KiPPRA

The KENYA INSTITUTE for PUBLIC
POLICY RESEARCH and ANALYSIS

Impact of Gender and Socio-Economic Factors on Learning Achievements in Primary Education in Kenya: Empirical Evidence

Eldah N. Onsomu

George Kosimbei

Moses W. Ngware

DP/56/2006

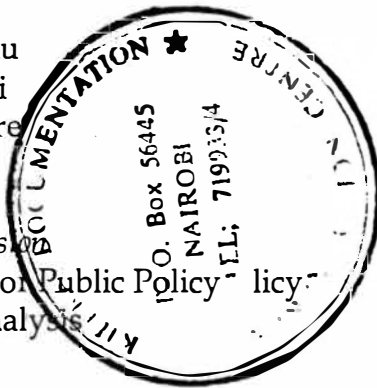THE KENYA INSTITUTE FOR PUBLIC
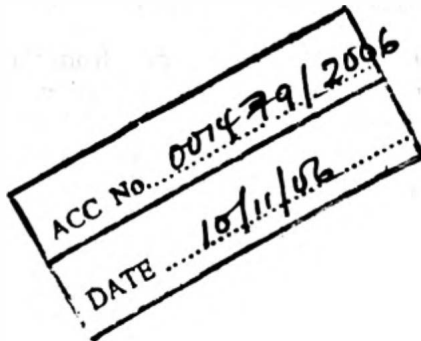POLICY RESEARCH AND ANALYSIS
(KIPPRA)

Σ

Impact of Gender and Socio-Economic Factors on Learning Achievements in Primary Education in Kenya: Empirical Evidence

Eldah N. Onsomu
George Kosimbei
Moses W. Ngware

Social Sector Division
Kenya Institute for Public Policy
Research and Analysis

KIPPRA Discussion Paper No. 56
January 2006

KIPPRA IN BRIEF

The Kenya Institute for Public Policy Research and Analysis (KIPPRA) is an autonomous institute whose primary mission is to conduct public policy research leading to policy advice. KIPPRA's mission is to produce consistently high-quality analysis of key issues of public policy and to contribute to the achievement of national long-term development objectives by positively influencing the decision-making process. These goals are met through effective dissemination of recommendations resulting from analysis and by training policy analysts in the public sector. KIPPRA therefore produces a body of well-researched and documented information on public policy, and in the process assists in formulating long-term strategic perspectives. KIPPRA serves as a centralized source from which the government and the private sector may obtain information and advice on public policy issues.

The Discussion Paper Series disseminates results and reflections from ongoing research activities of the Institute's programmes. The papers are internally refereed and are disseminated to inform and invoke debate on policy issues. Opinions expressed in the papers are entirely those of the authors and do not necessarily reflect the views of the Institute.

Abstract

Gender and socio-economic background of a pupil have a link to school opportunities and achievement. However, their effects vary across cultures and environments. This paper examines gender parity in primary schools in Kenya and factors that explain the differences in performance in mathematics and reading. The paper also presents an analysis of internal efficiency and gender equity in primary schools in Kenya and empirical evidence on what explains achievement in mathematics and reading scores. Gender differentials are manifested in schooling performance. Various gender-related and socio-economic variables affect pupils' performance in mathematics and reading differently. Overall, boys perform better than girls in both mathematics and reading. Teachers' competency in subject matter has positive impact on performance in reading and mathematics. Emerging policy implications include need to put more emphasis on the professional development of teachers in mathematics and reading; and enhancing reading skills for both teachers and students. Pedagogical interventions in Kenya's basic education should focus on improving performance of girls in both mathematics and reading. Provision of basic schooling sanitation facilities should also be increased. General reduction in poverty levels would lead to improvement in schooling performance.

Abbreviations and Acronyms

ASAL	Arid and Semi-Arid Lands
EFA	Education for All
HIV/AIDs	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
FGM	Female Genital Mutilation
GER	Gross Enrolment Rate
KIPPRA	Kenya Institute for Public Policy Research and Analysis
LSMS	Living Standards Measurement Survey
IDS	Institute for Development Studies
IIEP	International Institute for Education Planning
IMF	International Monetary Fund
MDGs	Millennium Development Goals
NFE	Non-formal Education
NER	Net Enrolment Rate
SACMEQ	Southern and Eastern Africa Consortium for Monitoring Education Quality
UNESCO	United Nations Educational, Scientific and Cultural OrganiZation

Table of Contents

1.   Introduction

Gender equality[1] and impact of socioeconomic differences in provision of learning opportunities are some of the major concerns in education development in many developing countries. Of particular concern is unequal or the disadvantaged position of women as compared to men and by extension girls as compared to boys in education participation and performance, and impact of poverty on households' schooling choices and levels of learning achievements. According to the goals of Education for All (EFA) and Millennium Development Goals (MDGs), many countries are faced with challenges of eliminating gender disparities in primary and secondary education by 2010 and achieving gender equality in education by 2015, with specific focus on ensuring girls' full and equal access to, and achievement, in basic education (UNESCO, 2003). To achieve these targets, informed strategies to improve participation of both male and female citizens in various socioeconomic activities, including education are necessary.

In most developing countries, gender differentials in education are more pronounced in terms of participation and internal efficiency and in cognitive performance, with girls being the most affected. While enrolment rates to some extent do not differ greatly, more boys than girls complete schooling, especially at primary school (IMF, 2005). However, country-specific empirical analysis has not been done, especially at lower levels, giving cognizance to regional socio-economic characteristics.

---

[1] According to UNESCO's EFA Global Monitoring Report 2003/04, 'gender equality' refers to the notion of boys and girls experiencing the same advantages or disadvantages in attending school, receiving teaching methods, curricula, and academic orientation, and producing equal learning achievement and subsequent life opportunities.

Kenya is committed to ensuring quality provision of Education for All by 2015 and Universal Primary Education by 2005. Policy initiatives towards achieving this goal have included abolition of user charges in primary education in 2003. During this year, primary gross enrolment reached 7.2 million pupils (48.6% female) having risen from 5.4 million pupils in 1989 (48% female). Interventions aimed at promoting girls education, include taking affirmative action in support of girl-child education; expansion and improvement of classrooms, boarding facilities and water and sanitation facilities to create conducive and gender responsive environments, particularly in Arid and Semi-Arid Lands (ASALs); and providing support to non-formal education institutions (Government of Kenya, 2005a, 2005b).

Despite the impressive gains in access to education, issues of gender equality in participation, progression and performance in all education levels require further analysis. Customs and circumstance lead to a range of cultural practices, which cause differences in schooling outcomes. For instance, at the time of the 1999 population census, 36 percent of all males aged 6 and above were attending school, compared to 34 percent of females (Government of Kenya, 2002). More glaring gender differences were observed among the population who never attended school. Female participation in education dropped from 30 in 1989 to 22 percent in 1999, while that of males dropped from 18 percent in 1989 to 14 percent in 1999. The gender gap had also narrowed during the 10 years span implying that participation rates are close to gender parity.

Therefore, it is important to understand the underlying factors contributing to the differences related to gender and socio-economic factors, including schooling performance, in order to provide reliable data and empirical evidence for informed policy formulation. Boys have been perceived to perform better than girls and more elaborate

techniques of data analysis are required to establish whether gender differences have any impact on education outcomes.

According to SACMEQ[2] I policy research survey of 1998, 22.6 percent female Standard Six pupils achieved desirable competency levels in reading compared to 24.2 percent of their male counterparts (Nzomo, Kariuki and Guantai, 2001). Another challenge is the difference between females and males in learning as measured by internal efficiency indicators, including dropouts, repetition, completion and transition. Therefore, although the Government underscores the role of women and/or gender parity in economic development through poverty reduction, gender differences are apparent in the schooling process. Further, there is a dearth of empirical evidence on implications of gender and socio-economic factors on education outcomes in Kenya.

This study investigates the gender differentials in schooling (participation, internal efficiency and survival rates) and the impact on learning achievements in mathematics and reading. It is motivated by realization that recent education policy reforms in Kenya appear to be based on the understanding that given the appropriate opportunity to learn, all children can master the knowledge and the skills specified in the basic education curriculum. The school system is slowly adopting a culture of quality as the basis for its operational practice. There is more focus on learning as the central goal of the education system at all levels as opposed to passing examinations, ensuring that teachers and administrators have the means and skills required to bring about quality results.

---

[2] SACMEQ is an acronym for Southern and Eastern Africa Consortium for Monitoring Education Quality. The Consortium undertakes cross-national research aimed at improving the quality of education in member countries and capacity building in policy research. Currently, the 15 member ministries of education include Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania (Mainland), Tanzania (Zanzibar), Uganda, Zambia, Zimbabwe and UNESCO-International Institute for Education Planning (IIEP).

SACMEQ I and II projects provide assessments of the conditions of schooling and the quality of education provided by primary education systems (Onsomu, Nzomo and Obiero, 2005). Creating equal learning opportunities and managing challenges of equity are among the pillars that anchor a culture of quality improvement. Similar studies in Kenya have tended to focus on learning achievement as measured by national examination scores. This study deviates from this traditional measure of learning achievement and uses scores in competency tests in reading and numeracy as the dependent variable.

In Kenya, English is the official language of communication, though schools allow some lessons in lower primary classes to be conducted in other languages such as Kiswahili. Being able to read, especially in English, is therefore critical to what a pupil learns in school. On the other hand, ability in numeracy assists the learner in logic and or abstract thinking. Logic and abstract thinking aids the learner in conceptualising theory into practice, and therefore be able to apply the content learnt into real life situations. It is in this context that the study focuses on reading and numeracy

With quality improvement, the focus of primary education shifts from mere participation and passing certification requirements, which is examination-oriented, to learning acquisition and outcomes. Though efforts are being made by the Ministry's Quality, Assurance and Standards Directorate (QASD) unit to improve the quality of education, in practice, there is a gradual shift to competency-based learning achievement with the school system clinging to preparing for national examinations due to public expectations. The current move to improve the quality of primary education in Kenya, as evidenced in the recently launched Kenya Education Support Programme (KESSP), brings with it not only the need to re-evaluate assessment systems, but also to establish the impact of learner characteristics on learning outcomes as measured by quality-based assessment scores such as competency tests.

The value added by this research paper on existing knowledge, therefore, lies on the empirical results that show the impact of selected learner characteristics on learning outcomes based on competency scores rather than scores from a certification requirement examination. The findings provide an opportunity for educational researchers to exchange, share and discuss the policy implications of their research results with policy makers and implementers, with a view to formulating effective policies and practices for improving equality in education and educational quality. To this end, the broad objective of this study is to assess gender disparities in primary education schooling and provide an empirical experience on the impact of gender and socio-economic differences on learning achievments at Standard Six of primary school level.

2.   Review of Related Literature

In this section, both theoretical and empirical literature on gender differentials and schooling performance are reviewed. All systems of education have multiple outcomes, such as cognitive achievement (what do the pupils know), affective achievement (attitudes such as whether the pupils like going to school or like subjects such as science, reading or mathematics) and behavioural values (such as civic responsibility and good moral values such as respect and social work). However, there has been growing discontent along gender lines on boys performing better than girls, especially in science-oriented courses. Pupils and teachers come from different gender, socio-economic levels and location. These variables may affect the participation and performance of pupils in school, either negatively or positively.

Boadu (2000) observes that boys from wealthier households in Ghana had enrolment rates 34 percentage points higher than boys from poor households; the gap in favour of girls from rich background compared with girls from low-income background was 55.4 percentage points. Wealth gaps in enrolment greatly exceed gender gaps in enrolment. The allocation of scarce household resources affects girls more than boys (Boadu, 2000). Early domestic responsibilities, especially among young girls, conflict with the pursuit of education. Retrogressive cultural practices such as female genital mutilation (FGM) and early marriages prevent the advancement of girls in education. The willingness of parents to educate girls is reduced by socio-economic and cultural effects such as their expected change of allegiance after marriage to the husband's family.

Poor health, which is a consequence of either malnutrition or of common diseases, was found to be a constraint on schooling (Boadu, 2000). It is an impediment to enrolment because parents fear sending their children

to school when the probability of contracting contagious diseases is high. Lack of proper water and sanitation facilities prompted pupils to go for safe drinking water from neighbourhood rivers and streams.

Distribution of female teachers has an important impact on school quality for female pupils. Female teachers are important in providing girls with role models and in providing counseling, especially on issues related to puberty.

Cultural practices, such as the existence of gendered division of labour within the household can probably lead to higher opportunity costs being associated with the schooling of girls relative to boys. Factors related to cultural norms, traditional beliefs and practices have a strong influence on girls' enrollment, persistence and performance in school. In some societies, initiation ceremonies are performed when children reach the age of puberty, which is considered to be the onset of adulthood. During the ceremony, knowledge and values concerning procreation, morals, sexual skills, birth control and pregnancy are passed on to the girls concerned. Boys undergo similar rituals preparing them for manhood. Unlike boys, it is considered shameful for girls to return to school after undergoing such rituals (Boadu, 2000).

The tangible benefits of schooling observed by Boadu (2000) are linked to the availability of employment opportunities in the formal sector. Lack of opportunities for formal employment, particularly in rural areas, may deter parents from sending children to school.

On average, gross enrolment ratios at primary school level in developing countries have increased by about 25 percent to around 100 percent (Colclough, Rose and Tembon). Significant increases have taken place for both girls and boys, with an aggregate gender gap in enrolments persisting in all regions.

Further, poor school quality is associated with poor academic results, with higher levels of repetition and dropout and with lower progression ratios to higher levels of the education system than is the case for better schools. Communities served by poor quality schools often recognize that they are likely to gain less, leading to lower demand and to more children being out of school.

In general, negative attitudes towards girls' schooling relative to that of boys remain. On the other hand, children who do not attend primary school are overwhelmingly from poor households. The majority of such non-attendees are girls. Two main reasons exist as to why poorer households may choose not to send their children to school (Coclough, Rose and Tembon, undated). First, the direct costs may be too high even with the universal free primary education. Parents incur expenditures for school uniforms, text and exercise books, construction or upkeep of school buildings, and other inputs in cash or in kind. Second, poorer households may depend, more so than richer households, upon the labour of their children in order to supplement household income, either directly, on the farm or indirectly.

Gendered roles in society change the balance of incentives for girls and boys to attend school. Leadership, male domination, and early girl marriages give less incentive to girls to perform well in school (Figure 1). This has been complicated further by the belief among some pastoralist communities in Africa that ownership of more domestic animals increases an individual's social status in the society. In such communities, girls are withdrawn from schools for marriage in exchange (dowry) for cattle, sheep, goats, donkeys or camel for the father.

The school environment may also be more conducive to the attendance and performance of boys than of girls. Male teachers may not provide girls sufficient support, and they may even be sexually threatening. Toilet facilities for girls' may be inadequate, while other facilities may be

unfriendly to girls (Coclough, Rose and Tembon, undated). Harassment from boys may occur, and the distance to school may have greater attendant risks for the safety of girls than boys.

A married girl's allegiance is more to her husband's family, resulting in sons being favoured for education than girls. Where girls are expected to perform household chores and to look after young siblings, the demands on their time may be greater than that for boys, and their school attendance may be more affected. Where a girl's allegiance after marriage is mainly to her future husband's family, the balance of perceived benefits to parents are likely to favour the education of sons over daughters. Where men mainly take schooling decisions in families, the education

Figure 1: Interactive effects of gender differentials in schooling
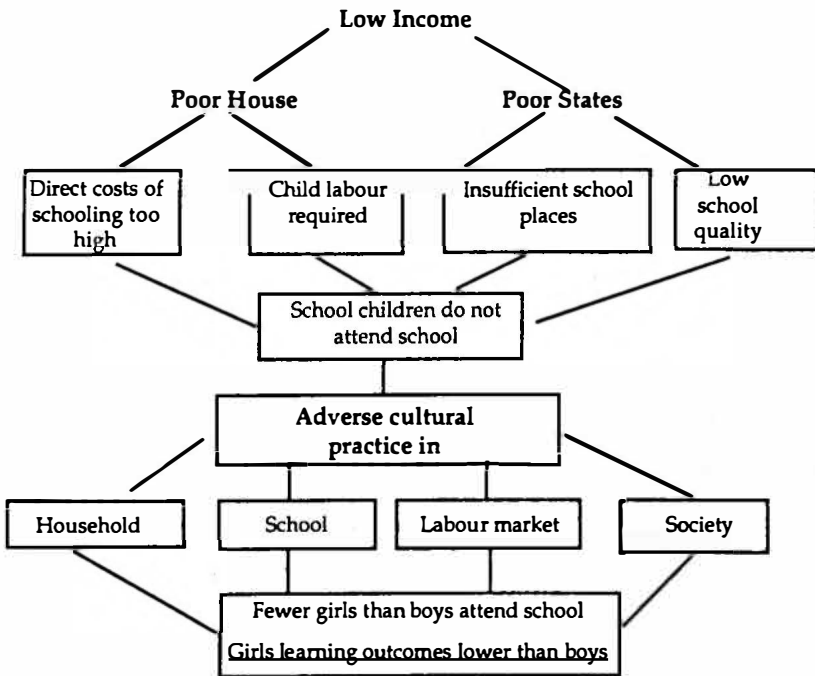
Source: Colclough, Rose and Tembon, undated)

of boys may again be more advantaged.

Colclough, Rose and Tembon (undated) studied gender inequalities in primary schooling and the role of poverty and adverse cultural practice on schooling. The study suggests a model of the relationships between poverty, schooling and gender (Figure 1). Evidence is presented to show that a wide variety of cultural practices impede the attendance and performance of girls at school, relative to boys. Findings reveal that poor households tend to have lower demand for schooling than richer households; whatever the benefits of schooling, the costs, for them, are more difficult to meet than is the case for richer households. Economic development is neither a necessary nor a sufficient condition for securing moves toward gender equity in schooling.

Ilahi (2001) studied gender in children's work and schooling in Peru using Living Standards Measurement Survey (LSMS) panel data. The study investigated the determinants of time allocation of boys and girls to schooling, housework and income-generating activities. The paper argues for the inclusion of housework in the broader definition of child labour, since this would capture the effects of household welfare, age composition, adult employment and sickness on children's time use, particularly that of girls. The traditional approach of defining the debate on child labour by focusing on the choice between income-generating activities and schooling is likely to have a gender-bias, since girls tend to work primarily at home and boys outside. The study established that the demand for girls schooling and their labour activities responds more strongly to household welfare, demographics and adult female employment than that of boys.

Nzomo, Kariuki and Guantai (2001), for instance, established a positive correlation between the socio-economic status of Standard Six pupils and the level of their learning achievements in Kenya. The results show

that as the socio-economic status of the sample pupils improved, the mean scores in the learning achievement also tended to increase. Families with higher socio-economic status had the ability to provide their children with necessary facilities and materials pertinent in improving performance. School location was also another key factor influencing learning achievement. Pupils in urban settings obtained higher mean scores in narrative, expository and documentary dimensions focused on during the study as compared to their counterparts in rural schools.

From SACMEQ I and II, cross national analysis by Miako (1998a) on differences in average reading and mathematics achievement scores by gender at Standard Six, girls scored significantly higher than boys in Seychelles (+65), Botswana (+27), South Africa (+27), Mauritius (+26) while in Tanzania, boys scored significantly higher than girls (-16) in reading. For mathematics, only in Seychelles did girls score significantly higher than boys (+38). In Tanzania (-33), Kenya (-22), Mozambique (-18), Zanzibar (-14) and Malawi (-10), boys performed significantly better than girls (Miako, 1998a). The study indicates that in all countries, at no instance were Standard Six girls less advantaged than their male counterparts; more important differences were the disparities between geographical locations and socio-economic levels. In Mozambique for instance, fewer girls than boys were enrolled in grade 6 and these girls were from higher socio-economic background than boys. However, although these girls were expected to perform better than their male counterparts, they repeated more frequently and scored significantly lower scores in both reading and mathematics.

Miako (1998b) analyses gender issues *vis a vis* socio-economic status and school location differences in Grade Six reading literacy in Mauritius, Namibia, Zanzibar, Zambia and Zimbabwe. She established that although there were no significant gender differences in schooling, differences between regions, socio-economic groups, and school location

were much more significant. This took the form of differences in wealth, and traditionally, the richer tend to be in urban areas where schools are better equipped, and the better teachers prefer to live there. In some of these countries, the level of reading was very low in general at Grade Six and children were hardly reading after school hours, especially in rural areas. The main policy implication emerging from this study was the need for better allocation of resources to rural schools in order to improve the quality of education provision and performance.

Studies done elsewhere show that a school environment that is not conducive to effective learning may lead to under-achievement, which results to repetition, a precursor for dropout (Chimombo, 2000). This study argues that repetition has harmful effects on students' self esteem and attitude towards schooling and this increases likelihood of dropping out of school. The study observes that teachers' attitude, behaviour and teaching practices have significant implications for female persistence and academic performance. Societal beliefs, which teachers bring to the classroom, also have profound implications on learning achievements. Chimombo (2000) observes that cultural beliefs that look at girls as having less ability than boys if brought to the classroom may lead to marginalization of girls and further demotivate them in their academic performance. In assessing the impact of related socio-economic factors in Malawi, the study concludes that inadequate provision and conditions of facilities like toilets has negative effects on female student persistence in school.

Kenya SACMEQ II report (Onsomu, Nzomo and Obiero, 2005) performed a multilevel analysis of the factors influencing Standard Six pupils' achievement in Kenya. The multilevel analyses were carried out in order to identify the major pupil-level, school-level and province-level factors influencing achievement in reading and mathematics among

Standard Six pupils. The study addresses the problems of traditional linear models with assumptions that subjects respond independently to educational programmes. It was found that younger pupils achieved better than their older counterparts, and this is attributed to grade repetition by the less able students. Boys achieved better than girls in mathematics, but not in reading. Pupils who always spoke English at home achieved better in school. Pupils from homes with better quality houses, many possessions and more educated parents were achieved better in school while those who ate at least three meals per day achieved better than pupils who ate fewer meals per day. Pupils who had never repeated a grade were better than pupils who had repeated a grade one or more times. Pupils given homework more frequently and had it corrected performed better than pupils who received homework but had it corrected less frequently. Pupils who were never absent from school performed better than those pupils who were frequently absent from school. Pupils who had most learning materials were estimated to achieve better than those who had hardly any learning materials. Pupils who had their own working places in class had better achievements than pupils who shared working places or had no working places in class.

Under the school level model, schools with smaller pupil-teacher ratios were estimated to perform better than schools with larger pupil-teacher ratios. Schools with a majority of their pupils from homes with good quality houses, more possessions and more educated parents were estimated to perform better than schools with a majority of their pupils from homes with poor quality houses, less possessions and less educated parents. Schools with little or no pupil's behaviour problems were estimated to perform better than schools with many pupils' behaviour problem. Schools in which a majority of the pupils were never absent from school were estimated to perform better in reading (but not in mathematics) than schools in which a majority of the pupils were more

often absent from school. Schools with teachers who had more professional training were estimated to perform better in mathematics (but not in reading) than schools with untrained teachers or teachers who had little professional training.

3.   Methodology

The study utilized both descriptive and inferential analysis. Under descriptive analysis, tables and figures are used to show the extent of gender differential in schooling outputs. Under inferential analysis, regressions are used to estimate a multilevel function of schooling performance.

3.1   Data Sources and Type

Data sources include Ministry of Education, Science and Technology; SACMEQ II Data Archive and Kenya Education Trend Data, among other relevant data sources. The Kenya SACMEQ (2000) II study sample was 185 primary schools and 3,299 Standard Six pupils. The sample was obtained through stratified random sampling techniques and is representative of all provinces and districts in Kenya.

The data contains variables on allocation of human and material resources among schools and regions. Technical information about sampling procedures, data collection, instrument construction, fieldwork, and test construction may be obtained from the Data Archive (2004). Data types include pupils' characteristics and learning environment, teachers' characteristics and their views on teaching, classroom resources, professional support, job satisfaction, school head characteristics, school infrastructure and organization, equity in resource allocation among schools and regions, and reading and mathematics scores for both teachers and pupils. Kenya education statistics comprise data on education participation and internal efficiency, among others, at various levels.

3.2   Conceptual Framework

To capture the impact of gender and socio-economic factors on primary education performance, schooling performance predictors include factors such as teacher performance, pupil's socio-economic status captured through such factors as socio-economic performance, source of lighting and floor material, parents' educational level, gender of teachers and pupils, total school resources and other factors.

These factors can be summarized as:

> *Zialocp = f(Zjsex, Zialoct, Zpsex, Zposlev, Zplight, Zpmother, Zpfather, Zsptrati, Zstratio, Zpagemon, Zpregme, Zpenglis, Zprepeat, Zpwrite, Zphmwkdn)*

Where *Zialocp* represents pupil reading or mathematics learning outcomes, Zjsex represents the sex of the mathematics or reading teacher, Zialoct represents mathematics and reading teacher scores, Zpsex is pupil's sex, Zposlev is pupil's home possession index, Zplight is pupil's source of lighting, Zpmother is mother's education, Zpfather is father's education, Zsptrati is pupil-teacher ratio, Zstratio is pupil-toilet ratio, Zpagemon is pupil's age in months, Zpregme is pupil's meals per day, Zpenglis represents pupils speaking English at home, Zprepeat represents class repetition, Zpwrite represents availability of writing place, and Zphmwkdn represents homework is ensured.

Pupil performance is expected to increase with teacher performance, pupil's ability, availability of class resources, and total school resources.

3.3   Empirical Model

To investigate the determinants of schooling performance, a linear model is estimated using ordinary least squares. The estimated model is of the form:

$$Zialocp = \beta_0 + \alpha_1 Zjsex + \alpha_2 Zialoct + \alpha_3 Zpsex + \alpha_4 Zposlev + \alpha_5 Zplight +$$
$$\alpha_6 Zpmother + \alpha_7 Zpfather + \alpha_8 Zsptrati + \alpha_9 Zstratio + \alpha_{10} Zpagemon +$$
$$\alpha_{11} Zpregme + \alpha_{12} Zpenglis + \alpha_{13} Zprepeat + \alpha_{14} Zpwrite$$
$$+ \alpha_{15} Zphmwkdn + \varepsilon$$

3.4   Construction and Definition of Variables

Reading (ZRALOCT) and Mathematics (ZMALOCT) scores

The traditional approach to describing test performance is of limited use in the identification of specific strategies that can be understood by teachers who like to plan either remedial programmes or performance improvement for their pupils (Ministry of Education, Science and Technology, 2004). Reading and numeracy performance of pupils and teachers is based on a descriptive account of increasing levels of competence using the Rasch scaling procedures, which goes far beyond the traditional approach of assigning scores based on the number of correct test items in reading and mathematics. Rasch analytical tools provide meaningful descriptive information about the tasks that pupils and teachers can currently manage, and the knowledge and skills that pupils require if they are to move to higher levels of competence. The tools are therefore appropriate in assisting policy makers identify intervention areas in improving education outcomes.

This study uses reading and mathematics scores generated through the Rasch procedures available in the SACMEQ Data Archive (2004). The data is based on the respective tests administered to sample pupils and teachers during the study. On average, the SACMEQ reading and mathematics scores have a mean score of 500 with a standard deviation

---

[3] Rasch scaling procedures permit that for each test, the performance of pupils is aligned along a single dimension that could be broken into groups or levels based on the skills requirements to successfully complete the items within each group (Ministry of Education, Science and Technology, 2004).

of 100 score. Teacher reading (ZRALOT) and teacher mathematics (ZMALOT) scores were also captured using the same procedures.

Pupil-home possession index (ZPOSLEV)

Major variables that capture socio-economic effects is home possession index, access to light at home and type of material the house floor is made of. These variables were generated by analyzing a question administered to all pupils, of the form: "which things (e.g daily newspaper, weekly magazine, radio, television set, telephone, refrigerator, car, bicycle, electricity, table to write on) can be found in the place where you stay during the school week" and "which type of animals (cows, camel, etc) can be found in the place where you stay during the school week". Analysis of these variables was used to generate a composite variable, Pupil Home Possession Index. Another question was asked on source of lighting (ZPLIGHT).

Toilet-pupil ratio (ZSTRATIO) and pupil-teacher ratio (ZSPTRATI)

The two variables are captured by dividing total school enrolment by number of toilets and teachers in school as provided by school head.

Sex of pupil (ZPSEX), reading teachers (ZXSEX), mathematics teachers (ZYSEX) and school heads (ZSSEX) take 1 if the respective individual is a female and 0 if otherwise.

Mother (ZPMOTHER) and father (ZPFATHER) education

A question was asked of the form: "What is the highest level of education that your father (male guardian) and mother (female guardian) have completed". Responses used to generate the variable were: "Did not go to school, completed some primary school; completed some secondary

school; completed some education/training after secondary school; I don't know and I don't have father/male guardian of father/ female guardian". The responses were analyzed to obtain a variable on education as availed in the data archive.

3.5   Analytical Techniques

The analysis reported in this paper is limited to the cross-sectional data generated through SACMEQ II project. In addition, the paper does not analyze all the variables available in the data archive but focuses on gender, social-economic factors and learning outcomes. However, other variables served as inputs in the analytical model for the purpose of controlling their effects on learning outcomes. Ordinary Least Squares (OLS) was chosen due to its ability to show the magnitude of the effects and the direction of such an effect. Testing for violations of classical assumptions in regressions gave confidence on the reliability of the OLS results.

Descriptive data analysis techniques were used in presenting situational analysis of primary education in Kenya while inferential analysis tools were used to establish relationships between gender and socio-economic factors on primary school performance. Sampling weights (Pweight 2) were used to adjust the missing data for variations and probabilities of selection that arose from application of stratified multigrade sample design.

4. Analysis of Results

Descriptive analysis on the status of gender differences in schooling is presented before the empirical results. This focuses on participation and internal efficiency indicators.

4.1 Gender Differentials in Primary Schooling in Kenya

4.1.1 Participation levels

The Government faces various socio-economic challenges in its commitment to reduce and narrow gender inequality through empowerment, employment and improving access, affordability and quality of social services such as education and health. These challenges include rising poverty levels, HIV/AIDS pandemic and its impact on the learning process, budgetary constraints on education financing, unsatisfactory learning process, fiscal constraints, unsatisfactory learning and schooling environment, and low levels of internal efficiency at primary school level. Further, wastage rates are evidenced by low completion rates and transition rates from primary to secondary school level (Government of Kenya, 2003). According to available data, about 50 percent of the students who enrolled in Standard One completed the full primary school cycle in 2000 while approximately 47 percent of those who completed Standard Eight progressed to Form One. Some of the contributing factors include limited capacity and high cost of secondary education. In 2003, primary completion rate was recorded at 57 percent (Table 4 and 5).

Although gender parity has been achieved at national level, particularly at primary education level, regional disparities are apparent, with North Eastern Province recording the highest regional disparities. Trend analysis of available data shows that boys have higher enrolment rates than their female counterparts in some regions (Table 1 and 2).

Table 1: Primary education gross enrolment rate by gender, 1989-2003

Primary schools gross enrolment rates by sex, 1989-2003									
Enrolment ('000)				Population aged 6-13 year ('000)			Gross enrolment rate (%)		
Year	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
1989	2,766.00	2,628.10	5,394.10	2,569.70	2,547.60	5,117.30	107.60	103.20	105.40
1990	2,766.40	2,625.90	5,392.30	2,659.10	2,637.30	5,296.40	104.00	99.60	101.80
1991	2,797.10	2,659.00	5,456.10	2,996.00	2,971.00	5,967.00	93.40	89.50	91.40
1992	2,806.80	2,723.40	5,530.20	3,052.00	3,025.00	6,077.00	92.00	90.00	91.00
1993	2,761.10	2,667.50	5,428.60	3,106.00	3,075.00	6,181.00	88.90	86.70	87.80
1994	2,814.80	2,742.20	5,557.00	3,158.00	3,123.00	6,281.00	89.10	87.80	88.50
1995	2,802.30	2,734.10	5,536.40	3,207.00	3,168.00	6,375.00	87.40	86.30	86.80
1996	2,843.40	2,754.30	5,597.70	3,258.00	3,220.00	6,478.00	87.30	85.50	86.40
1997	2,880.20	2,797.10	5,677.30	3,306.00	3,270.00	6,576.00	88.70	86.60	87.70
1998	2,994.60	2,925.20	5,919.80	3,352.00	3,316.00	6,668.00	89.30	88.20	88.80
1999	3,082.10	2,982.00	6,064.10	3,267.50	3,222.30	6,489.80	91.60	89.20	90.40
2000	3,064.50	3,013.60	6,078.10	3,378.60	3,335.08	6,713.70	90.70	90.36	90.53
2001	3,079.60	3,002.20	6,081.80	3,493.47	3,451.81	6,945.32	88.15	86.97	87.57
2002	3,143.10	2,988.00	6,131.10	3,608.75	3,572.62	7,184.93	87.10	83.64	85.33
2003	3,702.80	3,505.30	7,208.10	3,731.45	3,697.66	7,422.04	105.23	103.00	104.12

Source: Economic Survey (various); Kenya Population Census (1989): Analytical report, Vol. VII; Population projections (1989 and 1999)

The gross enrolment rate declined significantly from a peak of 104.4 percent (103.2 percent for girls and 107.6 percent for boys) in 1989 to 87.7 percent (86.6 percent for girls and 88.7 percent for boys) in 1997 before significant gains in 2003 of 104 percent (103 percent for girls and 105.2 percent for boys). Analyses at provincial level (Table 2) indicate substantial gender and regional disparities in access to primary education. Between 1999 and 2003 for instance, North Eastern Province recorded the lowest enrolment rates for female pupils of between 31 percent and 32 percent, followed by Nairobi Province (44 percent) and Coast Province (46 percent). Other provinces recorded near gender parity in 2003.

Some of the deterrent factors in girls' access to primary education in North Eastern Province include long distance to schools, which tends to negatively impact more on girls than boys, cultural bias, early marriages and associated parental responsibilities leading to dropouts, heavy workload at household level, high poverty incidence and unfavourable schooling environment especially at adolescent stage and poverty. The gender disparities in Nairobi Province can be attributed to the poor socio-economic and environmental conditions especially in the informal settlements (slum areas), where close to 60 percent of the urban population live. Child labour has also been identified as one of the main obstacles to education participation. According to Manda *et al.* (2003), 27 percent of the 5-14 year old male youth are economically active, compared to 22.3 percent of their female counterparts worldwide. In most instances, girls are more likely to perform domestic work that is usually excluded as economic activity. Further, 1.2 million children aged 6-14 years in 1998/99 were working, out of whom 760,641 were engaged in the worst forms of child labour (Manda *et al.*, 2003; Government of Kenya, 2001). The largest proportion was working in agriculture (72.5 percent), services (22 percent), retail (2 percent), manufacturing (3 percent), mining (0.8 percent), and construction (0.4 percent).

Table 2: Gross enrolment by province

Year	Province	Coast	Central	Eastern	Nairobi	Rift Valley	Western	Nyanza	N/Eastern	Total
1999	Boys	222,231	439,559	586,042	86,095	738,578	417,870	524,388	33,011	3,047,774
	Girls	177,113	438,410	560,081	79,522	706,500	424,194	500,168	15,123	2,901,111
	Total	399,344	877,970	1,146,122	165,617	1,445,078	842,064	1,024,556	48,134	5,948,885
	% Girls	44%	50%	49%	48%	49%	50%	49%	31%	49%
2000	Boys	224,933	439,201	551,196	96,103	786,893	381,601	562,547	32,970	3,075,442
	Girls	190,610	444,576	561,203	94,436	736,578	415,165	538,461	15,534	2,996,564
	Total	415,543	883,777	1,112,399	190,539	1,523,471	796,766	1,101,008	48,503	6,072,006
	% Girls	46%	50%	50%	50%	48%	52%	49%	32%	49%
2001	Boys	226,420	442,212	555,014	96,659	792,325	384,263	566,199	35,603	3,128,694
	Girls	191,847	447,626	565,094	94,991	741,662	418,064	541,972	15,737	3,031,993
	Total	418,267	889,838	1,120,107	191,649	1,533,987	802,327	1,108,171	51,341	6,113,184
	% Girls	46%	50%	50%	50%	48%	52%	49%	31%	50%
2002	Boys	216,192	424,274	585,306	89,198	849,554	386,636	602,127	35,022	3,188,308
	Girls	182,572	425,195	585,780	87,660	774,316	387,336	572,318	15,678	3,030,855
	Total	398,764	849,470	1,171,086	176,858	1,623,869	773,972	1,174,445	50,700	6,219,163
	% Girls	46%	50%	50%	50%	48%	50%	49%	31%	49%
2003	Boys	255,613	452,955	652,723	147,557	903,242	514,629	680,526	43,087	3,650,333
	Girls	218,607	451,031	635,807	100,343	865,825	512,288	650,245	20,065	3,454,211
	Total	474,220	894,680	1,288,531	229,697	1,769,143	1,026,917	1,330,771	63,152	7,077,111
	% Girls	46%	50%	49%	44%	49%	50%	49%	32%	49%

Source: Ministry of Education Science and Technology; and authors' computations

Schooling is a function of various factors, including student's gender, socio-economic background, income levels and equity in distribution, parent's characteristics such as level of income, education, among others. The cultural preferences in education choice influence parents, communities, and pupils. Gender disparities in education are more prevalent among the poor than the non-poor and manifest themselves through participation rates, retention, progression and performance in all levels of education (Manda *et al.*, 2003).

Analysis at provincial levels shows prevalent gender and regional gaps in primary education participation. North Eastern Province recorded the highest levels of both gender and regional disparities with only 20,065 gross female enrolment. In the province, 68 percent of boys and 32 percent of girls were enrolled in primary schools. In Western Province, participation rate of girls was higher than that of their male counterparts between 1999 and 2002. Coast Province, for instance, recorded a gross enrolment of 218,607 and 255,613 for both girls and boys, respectively, in 2003. In Nairobi Province, the proportion of girls was 49 percent of the total enrolment in 2003 (Table 2).

4.1.2 Internal efficiency

Internal efficiency in primary education level indicates high wastage rates of 13.2 percent repetition rate (13.5 percent for boys) and 12.9 for girls and 4.92 percent dropout rate (4.82 percent for girls) and 5.02 for boys in 1999. At provincial level, Nairobi Province had the lowest wastage rate (2.7 percent repetition and 1.48 percent dropout), while Rift Valley Province recorded the highest repetition rate of 15.2 percent (15.6 percent for boys and 14.9 percent for girls). On the other hand, the highest dropout rates were recorded in North Eastern Province (5.55 percent for boys and 6.93 percent for girls). Although dropout and repetition rates

improved by 2003 (2.0 dropout rate and 9.2 percent repetition rate), generally, boys record higher wastage rates than girls (Table 3).

The main emerging policy implication is need for designing region-specific programmes targeting those pupils who drop out of school before completing the basic school cycle. North Eastern Province, for instance, requires flexible informal education programmes that do not confine the pupils into the formal schooling system, but which give cognizance to the prevailing socio-economic conditions characterized by population mobility and environmental hardships.

Analysis of data presented in Table 4 on completion rates shows that the primary school cycle completion rate increased from 45.62 percent (43.21 percent for girls and 47.90 percent for boys) in 1989 to 57.23 percent (57.66 percent for girls and 56.82 percent for boys) in 2003.

Primary to secondary school transition rates at national level are presented in Table 5. Between 1990 and 2004, the transition rates remained below average (below 50 percent). In 1990, the transition rate at national level was 44.63 percent (45.39 percent for boys and 43.71 percent for girls). The lowest transition rate of 38 percent was recorded in 1993, before gradual improvements in subsequent years. In 2004, the transition rate was 45.35 percent (46.79 percent for boys and 43.85 percent for girls). The findings show that girls have a lower progression rate from primary to secondary. In 2003, there were 3,999 secondary schools nationwide with a teaching force of 46,445 compared to 19,938 primary schools with a primary education teaching force of 178,622, with 59 percent of them being male teachers (Government of Kenya, 2004).

There is therefore need to design special targeted programmes for the youth who drop out of school before completing the primary school cycle. The primary school cycle is the most critical education level in imparting basic knowledge, including fundamental skills for an economically productive and satisfying life. Although the national policy

Table 3: Repetition and dropout rates by gender and province, 1999 and 2003

Province	Repetition Rate						Dropout Rate					
	1999			2003			1999			2003		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Coast	14.7	15.1	14.9	11.60	11.23	11.46	5.09	4.88	4.99	1.90	1.80	1.80
Central	11.6	10.5	11.0	6.76	6.25	6.51	3.08	2.63	2.86	1.00	0.80	0.90
Eastern	13.2	13.1	13.2	8.49	7.88	8.19	4.68	4.42	4.55	1.90	1.40	1.60
Nairobi	3.0	2.4	2.7	0.73	0.57	0.65	1.64	1.32	1.48	1.60	1.30	1.50
R.Valley	15.6	14.9	15.2	10.96	10.04	10.51	4.87	4.68	4.77	2.30	2.20	2.20
Western	15.4	13.8	14.6	12.32	11.39	11.86	5.14	5.03	5.08	2.40	2.40	2.40
Nyanza	12.7	12.2	12.5	10.30	9.29	9.81	5.55	6.16	5.85	2.80	3.10	2.90
N. Eastern	6.5	9.3	7.4	4.20	4.43	4.27	5.55	6.93	5.98	2.30	3.10	2.60
National	13.5	12.9	13.2	9.71	8.64	9.19	5.02	4.82	4.92	2.10	2.00	2.00

Source: Ministry of Education, Science and Technology

Table 4: Primary school completion rates by sex, 1989-2004

Year in Std 8	% Completing Std 8		
Year	Boys	Girls	Total
1989	47.90	43.21	45.62
1990	45.67	40.55	43.20
1991	46.36	41.61	44.07
1992	44.67	48.24	46.41
1993	44.48	42.21	43.39
1994	44.64	43.03	43.86
1995	43.05	42.07	42.57
1996	45.07	43.51	44.31
1997	46.34	45.77	46.06
1998	46.41	48.09	47.22
1999	51.42	50.31	50.88
2000	49.86	51.06	50.45
2001	53.30	53.22	53.26
2002	60.33	53.16	56.87
2003	56.82	57.66	57.23
2004*	66.96	65.93	66.46

Source: Ministry of Education, Science and Technology; Economic Survey.
* Provisional

is that repetition should be highly discouraged, it is apparent that there is no compliance at the school level, and this leads to increasing costs of education, especially on demand for teachers and space occupied in class. Also, there is evidence that repetition leads to drop out rather than to increased likelihood of completion with better performance and,

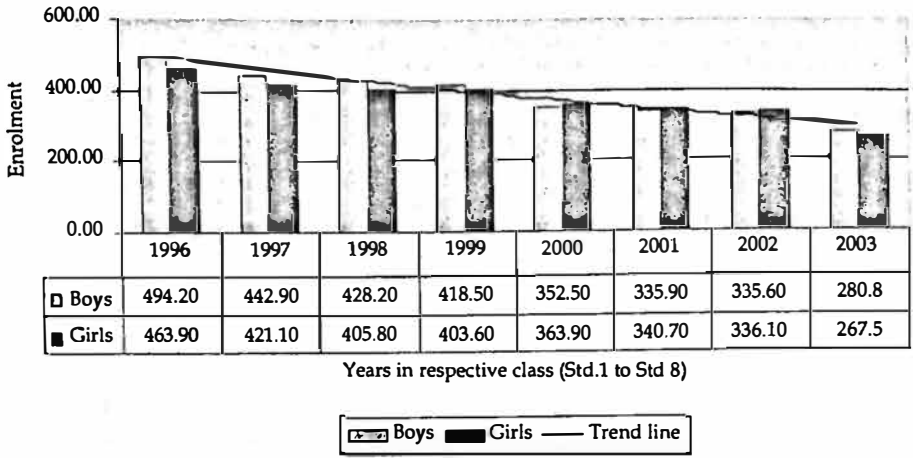**Table 5: Primary to secondary school transition rates by sex, 1991-2004**

Year in Std 8	Year in Form 1	Enrolment Std 8 ('000)			Enrolment Form 1 ('000)			% Transiting to F1		
		Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
1990	1991	210.40	174.10	384.50	95.50	76.10	171.60	45.39	43.71	44.63
1991	1992	207.30	173.70	381.00	97.30	78.10	175.40	46.94	44.96	46.04
1992	1993	195.00	198.80	393.80	81.50	69.60	151.10	41.79	35.01	38.37
1993	1994	210.40	185.30	395.70	90.80	78.10	168.90	43.16	42.15	42.68
1994	1995	212.50	190.30	402.80	96.40	83.60	180.00	45.36	43.93	44.69
1995	1996	211.60	194.00	405.60	97.40	85.90	183.30	46.03	44.28	45.19
1996	1997	217.30	199.00	416.30	98.50	88.60	187.10	45.33	44.52	44.94
1997	1998	217.30	209.30	433.90	102.40	92.80	195.30	47.12	44.34	45.01
1998	1999	221.00	215.30	436.30	105.20	95.80	173.90	47.60	44.50	39.86
1999	2000	246.60	228.00	474.60	108.12	97.20	205.31	43.84	42.63	43.26
2000	2001	235.60	227.80	463.40	112.17	103.43	215.60	47.61	45.40	46.53
2001	2002	261.70	246.60	508.30	116.22	105.23	221.45	44.41	42.67	43.57
2002	2003	296.90	244.50	541.40	129.40	121.66	251.06	43.58	49.76	46.37
2003	2004	280.80	267.50	548.30	131.38	117.29	248.67	46.79	43.85	45.35

Source: Economic Survey (Various)

therefore, is a major cause of internal inefficiency in the system. It leads to low performance in learning achievements.

Figure 2 presents cohort trend analysis from Standard One to Standard 8 over the period between 1996 and 2003. At the final grade of primary school level, completion rate is only 57 percent (57 percent for boys and 56 percent for girls). The transition rate from Standard 8 to Form 1 is also low. In 2003 for instance, the national transition rate was 45.35 percent (46.78 percent for boys and 43.85 percent for girls) having increased from 44.63 percent (45.39 percent for boys and 43.71 percent for girls) in 1991 (Table 5). The finding indicates a significant decline within the cycle. There were higher enrolment rates at lower primary compared with upper primary classes. The emerging policy concern is therefore to establish factors contributing to this situation particularly at upper primary. Primarily, this finding is consistent with the high wastage rates and internal inefficiency of the system. There is therefore need for special intervention programmes at upper primary school level. Analysis on reading and numeracy achievements in the subsequent

Figure 2: Progression from Standard 1 to 8, 1996-2003

	1996	1997	1998	1999	2000	2001	2002	2003
□ Boys	494.20	442.90	428.20	418.50	352.50	335.90	335.60	280.8
■ Girls	463.90	421.10	405.80	403.60	363.90	340.70	336.10	267.5

Years in respective class (Std.1 to Std 8)

☐ Boys   ■ Girls   —— Trend line

Source: Ministry of Education, Science and Technology; Economic Survey (various); and authors' computations.

sections provide further insights on possible contributing factors for low performance and therefore low progression rates, even to post-primary levels.

Data presented in Table 6 indicates survival rates for two cohorts for the period 1987-2000 and 1989-2002. The data indicates that 48.2 percent and 47.2 percent and 48.7 percent and 47.8 percent of total enrolment in Standard 1 and Standard 8 in 1987 and 1994 and 1989 and 1996, respectively, were female. From analysis of 1987 to 2000 cohort at secondary school level, 46.4 percent, 45.7 percent and 30 percent enrolment in Form 1, 4 and first year university, respectively, were female. However, progression rate from Standard 1 to Form 1 was 19.60 percent (18.90 percent for girls and 20.25 percent for boys). Survival rates from Standard 1 to Form 4 and first year university was 16.56 percent (15.71 percent for girls and 20.25 percent for boys) and 1.2 percent (0.7

Table 6: Survival rates

Survival rates	1987-2000 Cohort				1989-2002 Cohort			
	Boys	Girls	Total	% girls	Boys	Girls	Total	% girls
Enrolment in Std 1,1987 and 1989	476,000	442,300	918,300	48.2	482,200	457,300	939,500	48.7
Enrolment in Std 8,1994 and 1996	212,500	190,300	402,800	47.2	217,300	199,000	416,300	47.8
Enrolment in Form 1,1995 and 1997	96,400	83,600	180,000	46.4	98,487	88,614	187,101	47.4
Enrolment in Form 4,1998 and 2000	82,600	69,500	152,100	45.7	91,700	78,371	170,071	46.1
Expected enrolment in 1st Year-University,1999/2000 and 2001/2	7,453	3,194	10,647	30.0	7,467	3,572	11,039	32.4
Survival (Completion) rate from Std 1 to Std 8 (%)	44.64	43.03	43.86	.	45.06	43.52	44.31	..
Survival (transition) rate from Std 8 to Form 1 (%)	45.36	43.93	44.69	..	45.32	44 53	44.94	..
Survival rate from Std 1 to Form 1 (%)	20.25	18.90	19.60	..	20.42	19.38	19.91	..
Survival (Completion) rate from Form 1 to Form 4(%)	85.68	83.13	84.50	..	93.11	88.44	90.90	..
Survival rate from Std 1 to Form 4 (%)	17.35	15.71	16.56	..	19.02	17.14	18.10	..
Survival rate from Std 1 to University level (%)	1.57%	0.72%	1.16	..	1.55	0.78	1.17	..

Source: Economic Survey (Various); Government of Kenya, 2000; and author's computations

percent for girls and 1.6 percent for boys), respectively. The data further shows that between 1989 and 2000, only 1.17 percent (0.78 percent girls and 1.55 percent boys) of those enrolled in Standard 1 survived to enter university level of education.

Using the same cohort, 18.10 percent (17.14 percent girls and 19.02 percent boys) survived to Form 4 while 90.90 percent (88.44 percent girls and 93.11 percent boys) of the 44.94 percent (44.53 percent female and 45.32 percent for male) who progressed from primary to secondary school level actually completed Form 4. This finding indicates that the highest wastage rates are recorded in primary school level and before transiting to secondary school level. Inadequate facilities at post-primary education and poor performance at the primary school level are key constraining factors for survival in education. To address the challenges on internal inefficiency of the system, there is need for targeted initiatives, at least at primary and secondary education level, including expansion of physical infrastructure and addressing the problems of dropout and repetition at the respective levels.

In addressing gender issues in schooling, various factors must be considered, including socio-economic background as depicted by poverty levels, expansion of physical infrastructure and child labour. These have to a large extent been associated with primary education wastage. Girls' participation in secondary and tertiary levels can be traced back to their participation in primary level. Therefore, any strategy aimed at increasing gender parity must start from lower levels of education. The country has a great challenge towards achieving gender equality particularly in the disadvantaged districts/provinces and urban informal settlements and post-primary education.

4.1.3   Gender differences in the teaching profession

Between 1997 and 2003, the aggregate number of primary school teachers reduced from 186, 590 (41.4 percent female) in 1997 to 178,622 (58.6 percent male) in 2003. The pupil-teacher ratio was 36:1 in 2002 and 39.8:1 in 2003 at the national level. This is due to the increase in enrolment without proportionate increase in employment of teachers. Approximately 41.5 percent of the 176,264 trained teachers were female, compared with the 31.5 percent untrained female teachers. Male teachers in the profession dominated both the trained (58.5 percent) and untrained teacher categories (68.4 percent).

4.2   Empirical Analysis on Gender Differentials in Learning Achievements

Behaviour of gender differentials in primary schooling performance remains an important area of research. Figures 3 and 4 present graphical evidence on gender differences in mathematics and reading in Standard 6 in 2000 in Kenya. The figures show that boys and girls perform differently in mathematics and reading at Standard Six. For instance, in

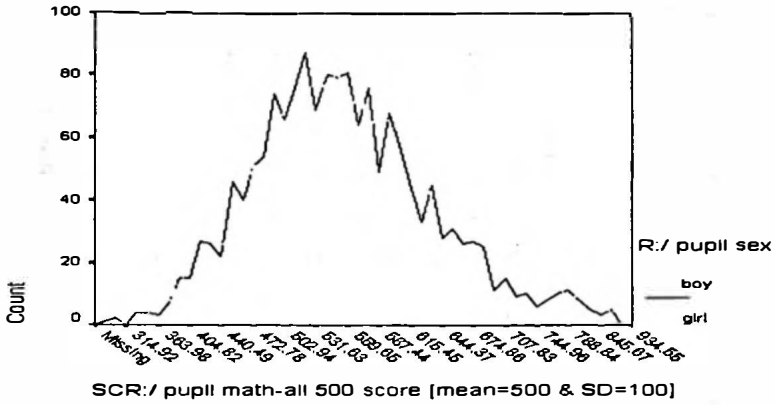## Figure 3: Gender differentials in mathematics scores

SCR:/ pupil math-all 500 score [mean=500 & SD=100]

Figure 4: Gender differentials in reading scores

SCR:/ pupil reading-all 500 score [mean=500 & SD=100]
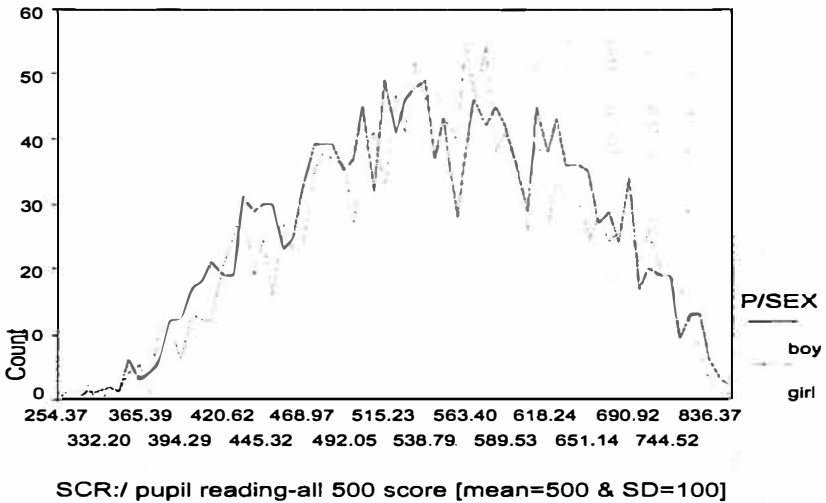
Table 7: Correlations

	ZMALOCP	ZRALOCP	ZRALOCT	ZMALOCT	ZPSEX	ZPOSLEV	ZPLIGHT	ZPFLOOR	ZPMOTHER	ZPFATHER	ZYSEX	ZXSEX	ZSTRATIO	ZSPTATI
ZMALOCP	1													
ZRALOCP	0.7615	1												
ZRALOCT	0.0935	0.1136	1											
ZMALOCT	0.0596	0.0521	0.2122	1										
ZPSEX	-0.1165	-0.0018	0.0408	-0.0174	1									
ZPOSLEV	0.2098	0.2873	0.0284	0.0132	0.0162	1								
ZPLIGHT	0.2225	0.3111	-0.0024	0.0289	-0.0264	0.4374	1							
ZPFLOOR	0.1808	0.2639	-0.0031	0.0133	0.0204	0.3575	0.4097	1						
ZPMOTHER	0.2107	0.2970	0.0571	0.0744	0.0823	0.2746	0.2473	0.3182	1					
ZPFATHER	0.2251	0.3030	0.0434	0.0606	0.0558	0.3044	0.2698	0.3338	0.5809	1				
ZYSEX	0.0897	0.2011	0.0793	-0.0904	0.0162	0.1459	0.1938	0.1641	0.1831	0.1374	1			
ZXSEX	0.1131	0.2014	-0.0107	0.0129	0.0523	0.2090	0.2497	0.2270	0.2273	0.1833	0.2501	1		
ZSTRATIO	-0.1190	-0.1143	-0.0823	0.0148	-0.0671	-0.0348	-0.0090	-0.0718	-0.1821	0.1383	0.0643	-0.1205	1	
ZSPTRATI	0.2210	-0.2544	0.0076	-0.0444	-0.0282	-0.0833	-0.1407	-0.0981	-0.1410	-0.1192	0.1172	-0.2014	0.2964	1.000

Table 8: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Pupil's mathematics scores	3296	566.3274	90.28861	274.1879	934.5546
Teacher mathematics scores	3214	961.2268	101.004	627.8312	1292.586
Pupil's reading scores	3299	553.3906	93.37121	254.3722	947.0997
Reading teacher gender	3099	.4969345	.5000713	0	1
Mathematics teacher gender	3214	.2887368	.4532458	0	1
Reading teacher score	3119	791.1522	66.12432	437.2111	1047.055
Pupil's sex	3299	.4862079	.4998855	0	1
Pupil's home possession index	3299	1.454683	.4980176	1	2
Pupil's home source of lighting	3299	2.463777	.8920546	1	4
Mother's level of education	3299	3.490452	1.657851	1	6
Father's level of education	3299	3.931494	1.679841	1	6
Pupil teacher ratio	3282	34.22869	9.38458	13.10526	67.42857
Pupil toilet ratio	3282	53.11144	70.99933	5.928571	750
Pupil's age in months	3299	167.3071	19.04113	128	250
Pupil's meals per day	3299	11.24977	1.489012	3	12
Pupils speaking English at home	3299	.8829948	.3214752	0	1
Pupils class repetition	3299	.5765383	.4941821	0	1
Pupil's writing space	3299	.9636253	.187249	0	1
Pupils homework done	3296	.378034	.4849697	0	1

Table 9: Regression results with mathematics pupil scores (ZMALOCP)

Variable	Coefficient	t-Statistic	Prob.
Mathematics teacher gender	-1.102	-0.31	0.759
Teacher mathematics score	0.007	0.44	0.661
Pupil's gender	-27.849	-8.97***	0.000
Pupil's home possession index	12.043	3.42***	0.000
Pupil's home source of lighting	5.647	2.62***	0.009
Mother's education	3.79	3.21***	0.001
Father's education	2.648	2.23**	0.026
Pupil teacher ratio	-2.079	-9.90***	0.000
Pupil toilet ratio	-0.1039	-2.90***	0.004
Pupil's age in months	-0.958	-10.68***	0.000
Pupils meals per day	3.396	3.32***	0.001
Pupil speaking english at home	15.939	3.71***	0.000
Grade repetition	-7.379	-2.19**	0.029
Writing place	34.0897	4.83***	0.000
Home work make sure	9.854	3.08***	0.002
Constant	669.439	22.53***	0.000

Number of observations= 3208
$F(15,3194)= 47.93$***
Prob> F = 0.000
R-squared= 0.25
Root MSE= 76.816
Ramsey RESET $F(3,3189)=9.63$, Prob(F)=0.000

Significant at (***) 1%, (**) 5%, and (*) 10%, respectively.

mathematics, boys score relatively higher than girls beyond the mean score. However, there is no clear pattern of scoring in reading.

Table 7 presents correlation coefficients for schooling performance (proxied by mathematics and reading scores) with the pupil-toilet ratio, pupils-teacher ratio, school head sex, mathematics teacher sex, father's education, mother's education, roof material, pupil's source of lighting, pupil's sex, pupil reading score, pupil maths score, teacher maths score, and the teacher reading score. Most of the correlations are statistically significant at 1 percent level (Table 8 and 9).

Regression analysis was performed using Stata 8 software. Pweight2 has been used to weigh the data. The results are presented in Table 9 and 10.

4.2.1   Learning achievements in mathematics

The dependent variable was mathematics pupils' scores. The regressions are performed using robust Ordinary Least Squares method. The results presented in Table 9 suggest that pupil's home possessions affect performance in mathematics positively. The coefficient has a value of 12.043, which is statistically significant at 1 percent level. Home possessions including family radio, TVs and reading materials provide learning experiences to the learner and are therefore likely to contribute positively to achievement. Pupil's lighting has a positive sign consistent with the possessions. Lighting provides an opportunity to the learner to do more practice and or homework at home. On the other hand, pupil-teacher ratio, pupil-toilet ratio, and pupil's age relate negatively with the mathematics pupil score. In addition, for girls, the sign of the sex coefficient is negative, with a coefficient of -27.849 implying that girls are relatively poor in mathematics compared to boys by that magnitude. This coefficient is statistically significant at 1 percent level of significance. The higher the pupil-teacher ratio, the lower the achievement in mathematics due to its implication on improved effectiveness in teaching. Fewer students per teacher provides an opportunity for individualized instructions that could be advantageous to slow learners.

School environment has a significant impact on schooling outcomes through its reinforcement effects on overall education delivery. An increase in the pupil-toilet ratio implies that the number of pupils is growing faster than the toilets. This would reduce performance in mathematics as suggested by the negative coefficient with a value of 0.1039, which is significant at 1 percent. Pupil-toilet ratio could be indicative of supportive physical facilities in a school. Inadequate or poor quality facilities impact on learning negatively due to the poor learning environment created. Therefore, inadequacy of toilets negatively affects performance. Meals per day influence mathematics scores

positively, with a coefficient of 3.87, which is significant at 1 percent. While not all meals may contain a balanced diet, their presence minimizes the incidences of hunger and malnutrition that diminish a learner's concentration. Food is therefore a critical input in achievement in mathematics, probably also in other disciplines.

Pupil's speaking English at home perform better in mathematics. The coefficient of 15.939 is statistically significant at 1 percent level. English language is the language of instruction in the Kenyan school system, and those with exposure to English language at home are therefore likely to have an added advantage. Besides, the older the pupil the lower the score. This is suggested by the coefficient for the age variable, which has a magnitude of -0.958. This could have been as a result of over-age pupils due to multiple repetitions of low achieving pupils. Pupils who repeat grades have a lower mathematics score. The coefficient has a negative sign and a magnitude of −7.379, which is statistically significant at one percent level of significance. This implies that repeaters perform relatively poorer than non-repeaters by that magnitude. Such an argument may be true in the case of passing examinations but not for learning acquisition as demonstrated here. In Kenya, over Ksh 0.5 billion is spent on repeaters under the free primary education every year. From this analysis, such a huge expenditure may no longer be justifiable (KIPPRA, 2006).

Parent's education has a positive influence on mathematics scores. The coefficients for mother and father education have positive signs of 3.79 and 2.648, respectively. This is as expected since parental support is crucial in providing a conducive learning environment at home. Pupils who have writing space and do their homework perform well in mathematics. This is suggested by the positive coefficients of 34.08 and 9.854, respectively. The coefficients are statistically significant at 1 percent level of significance. Regular homework provides the necessary practice required to master mathematical concepts. Doing homework at home

would therefore be expected to contribute positively and significantly to achievements in mathematics. Writing space provides a personal working space that creates a conducive environment with minimum disturbance and therefore better concentration during study.

The general significance of the model is good, suggested by an F- statistics of 47.93 significant at 1 percent. The general fitness of the model is relatively good, given the nature of the data[4]. The adjusted R-squared suggests that 25 percent of the variations in mathematics scores are due to the explanatory variables in the model. However, a limitation of the study as far as regression analysis is concerned is that the variables are confined to the SACMEQ II dataset. Besides, diagnostics tests are performed on the variables and the model. All the variables in the model were tested and passed the Lowess test. The Ramsey reset test was performed to throw light on the omitted variables (Table 9). Indeed, the Ramsey test rejects the null hypothesis of no omitted variables and accepts the alternative hypothesis of presence of omitted variables in the model. Robust regression was utilized to contain heteroskedasticity. It employs a fitting criterion that is not as vulnerable as the least squares to unusual data. The residual plots suggested no presence of serious econometric problems.

4.2.2   Learning achievements in reading

On pupils' performance in reading, the regression model is estimated using robust Ordinary Least Squares and the results are presented in Table 10. The dependent variable is pupils' reading scores. The explanatory variables included in the model are teacher reading scores, pupil's sex, pupil's home possession index, pupil's source of lighting, parent's education, pupil-teacher ratio, pupils speaking English at home,

---

[4] The study utilized SACMEQ II dataset, which is cross-sectional in nature.

Table 10: Regression results with reading pupil scores (ZRALOCP)

Variable	Coefficient	t-Statistic	Prob.
Reading teacher gender	2.860	0.89	0.376
Teacher reading score	0.195	7.52***	0.000
Pupil's gender	-6.036	-1.98**	0.048
Pupil's home possession index	15.317	4.35***	0.000
Pupil's home source of lighting	8.7002	4.01***	0.000
Mother's education	4.932	4.21***	0.000
Father's education	3.794	3.23***	0.001
Pupil teacher ratio	-2.486	-13.07***	0.000
Pupil toilet ratio	-0.039	-1.13	0.259
Pupil's age in months	-0.947	-10.20***	0.000
Pupils meals per day	3.142	3.33***	0.001
Pupil speaking english at home	26.55	6.36***	0.000
Grade repetition	-10.891	-3.16***	0.002
Writing place	54.199	7.69***	0.000
Home work make sure	6.28	2.02*	0.044
Constant	459.439	14.12***	0.000

Number of observations= 3079
$F(15,3063)= 77.19$***
Prob> F = 0.000
R-squared= 0.33
Root MSE= 73.619
Ramsey RESET $F(3,3060)=9.55$, Prob(F)=0.000
Significant at (***) 1%, (**) 5%, and (*) 10% respectively.

pupil's age, pupils repetition, writing space, homework done and pupil-toilet ratio.

The results reveal that teacher reading score contributes to better performance in pupil' reading scores. The coefficient of 0.195 is statistically significant at 1 percent level. Pupil's gender has a negative relationship with the reading scores, with a coefficient of –6.036 significant at 1 percent level. This suggests that girls perform poorly in reading compared to boys.

Pupil source of lighting affects reading scores positively, with a coefficient of 8.7002 that is statistically significant at 1 percent. Pupils' home possessions contribute positively to pupil reading scores. The coefficient of 15.31 is statistically significant at 1 percent. The two immediate former variables capture the socio-economic background of the pupil. Pupils who are better off in possessions perform well in reading. Meals per day

influence reading scores positively, with a coefficient of 3.83, which is significant at 1 percent.

Both mother's and father's education influence reading positively. The coefficients are statistically significant at 1 percent level, which have values of 4.39 and 3.794, respectively. This may result from the fact that literate parents will encourage their children to read. Worsening of the pupil-teacher ratio leads to a decline in the reading scores. The pupil teacher ratio relates negatively with reading scores with a coefficient of −2.486. When the number of pupils increase *vis- a- vis* the teachers, the reading scores will decline. This can be attributed to a large pupil-teacher ratio and class size, hence constraining effective teaching and learning process. The pupil-toilet ratio relates negatively with pupil reading scores.

Pupils speaking English at home perform better in reading. The coefficient of 26.55 is statistically significant at 1 percent level. Besides, the older the pupil the lower the score. This is suggested by the coefficient for the age variable, which has a magnitude of −0.947. Pupils who repeat grades have a lower reading score. The coefficient has a negative sign and a magnitude of −10.891, which is statistically significant at 1 percent level of significance.

Pupils who have writing space and do their homework perform well in reading. This is suggested by the positive coefficients of 54.199 and 6.28, respectively. The coefficients are statistically significant at 1 percent level of significance.

The general significance of the model is good, suggested by an F-statistics of 77.19 significant at 1 percent. The general fitness of the model is relatively good, given the nature of the data.[5] The adjusted R-squared suggests that 33 percent of the variations in reading scores are due to

---

[5] The study utilized SACMEQ II dataset, which is cross-sectional in nature.

the explanatory variables in the model. Besides, diagnostics tests are performed on the variables and the model. The Lowess test was performed to suggest the variables that can be fit in the linear model. All the variables in the model passed the Lowess test. The Ramsey reset test was performed to throw light on the omitted variables (Table 10). The Ramsey test rejects the null hypothesis of no omitted variables and accepts the alternative hypothesis of presence of omitted variables in the model. Robust regression was utilized to contain heteroskedasticity. It employs a fitting criterion that is not as vulnerable as the least squares to unusual data. The residual plots suggested no presence of serious econometric problems.

Generally, the environment at home can have a significant impact on the schooling of children. The environment at home can reinforce what children learn at school. Materials and resources found in the home where a child stays during the school week, for instance, improves reading and mathematics scores at school. On the other hand, education of the parents is a good predictor for both school attendance and performance.

The findings reveal that overall, boys in grade six of the primary school level perform well in mathematics and reading compared to girls. Besides, the pupils' socio-economic background affects both reading and mathematics scores. The summary of data utilized in the study is given in Table 8.

5. Conclusions and Policy Implications

Gender and socio-economic factors are some of the major factors affecting learning achievements in education in Kenya. Results of this study suggest that boys perform better than girls in mathematics and reading. This can be traced in their future learning and career progression in terms of the courses they undertake in technical and institutions of higher learning as implied by survival levels from Standard 1 to post-primary education. Although Kenya is close to achieving gender parity in access to schooling at national level, gender differentials are manifested in schooling at regional levels and in learning achievements, both in reading and mathematics. Girls record lower participation rates and internal efficiency rates than boys in primary education. It is therefore not enough to provide equal opportunities to boys and girls as this is not translated to equal achievements and learning outcomes. Provision of equal opportunities in primary schooling on gender lines is a necessary but not sufficient condition for equality in achievement and learning outcomes.

Policies already in place need to be reviewed with particular focus on learning achievements for girls. Specific interventions include reviewing teacher in-servicing to focus on competency skills, including inferential, analytical and critical reading skills; and competencies in numeracy, problem-solving and abstract problem-solving.

The results further conclude that there is no gain in grade repetition up to Standard 6. Pupils who had repeated achieved lower competency levels than those who had not repeated during their schooling before Standard 6. Another factor with negative impact on learning outcomes was pupils' level of socio-economic status. Targeted poverty interventions to augment Free Primary Education policy are required for improved learning achievements. Measures could include continued provision of meals to pupils in marginalized schools, particularly ASAL

and urban informal settlements. In addition, a no repetition policy should be strictly enforced as repetition can only be described as a violation of a child's right to quality education. There are better ways of improving a learner's achievement such as improving the quality of learning inputs and applying more child-centered instructional techniques. Resources spent on repeaters should be shifted to provision of quality primary education.

Improved school environment is critical for quality education delivery characterized by improved learning outcomes. Interventions aimed at increasing funding and provision of basic schooling facilities should be encouraged particularly in increasing the pupil-toilet ratio and general school environment.

References

Boadu, E.A. (2000). "Gender disparities in education, health, and labour force participation in Ghana. University of Ghana, Population Impact Project.

Chimombo J. (2000). *Classroom, school and home factors thet negatively affect girls education in Malawi.* Centre for Education Research and Training.

Colclough, C., Rose, P., Tembon, M., (undated). *Gender inequalities in primary schooling: The roles of poverty and adverse cultural practice.* IDS Working Paper No. 78.

Dolata S., Ikeda M. and Murimba S. (2004). "Different pathways to EFA for different school systems". IIEP Newsletter, January-March 2004.

Government of Kenya (2005a). *Sessional Paper No. 1 of 2005 on Policy Framework for Education, Training and Research.* Nairobi: Government Printer.

Government of Kenya (2005b). *Kenya Education Sector Support Programme (KESSP) 2005-2010.* Nairobi: Government Printer.

Government of Kenya (2004). *Statistical abstract.* Nairobi: Government Printer.

Government of Kenya (2003). *Economic Recovery Strategy for Wealth and Employment Creation.* Nairobi: Government Printer.

Government of Kenya (2002). *Analytical Report on Gender Dimensions.* Vol. XI, Nairobi: Government Printer.

Government of Kenya (2001). *The 1998/99 child labour report.* Nairobi: Government Printer.

Government of Kenya (1998). *Poverty Reduction Strategy Paper.* Nairobi: Government Printer.

Ilahi, N., (2001). *Children's work and schooling: Does gender matter? Evidence from the Peru LSMS panel data.* Washington DC: World Bank

International Monetary Fund-IMF (2005). *Finance and development.* Washington DC, Vol. 42, No. 2.

KIPPRA (2006). Budgeting process in Kenya: A case for social budgeting. Report prepared for UNICEF/Government of Kenya Social Budgeting Initiative. Nairobi: Kenya Institute for Public Policy Research and Analysis.

Manda D.K., Kimalu P. K., Nafula N.N., Kimani D. N., Nyaga R. K., Mutua, J., Mwabu, G. and Kimenyi, M. S. (2003). *Costs and benefits*

of eliminating child labour in Kenya. KIPPRA Working Paper No. 10, Nairobi: Kenya Institute for Public Policy Research and Analysis.

Miako S., (1998a). "Gender equality in reading and mathematics achievement: Reflecting on EFA goal 5". IIEP Newsletter. April-June 2004.

Miako S., (1998b). *Gender vs. socio-economic status and school location differences in grade 6 reading literacy in five African countries.* Harare: Ministry of Education and Culture.

Nzomo J., Kariuki, M. W. and Guantai, L. (2001). *The quality of education: Some policy suggestions based on a survey of schools.* UNESCO-IIEP.

Onsomu, E., Nzomo, J. and Obiero, C. (2005). The SACMEQ II Project in Kenya: A study of the conditions of schooling and the quality of education. Harare: SACMEQ.

UNESCO (2000). *Dakar Framework for Action.* ED-2000/WS/27, Paris: UNESCO).

UNESCO (2003). *EFA Global Monitoring Report 2003/2004: Gender and Education for All: The leap to equality.* Paris: UNESCO.