, 301,752 + 377,232 = GF 678,984. On the same basis, a child who reached higher education would have consumed GF 6,569,025.

If the total population count is artificially set at 100, then 33 children (= 100 - 67) would never have attended school (column 5). For them, the government incurred no expense (column 7). A child who completed their primary cycle would have cost the state GF 301,752. Consequently, for the 37 members of the cohort for whom the primary level was the terminal one, the state invested a total of GF 301,752 x 37 = 11,164,824 (column 8). The 18 members of the cohort who ended their schooling during lower secondary consumed 18 x GF 8,984 = GF 12,221,712 of public resources for their education, and so on.

To fill column 9, the share of public education resources consumed by each group (by terminal education level) must be computed on the basis of column 8 data. The government would thus have spent GF 11,164,824 for the group of children who finished during primary, of a total amount of GF 54,297,099 (last line of column 8, equal to the sum of the resources consumed by each group). The share is then obtained by straightforward triangulation: 11,164,824 x 100 / 54,297,099 = 20.6 percent. Likewise, for lower secondary, the GF 12,221,712 represents 22.5 percent of the total amount of public financing (12,221,712 x 100 / 54,297,099).

TABLE A6.6 - Structural Distribution of Public Education Expenditure among a Cohort of 100 Pupils (AER Approach), Guinea, 2000

1. Cycle	2. Unit Cost (recurrent public expenditure per public and private student) ('000 GF)	3. Length of Cycle	Cohort		Public Resources		Cumulated Public Resources Consumed by Group		10. Cumulated Share of Cohort (Xi)	11. Cumulated Share of Resources (Yi)	12. External Areas
			4. AER (%)	5. Share by Terminal Cycle (%)	6. By Cycle	7. Cumulated, by Terminal Cycle	8. Amount (Col. 7 x Col. 5) (GF)	9. Share (%)			
Never Enrolled	0			33=100-67	0	0	0	0	33	0	0
Primary	50,292	6	67	37=67-30	301,752 = 50,292 x 6	301,752	11,164,824 =301,752 x 37	20.6 = 11,164,824 /54,297,099	70=33+37	20.6	380=(20.6-0) x (70-33) / 2
Lower Secondary	94,308	4	30	18=30-12	377,232 = 94,308 x 4	678,984 = 301,752 + 377,232	12,221,712 =678,984 x 18	22.5	88	43.1= 20.6+22.5	573=(43.1+20.6) x (88-70) / 2
Upper Secondary	188,616	3	12	9=12-3	565,848 = 188,616 x 3	1,244,832 =678,984 +565,848	11,203,488	20.6	97	63.7	480
Higher	1,774,731	3	3	3	5,324,193 = 1,774,731 x 3	6,569,025 =1,244,832 +5,324,193	19,707,075	36.3	100=97+3	100	246
Overall		-	-	100	6,569,025	8,794,593	54,297,099	100			1,679
13.Gini	0.664=1 –2 x (1,679/(100 x 100))										

Source: World Bank, 2005d (Guinea CSR).

percent. Likewise, for lower secondary, the GF 12,221,712 represents 22.5 percent of the total amount of public financing (12,221,712 x 100 / 54,297,099).

Column 10 is obtained by cumulating the shares of each population group found in column 5: the cumulated share of individuals who do not receive secondary education (70 percent) is equal to the sum of the share of those who never enrolled (33 percent) and those for whom primary was the terminal level (37 percent). Those who never benefitted from upper secondary (88 percent) are the sum of the former (70 percent), and those for whom lower secondary was the terminal level (18 percent).

Column 11 is reached by cumulating the shares of resources consumed by each group of children, as per column 9. Thus, the cumulated percentage of resources spent on children who never reached upper secondary is 43.1 percent: 0 percent for those who never enrolled, 20.6 percent for those who dropped out during primary and 22.5 percent for those who dropped out during lower secondary.

ANNEX 6.6: INTERMEDIATE COMPUTATION OF THE APPROPRIATION INDEX

The share of education expenditure consumed by boys for instance (see the last column of Table A6.7, the same as column [a] of Table 6.13), is obtained by combining two data sets: (i) the distribution of boys aged 5 to 24 years among different education levels (provided by Table A6.8); and (ii) the share of resources consumed by level and cycle (provided by Table A6.9).

The cells of Table A6.7 for boys are obtained by multiplying the share of resources consumed by each level (provided by Table A6.9) by the value of the cell corresponding to the given level, as provided by the first line of Table A6.8, and divided by 100. Thus, the resources consumed by boys whose terminal level is secondary is obtained by multiplying the share of boys for whom secondary is the terminal level (56 percent) by the share of resources devoted to individuals for whom secondary is the terminal level (41.2 percent), and dividing by 100: 56 x 41.2 / 100 = 23.1 percent. A similar approach is used for each other level. The total column of the table, that is a sum of the values on the line, provides the overall share of public resources consumed by boys (52.9 percent in our example). It can be assimilated into a weighted sum of Table A6.9, the weights being the percentages of Table A6.8. The same analytical approach can be used for the other socioeconomic groups (rural populations, the poor, and so on).

TABLE A6.7 - Share of Public Resources Consumed by each Group (%), The Gambia, 2006

	Highest Level of Education Attained					Total
	Never Enrolled	**Basic 1**	**Basic 2**	**Secondary**	**Higher**	
Gender						
Boys	**0.0=44.8x0/100**	**4.1=48.4x8.5/100**	**13.6=51.5x26.4/100**	**23.1=56x41.2/100**	**12.1=50.7x23.9/100**	**52.9**
Girls	0.0	4.4	12.8	18.1	11.8	**47.1**
Total	*0.0*	*8.5*	*26.4*	*41.2*	*23.9*	***100.0***
Area of Residence						
Urban	0.0	3.3	13.3	29.2	18.3	**64.0**
Rural	0.0	5.2	13.1	12.0	5.6	**36.0**
Total	*0.0*	*8.5*	*26.4*	*41.2*	*23.9*	***100.0***
Household Wealth						
Q1	0.0	1.5	2.7	1.4	0.2	**5.8**
Q2	0.0	1.8	5.2	4.0	1.2	**12.3**
Q3	0.0	1.7	5.2	6.2	1.9	**15.0**
Q4	0.0	1.8	6.3	8.9	3.9	**20.9**
Q5	0.0	1.6	7.1	20.7	16.7	**46.0**
Total	*0.0*	*8.5*	*26.4*	*41.2*	*23.9*	***100.0***

Source: Government of The Gambia, World Bank and Pôle de Dakar, 2011 (The Gambia CSR).

TABLE A6.8 - Social Distribution of Youth Aged 5-24 Years among Education Levels (%), The Gambia, 2006 (Table 6.12 in the main text)						
	Highest Level Attained (%)					**Total**
	Never Enrolled	**Basic 1**	**Basic 2**	**Secondary**	**Higher**	
Gender						
Boys	**44.8**	**48.4**	**51.5**	**56.0**	**50.7**	**48.7**
Girls	55.2	51.6	48.5	44.0	49.3	51.3
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Area of Residence						
Urban	27.9	38.5	50.4	70.9	76.5	37.9
Rural	72.1	61.5	49.6	29.1	23.5	62.1
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Household Wealth						
Q1	26.9	17.7	10.3	3.4	0.7	19.6
Q2	21.9	21.5	19.6	9.7	5.1	20.2
Q3	21.9	20.1	19.5	15.0	8.1	20.0
Q4	17.4	21.7	23.8	21.6	16.2	20.2
Q5	11.9	18.9	26.8	50.3	69.9	20.0
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: Government of The Gambia, World Bank and Pôle de Dakar, 2011 (The Gambia CSR).

TABLE A6.9 - Share of Resources Consumed by Level and Cycle, The Gambia, 2006 (Column 8 Of Table 6.10 in the main text)		
Cycle	**Share of Resources Consumed by Level (%)**	**Share of Resources Consumed by Cycle (%)**
Never Enrolled	0.0	
Basic 1	0.4	
	0.8	
	1.0	
	1.1	
	1.3	
	3.9	**8.5**
Basic 2	1.6	
	5.1	
	19.8	**26.4**
Secondary	1.9	
	7.1	
	32.2	**41.2**
Higher	23.9	**23.9**

Source: Government of The Gambia, World Bank and Pôle de Dakar, 2011 (The Gambia CSR).

NOTES

93 It is left to the reader to explore other, more detailed literature on how best to handle missing data, for example Wooldridge, J.M. Introductory Econometrics: A Modern Approach. South-Western College Pub. 4th edition, 2009.

94 'Wastage' refers to the combined effect of grade repetition and drop-out.

95 A variant of this method uses an estimate of the actual average ages of the pupils in each academic year instead of the official theoretical ages. This variant gives results that are very close to those calculated by the traditional method.

96 See Section 1.1 on budget procedures (planning, approval, commitment and so on).

97 The Office National de l'Informatique (ONI) is an IT service responsible for processing personnel payroll data.

98 For the calculation, one assumes that survival rate is 100% in each cycle.

99 Often referred to as CWIQ.

100 Often referred to as MICS.

101 European Regulation n° 1991/2002 made quarterly and continuous employment surveys compulsory in member states as of 2003 and the Regulation n° 1897/2000 provides a detailed protocol for the identification of the unemployed.

102 In case it is difficult to build a sample which is representative of the active population having recently left education/ training, as described in this annex, it is recommended to use the 15-29 years old age-group as ILO does when implementing surveys on education to work transition.

103 Usually a tracer study targets the graduates of education and training programmes. However, specifically in non-formal education and training, those who complete the program may not be called graduates, because they may not hold a formal or nationally recognised certificate. These are referred to as leavers or completers instead. It may also be interesting to compare the employment performance of completers with those who attended training programmes but dropped out prematurely in order to establish whether it is the actual qualification or the skills acquired that matter in the labour market. The Higher Education Tracer Survey conducted in Malawi in 2009 (Pheiffer and Chiunda, 2009) studied this idea, finding that graduates are better off in the labour market than those who did not complete their studies.

104 See for example World Bank, 2012. Baseline Survey: Labour Market Outcomes of Punjab TEVTA Graduates. Discussion Paper Series. Report No. 52 (South Asia Human Development Sector).

105 It is based on the assumption that there are very few students enrolled in primary education after the age of 17.

106 See Chapter 4 for a complementary analysis of the allocation of public resources.

107 Note that the correlation coefficient between two variables x and y can be easily calculated with Excel or Calc, through: *Formula – Insert Function – CORREL* (Excel 2007).

EDUCATION SECTOR ANALYSIS
METHODOLOGICAL GUIDELINES

VOLUME 1

The purpose of these guidelines is to provide methods for comprehensive education sector analyses to support the preparation and monitoring of education sector plans.

They are an update of a 1999 document that has been used to support the preparation of approximately 70 Education Country Status Reports (CSR) in more than 40 countries.

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