THE DECLINE IN PRIMARY SCHOOL ENROLMENT IN KENYA

Arjun S. Bedi[a]
Paul K. Kimalu[b]
Damiano Kulundu Manda[c]
and
Nancy Nafula[d]

[a] Institute of Social Studies, The Hague, The Netherlands, em: bedi@iss.nl; [b] Kenya Institute for Public Policy Research and Analysis (KIPPRA), Nairobi, Kenya, em: kimalu@kippra.or.ke; [c]KIPPRA and University of Nairobi, Kenya, em: manda@kippra.or.ke; [d] KIPPRA, em: nafula@kippra.or.ke. Our names as authors are listed alphabetically. We thank Alemayehu Geda, Gabriela Guerrero, Jan van Heemst, Diana Kimani, Germano Mwabu, Robert Nyaga and Rob Vos for helpful comments. This paper has been written under the auspices of the KIPPRA-ISS project.

The Institute of Social Studies is Europe's longest-established centre of higher education and research in development studies. Post-graduate teaching programmes range from six-week diploma courses to the PhD programme. Research at ISS is fundamental in the sense of laying a scientific basis for the formulation of appropriate development policies. The academic work of ISS is disseminated in the form of books, journal articles, teaching texts, monographs and working papers. The Working Paper series provides a forum for work in progress which seeks to elicit comments and generate discussion. The series includes the research of staff, PhD participants and visiting fellows, and outstanding research papers by graduate students.

For further information contact:
ORPAS - **Institute of Social Studies** - P.O. Box 29776
2502LT The Hague - The Netherlands - FAX: +31 70 4260799
E-mail: **workingpapers@iss.nl**

ISSN 0921-0210

Comments are welcome and should be addressed to the author:

ABSTRACT

Since independence in 1963, Kenya has invested substantial resources in the education sector. For almost three successive decades, these investments and other government policies led to impressive gains in educational access at all levels. However, in the nineties there appears to have been an erosion in educational participation and a reversal of the gains achieved in previous decades. Motivated by this trend, this paper uses temporal and cross-section data to assess the plausibility of various factors that may be responsible for the decline in primary school educational enrolment. In particular, we consider the role of school fees, school inputs and curriculum, school availability, the expected benefits of education and the spread of HIV/AIDS. We also try to identify the most effective policy interventions that may be used to prevent further declines in primary school enrolment rates.

Keywords: Primary school, Kenya, User fees, Test Scores, HIV/AIDS
JEL Codes: D1, I2

CONTENTS

1. INTRODUCTION

Investments in education are widely recognized as a key component of a country's development strategy. Increases in the quantity and quality of educational provision have been associated with a wide range of benefits including enhanced productivity, reduced poverty and income inequality, improved health and economic growth.[1] Spurred by such evidence, governments in developing countries continue to devote a substantial fraction of their total expenditure to the education sector.[2]

Kenya is no exception. Since independence, the government of Kenya has devoted a substantial fraction of its resources to the education sector. Between 1991-2000, public expenditure on education accounted for 28.2 percent of total government expenditure.[3] These investments have led to the establishment of a comprehensive network of schools and resulted in an impressive expansion of coverage and access to education at all levels. Adult literacy rates have more than trebled from 20 percent in 1963 to 76 percent in 1997 and the average educational attainment of the working-age population (age 15-64) is now around 6 years (see Kimalu et al., 2001).

Despite these impressive gains, a variety of problems continue to hamper the Kenyan education system. In terms of achievement, mean scores in English and Mathematics as measured by the Kenya Certificate of Primary Education (KCPE) examination have remained virtually unchanged during the period 1990 to 1995. With regard to efficiency, it is estimated that about 5-6 percent of Kenyan primary school students desert annually and repetition rates are estimated to be around 15-16 percent.

While high drop-out and repetition rates are causes of concern, in recent years, a more troublesome trend appears to be the decline in school enrolment ratios. These declines have overturned the gains in educational participation achieved in previous years. From a gross primary school enrolment rate (GER) of 98.2 percent in 1989, the enrolment rate has fallen to 86.9 percent in 1999. Similarly the gross secondary school enrolment rate has declined from 29.4 to 21.5 percent. In its poverty eradication plans the government of Kenya lays out its goal of achieving universal primary education by

---

[1] See Lockheed, Verspoor and associates (1991) for a detailed review.

[2] According to UNDP (1999), between 1993 and 1996 the average (unweighted) expenditure on education as a percentage of total government expenditure in developing countries was 14.8 percent.

[3] This figure corresponds to around 5-7 percent of GDP spent on education during the period 1991 and 2000. In terms of international comparisons this educational expenditure ratio is amongst the highest in the world (see UNESCO, 1999).

2015 and achieving a 15 percent increase in primary school enrolment between 1999-2005. Notwithstanding these targets, the declining pattern of primary school enrolment suggests that it may be difficult for the government to achieve its aims.

Motivated by the decline in enrolment rates and the importance attached to education as a means of alleviating poverty, our focus in this paper is on school enrolment. Specifically, our aim in this paper is to assess the plausibility of various factors that may be responsible for the decline in primary school enrolment. Furthermore, we also try to identify the most cost-effective policy interventions that may be used to influence enrolment.

The next section of the paper lays out an analytical framework that we use to motivate our empirical investigation. Section III briefly discusses Kenya's education system and examines the recent trends in enrolment rates. In this section we use descriptive statistics to assess the plausibility of various explanations that may drive enrolment patterns. Section IV describes the data set on which we base our econometric work. Section V presents our estimates and section VI concludes the paper.

2. PRIMARY SCHOOL ENROLMENT-AN ANALYTICAL FRAMEWORK

To formalize the school enrolment decision and to motivate our empirical work this section presents a framework tailored to our needs.[4] Consider the discrete school enrolment choice faced by parents. Parents have to determine whether it is worthwhile to enrol their children in school. While attending school yields benefits it comes at a cost. Direct and opportunity costs associated with school attendance lower resources available for household consumption. This household choice may be cast in terms of utility functions. Assume that each household has a utility function defined over *b* and *c,* where *b* denotes the benefits associated with attending school and *c* is household consumption. Accordingly, household utility conditional on school attendance (denoted by subscript 1) is given as,

$$U_1 = U(b, c_1)\,. \tag{1}$$

The associated budget constraint is,

$$y = c_1 + p\,, \tag{2}$$

[4] The framework used here is similar to those in Gertler and Van Der Gaag (1988) and Gertler and Glewwe (1990).

where y is household income, and p represents the total cost associated with school attendance.

In a similar fashion the utility associated with not attending school may be defined by,

$$U_0 = U(c_0). \tag{3}$$

The budget constraint is $y = c_0$. Given the utility associated with both options, households choose the option that yields the highest utility. The solution to the unconditional utility maximizing problem is

$$U^* = \max(U_1, U_o), \tag{4}$$

where U^* is the maximum utility. Alternatively, school attendance may be defined in terms of a dichotomous variable, a, where $a = 1$ if a child attends school and 0 otherwise. A child attends school i.e., $a = 1$ if $U_1 > U_0$.

Empirical Specification

Since our purpose is to determine the factors that influence enrolment we proceed by specifying linear forms of the conditional utility function. For the schooling option,

$$U_1 = \beta_1 b + \beta_2 c + \varepsilon_1, \tag{5}$$

where the β 's are coefficients to be estimated and ε_1 is assumed to be a mean zero, normally distributed error term with positive variance. Since $c_1 = y - p$, we may rewrite (5) to obtain,

$$U_1 = \beta_1 b + \beta_2 (y - p) + \varepsilon_1 \tag{6}$$

The utility function for the non-schooling option is,

$$U_o = \beta_2 y + \varepsilon_0 \tag{7}$$

Thus, an individual attends school, i.e. $a = 1$ *if* $\beta_1 b - \beta_2 p + \varepsilon_1 - \varepsilon_0 > 0$. Hence, the probability of attending school may be written as:

$$\Pr[a = 1] = \Pr[\beta_1 b - \beta_2 p + \varepsilon_a > 0]. \tag{8}$$

Assuming that the composite error term ε_a is normally distributed gives rise to an estimable probit enrolment model.[5]

Costs of attending school

The total cost (P) of sending a child to school includes direct (monetary) and opportunity costs. The available household survey data allows us to construct a measure of the direct costs of schooling. Detailed costs of sending a child to school are available for those children who are attending school. These data are used to compute a district-wide average of the cost of attending school and is used as our measure of the direct cost of schooling.

Turning to opportunity costs, attending school reduces a child's availability for work in and outside the home. If a child makes substantial contributions to family income, or plays an important role in supporting other working members, then the opportunity cost of attending school is likely to be high and this may curtail the attractiveness of the schooling option.[6] These opportunity costs and the value of a child's time will depend on the personal characteristics of the child (age, sex) and the value that parents place on a child's time. Since we do not directly observe opportunity costs we allow such costs to depend on a vector of child and family characteristics.

Benefits of attending school

Parents have to ascertain the total benefits (B) associated with school attendance. The main benefit associated with attending school is likely to be the expected addition to a child's human capital. To capture this effect we need a measure of the human capital gains associated with school attendance. Expected test scores are often used to indicate the benefits derived from education. Since such scores are not available for the individuals in our data set, we use district-wide average test scores from the KCPE examination as a measure of the expected benefits of attending school. These test scores are directly observable by parents and it is likely that they provide a signal that may be used by parents to judge the value of schooling. Bedi and Marshall (1999,

[5] In this linear utility specification, income has been differenced out of the decision rule and does not directly affect the school enrolment decision. In our empirical work we assess the role of household expenditure on enrolment by examining the enrolment decision across different expenditure quintiles.

[6] For example, Patrinos and Psacharopoulos (1995) show that child earnings account for 27.8 percent of total income in urban households in Paraguay, while Patrinos and Psacharopoulos (1997) show that child labor contributes 17.7 percent of household income in rural Peru.

2001) provide empirical evidence on the role played by expected test scores in determining educational choices.[7]

In addition to test scores it is likely that the quality of school inputs/curriculum play a role in determining the expected pay off from education. School inputs may influence the enrolment decision indirectly by influencing test scores (increasing the payoff associated with education) but may also have a direct impact on enrolment. In our empirical work we consider both these possibilities.

In accordance with the discussion above, equation (8) may be adjusted and rewritten as,

$$\Pr[a=1] = F[\gamma_{SF} SF + \gamma_x X + \gamma_H H + \gamma_{SI} SI], \qquad (9)$$

where, F represents the standard normal cumulative distribution function, SF represents school fees, X is a vector of child and family characteristics that influence the opportunity cost of enrolment, H is a measure of expected human capital gains, SI is a vector of school inputs and the γ's are coefficients to be estimated.

3. THE KENYAN EDUCATION SYSTEM AND TRENDS IN ENROLMENT

Since independence the Kenyan education system has witnessed several changes in structure and in curriculum. In the prevailing system (8-4-4), primary education is supposed to start at the age of 6 and consists of 8 years. This is followed by 4 years of secondary education. Secondary education paves the way for higher education which is imparted through a variety of technical institutes, polytechnics and universities. University education consists of a 4 year cycle.

Based on data collected in 1997, the educational pyramid reveals that 44 percent of the working age population has not completed primary school while 21 percent of the working age population has attained at least 8 years of schooling and completed

[7] It may be argued that expected earnings or expected employment prospects are better indicators of the expected benefits of education and should be used instead of test scores. We don't have district level information on employment rates by education level and so this measure is ruled out. While it is possible to create a measure of expected earnings it is not clear how this measure can be directly influenced by educational policies. On the other hand, school test scores may be influenced by altering the quality of school inputs and may be influenced to a greater extent by educational policies. A further justification for using this measure lies in the relationship between test scores and earnings. Based on their analysis of Kenyan data, Boissiere, Knight and Sabot (1985) report that cognitive skills, as measured by test scores on literacy and numeracy tests, are highly rewarded in the labor market.

primary school. About 17 percent has reached but not completed lower secondary education while 13.7 percent has completed lower secondary education. The remaining 5 percent has enrolled beyond lower secondary education and have at least 10 years of education (see Kimalu et al., 2001).

Although the focus of our work is on primary school enrolment in the nineties, it is quite illuminating to begin our discussions by examining enrolment patterns over a longer time period. In 1970 the gross enrolment ratio (GER) in Kenya was 62 percent and there was a gap of 20 percentage points between males and females (see Table 1a). Due to a rapid expansion of educational availability and the introduction of free education for grades I to IV in 1974, enrolments grew at a furious pace. By 1980 the GER had reached a peak of 115 percent and the gender enrolment gap had narrowed to 10 percentage points. While there is some disagreement on whether enrolments did indeed peak in 1980 all sources clearly show that a first enrolment shock occurred between 1984 and 1985.[8] Enrolment rates fell from 107 to 99 percent. For the next five years they remained stable. In 1989, there was a second shock and the GER declined from 98 to 92 percent. Thereafter, there was a gentler decline till the GER reached around 88 percent in 1993.[9] Since then the rates have stabilized between 86-88 percent. Despite variations in the overall GER, the gender gap has narrowed considerably and since 1989 has ranged between 3-4 percentage points. There are substantial regional differences in enrolment rates. In 1990, the Central and Western regions of the country had the highest enrolment rates of around 104 percent. The North Eastern province had the lowest enrolment rate of around 24 percent, followed, somewhat surprisingly, by Nairobi at around 66 percent. Over the decade of the nineties there has been a fall in enrolment rates in nearly all the provinces. The sharpest declines seem to have been ex-

[8] The World Bank's Africa database (see Table 1a) indicates that school enrolments peaked in 1980, while information from the Republic of Kenya's Economic Surveys show that enrolments peaked in 1983. There is also disagreement on the level of the GER. According to the World Bank's Africa database enrolments fell from 107.1 in 1984 to 99 in 1985. The Economic Surveys report corresponding figures of 103 and 96.

[9] Our discussion of enrolment declines is based on gross enrolment rates. It is possible for this rate to fall due to a reduction in the number of children repeating grades. However, numbers from the Ministry of Education (personal correspondence) show that repetition rates have been increasing over time. In 1979 the repetition rate was 8.92 percent while in 1993 it is estimated to be around 15.4 percent.

perienced in Nairobi and the Central province (see Table 1b).[10]

3.1 Explaining the trends

As outlined in the previous section, household choices concerning school enrolment are influenced by the costs and benefits associated with education. In particular, increases in the expected returns from attending school (directly or through provision of better school inputs) are likely to increase the probability of school enrolment. On the other hand increases in school fees and increases in the opportunity cost of attending school are likely to reduce the probability of enrolment. In this section we consider various changes that may have altered the cost-benefit calculus and exerted an influence on enrolment patterns.

School Fees

The most apparent reason for the decline in enrolment in the nineties lies in the introduction of a formal cost-sharing system in 1988. According to the cost-sharing system the government's contribution is confined to payment of teachers salaries while parents are required to pay for school uniforms, stationery, text-books, instructional materials and other school equipment. Parents are also expected to contribute to school construction and maintenance costs through *harambees* (fund-raising efforts). Although cost sharing as a formal policy was introduced in 1988, informal cost-sharing already existed. Parents were already paying for school uniforms, text-books and school maintenance. The real change was the re-introduction of school levies (to meet the cost of school materials, instructional equipment) that had been abolished in previous years.

The timing of this sudden and added increase in financial responsibilities is consistent with sharp decline in enrolment rates between 1989 and 1990. It is also consistent with the provincial (urban/rural) trends in enrolment rates. As displayed in Table 1, Nairobi and the Central province witnessed the largest declines in enrolment rates and

[10] The enrolment figures that we present pertain to enrolment in public schools. If there has been a shift in enrolment from public to private schools then part of the decline in the gross enrolment rate may be related to this shift. In recent years there has been an increase in the level of private participation. For instance, between 1994 and 1997, the number of private schools as a percent of all primary schools has increased from 0.67 to 2.2 percent (MOE, 1999). It is estimated that in 1997 around 2-3 percent of total enrolment is in private schools. Given the low private participation and the growth of these schools in a time period when enrolments have been more or less stable (i.e., 1994-1998), suggests that the shift from public to private schools is not particularly important in explaining enrolment patterns.

at the same time are provinces with the highest school fees as a ratio of per capita expenditure.

School curriculum

The 8-4-4 education system currently prevailing in Kenya was introduced in January 1985. This new system placed considerably more emphasis on acquiring vocational education in the last two years of primary schooling and throughout secondary school. The aim of this new system was to produce self-reliant school leavers with sound technical education. The introduction of this new system placed a substantial financial burden on parents. Physical facilities for teaching, including workshops and home-science classrooms had to be constructed to cater to the new vocational training curriculum. The financial responsibility for constructing these facilities was placed on parents, school committees and the local community served by the school. The additional subjects to be taught (an increase from 6 to 11 subjects) under this new curriculum also increased the financial requirements for text-books. Furthermore, completion of the extended curriculum required children to spend considerably more time in school and increased the opportunity costs of schooling. The doubling of subjects, the additional time required and the financial requirements for constructing new facilities suggests that between 1984 and 1985 the total costs of attending primary school may have increased by more than 100 percent. This curriculum-induced price shock is clearly the main factor behind the first enrolment shock.

Apart from costs, the new curriculum also increased the burden on teachers and students. Abagi (1997) notes that trying to cover an extended curriculum in the same time period increases pressure on students and staff and reduces student performance (lower test scores).[11] The reduction in learning, i.e., a reduction in the expected benefits from attending school may manifest itself in a reduction in school participation. The reduction in learning due to the increased pressure of the new curriculum could certainly have played a role in depressing enrolments in subsequent years. However, in terms of observed indicators of performance such as the KCPE scores, it does not appear that there were any reductions in educational performance. As Table 2 shows,

[11] Abagi (1997) writes that students in primary school are placed under great pressure. "They are taught 13 subjects, nine of which are examined at the end of Standard 8, stay in school from 7 a.m. to 5 or 6 p.m., and have short holidays." He goes on to argue that such a burden reduces the motivation for learning and leads to a deterioration in performance.

KCPE scores on English and Mathematics remained virtually unchanged during the nineties.

School inputs

Concentrating only on educational performance does not provide a complete picture. In terms of educational inputs there appear to have been some sharp changes during this period. The ratio of trained to untrained (without formal teaching qualifications) teachers increased sharply from 70 percent in 1990 to 96.6 percent in 1998. Correspondingly, while the student-teacher ratio remained between 31-32, the student to trained-teacher ratio fell from 44.4 to 33.6 (see Table 2). The increase in the proportion of skilled teachers may be expected to lead to an increase in educational performance and increased educational participation.

Our information on other school inputs is limited. Deolalikar (1998) points out that inadequacies in school equipment are one of the most important factors adversely affecting the quality of primary education in Kenya. However, we were unable to gather information on school inputs such as text-books and school equipment. Since the introduction of the cost-sharing system, parents have been responsible for the supply of text-books and it is possible that the pupil-text book ratio has fallen from the 17:1 reported in 1990 (see Republic of Kenya/UNICEF report, 1994).

In any case, the unchanged educational performance of students despite improvements in the observed quality of teachers increases the possibility that the lack of other inputs or factors such as an overloaded curriculum may have reduced the expected benefits of attending school and reduced educational participation.

Capacity of the system

Another possible explanation for the decline in enrolment may lie in the capacity of the primary school system to absorb students. An increase in the primary school-going population coupled with small or no increases in the capacity of the education system would manifest itself in a decline in gross enrolment rates. Between 1990 and 1999 the primary school going population increased by 15.4 percent from 5.85 million to 6.75 million. Over the same duration the number of primary schools grew by 18.5 percent and the number of primary school classes grew by 17 percent. These numbers suggest that the capacity of the school system does not appear to be a factor that inhibits enrolment growth. In fact, over this period, the comparatively lower rate of growth

in the number of enrolled students (an increase of 8.9 percent between 1990 and 1999) led to a decline in average class size from 33 to 31.

Labor Market Conditions

One of the main benefits of acquiring education is the expected role played by education in enhancing employment and wage prospects. While Kenya enjoyed an annual average GDP growth rate of around 4.5 percent between 1963-1989, the average annual growth rate between 1990 and 1999 has been substantially lower at around 2.5 percent. This decline in growth rates has been accompanied by a rapid increase in unemployment rates. Between 1989 and 1997 the unemployment rate rose from 6.5 percent to 18 percent (see Table 3). Except for individuals with university education (8 percent unemployment in 1997) unemployment amongst individuals with other levels of education was not substantially different from uneducated individuals (see Table 3). The composition of employment has also undergone some changes in recent years. Small-scale farming (including pastoral activities) provides the largest share of employment in Kenya. While this sector retains its share, the share of the formal sector appears to have declined. Due to the decline in growth rates and on-going public sector reforms there has been a shift in employment from the formal to the informal or *jua kali* sector. In 1999, excluding small-scale farming, the informal sector accounted for around 68 percent of total employment. Thus, it is likely that the reduced employment prospects of educated individuals and the reduction in formal sector employment may have played a role in reducing the incentive to acquire education.

HIV/AIDS

The decline in educational participation during the decade of the nineties appears to coincide with the increase in the spread of HIV and AIDS in Kenya. AIDS was first reported in Kenya in 1984 and between 1990 and 1999 the HIV prevalence rate increased from 4.8 percent to 13.5 percent (see Table 4a). The prevalence of AIDS is considerably higher in urban areas (this is consistent with the greater decline in educational enrolment in urban areas) and adults, i.e. individuals between 15-49, account for around 94 percent of the total number of HIV positive individuals. Most deaths associated with AIDS occur in the age range 29 to 39.

There are several ways in which the spread of HIV/AIDS may have an impact on the education sector (see Stover and Bollinger, 1999). First, increased expenditure

on health care or a reduction in household income due to the death of a parent may reduce a household's ability to pay school fees and force children to drop out of school. The death of a parent may also increase the opportunity cost of a child's time and result in a reduction in enrolment. Second, children may drop out of school if they contract the disease themselves. Third, the disease may also reduce the supply of experienced teachers. In the Kenyan case, the effect of HIV/AIDS via a reduction in household income and the attendant increase in opportunity cost is probably the most likely channel through which HIV/AIDS affects educational participation. Given that the disease mainly affects individuals older than 15 years it is unlikely that the incidence of the disease amongst primary school children is a major reason for the decline in educational participation.[12] As discussed above, between 1990-1998 there was an increase in the supply of skilled teachers suggesting that the prevalence of HIV does not appear to affect the availability of skilled teachers.[13]

While it seems most likely that HIV/AIDS will have an impact through its effect on reducing household expenditure, empirical evidence on the effect of HIV/AIDS on educational participation is rather limited. On the basis of cross country evidence from six African countries, Ainsworth et al. (2000) report that countries with higher HIV prevalence appear to have higher enrolment rates suggesting that differences in educational policies probably play a far greater role in determining outcomes than the incidence of disease. From a within country perspective, Ainsworth et al. (2000) use data from a Demographic and Health Survey conducted between 1991-1994 in the Kagera region of Tanzania to examine the effect of adult mortality on primary school enrolment.[14] Their evidence does not suggest that the decline in primary school enrolment rates in Tanzania is strongly associated with adult mortality. They show that, regardless of wealth, households cope with adult deaths by delaying the enrolment of young children (7-10) while maintaining the enrolment of older children (11-14).

We now turn to the Kenyan context. In order to gather information on the prevalence of HIV/AIDS, Kenya has implemented a sentinel surveillance system.

---

[12] According to the Kenya Human Development Report (1999), 76,744 full-blown cases of AIDS have been reported. Of these around 1 percent or 736 cases are in the age group 5-14.

[13] After 1998 there does appear to be a decline in the number of skilled teachers. Recent statements by the Government of Kenya also indicate that in the last few years there may have been a decline in the availability of skilled teachers.

[14] The Kagera region is located close to Lake Victoria. HIV prevalence rates in this region are around 33 percent higher than the country average.

Pregnant women who visit ante-natal clinics in sentinel sites located across the country are tested for the presence of the HIV virus. Each sentinel site represents a number of districts and a certain percentage of the adult population. Information on HIV prevalence among pregnant women and the percentage of the adult population represented by a particular site are used to make projections for the prevalence of HIV in the country's adult population. Table 4b presents information on HIV prevalence rates across 16 sentinel sites. Except for two sites, the information presented in Table 4b pertains to clinics in urban areas.

We begin our investigation of the link between enrolment rates and HIV prevalence by estimating the correlation between these two rates. Correlations between HIV prevalence rates (lagged HIV prevalence rates) and enrolment rates do not suggest any relationship. In fact for some years the relationship between the two rates is positive (see Table 4b). Temporal patterns also suggest that there is no relationship between changes in HIV prevalence rates and changes in enrolment rates. There are of course several problems with simply estimating correlations. We have not controlled for the urban nature of the HIV data, nor for any other individual, family or regional characteristics.[15] Later on in the text we discuss results based on a more complete analysis.

Summary

We have discussed several potential factors that may have a bearing on the decline in enrolment rates in the mid-eighties and the nineties. These factors may be operating simultaneously and it is difficult to isolate the relative effects of each of the possible factors using only descriptive statistics. However, on the basis of the preceding discussion it does seem that the first enrolment shock between 1984-85 may be attributed to the additional educational costs induced by the new educational structure and curriculum. Similarly, the second enrolment shock between 1989-90 also appears to be cost-driven and may be attributed to the re-introduction of school levies. Thereafter, the more gradual decline may be driven by the reduction in expected gains (stagnant test scores, reduced employment opportunities). The capacity of the school system and the spread of AIDS do not seem to have much of a bearing on enrolment rates.

[15] For instance, if HIV/AIDS rates are higher amongst those with higher incomes, then without controls for income we may conclude that there is a positive link between HIV/AIDS and enrolment.

So far our discussion has been temporal in nature and based on descriptive statistics. In order to try and pin down the relative importance of at least some of these factors and to examine their effects on different expenditure groups we now turn to regression analysis. Our regression analysis is based on cross-section data, and in contrast with the previous section, we now rely on cross-sectional variation to identify the factors associated with enrolment.

4. DATA DESCRIPTION AND SPECIFICATION

The empirical work in this paper is based on a data set that has been created by combining information from the 1994, Welfare Monitoring Survey (WMS) II and district level information obtained from the Ministry of Education. The WMS II covered over 10,000 households and over 50,000 individuals in all districts in Kenya. The multi-purpose survey gathered information on a variety of dimensions including income and consumption, child health, fertility, and other individual and family characteristics. The survey also contains detailed information on the education of all household members, including expenditures on education. These individual and household data were merged with district level information on school inputs. Although, the district level data are highly aggregated and ignore intra-district differences, they do allow us to conduct a more complete analysis. Relying solely on the household data set would have restricted our analysis largely to the demand for schooling. The combined data set allows us to go beyond this and explore the role of supply-side variables.[16]

We restrict ourselves to children in the age group 6 to 15 on whom we have complete information on school enrolment, child, family and other district level characteristics.[17] The sample used in this paper consists of 13,306 children. Figures on primary school enrolment (on the basis of these data) and descriptive statistics and definitions for the independent variables are provided in Tables 5 and 6.

Table 5a presents figures on gross and net enrolment rates. The gross enrolment ratio for 1994 is around 88 percent. This is quite similar to the figure for primary school

[16] As pointed out by Moulton (1986), in cases where regressors include variables with repeated values within groups (as in the present context), ignoring intra-group error correlation may lead to incorrect statistical inference. Acknowledging this possibility our estimates of the enrolment equation are corrected for the effects of intra-group correlation.

[17] We consider children in the age group 6 to 15 rather than the age group which should be in primary school, i.e., 6 to 13, in order to allow for the possibility of late enrolment in primary school. Estimates based on the smaller age group (6-13) and for a sample of 8-15 year old children were not substantially different.

enrolment that was obtained from the Ministry of Education (MOE) - see Table 1b. The net enrolment ratio is lower at around 80 percent. The higher gross enrolment ratio indicates that a number of children who are not in the primary school going age of 6-13 years are still in school. This may be because some children join school later than expected or that they are repeating grades. Table 5b presents figures on net enrolment rates disaggregated by expenditure deciles. Net enrolment rates vary from 68.5 percent at the lowest expenditure decile to 87.1 percent at the highest decile. The gap in the male-female enrolment ratios is also more pronounced at the lower deciles. As mentioned earlier, while there is a gap between male and female enrolment rates these differences are not very large. At the mean, the gap in the net enrolment ratio is about 2 percent in favor of males.[18]

Corresponding to *SF* in equation (9), the measure of school costs that we use in our regressions has a mean of 44 shillings per month (see Table 6). This measure consists of household expenditure on school fees, school uniforms, transport and boarding. We exclude other elements of school expenditure as they may contain a discretionary element (endogenous) and could obscure the relationship between school costs and enrolment. Our measure of school costs is considerably smaller than the total school expenditure which is 72 shillings per month and also includes expenditure on text books, individual tutorials and *harambee* contributions.[19] In terms of the individual expenditure components, school uniforms account for the largest share (29 percent), followed by school fees (26 percent), text books (21 percent) and *harambee* contributions (13 percent).

Vector *X* corresponds to a set of child and family variables. The child-specific variables include age, sex and order of birth. Family characteristics include maternal and paternal years of schooling, and three indicators of household wealth, i.e., whether

---

[18] In our data set there are two variables that may be used to capture enrolment. We have information on whether a child has ever attended school and also whether a child is currently in school. The difference between the two variables indicates children who have dropped out of school. In our sample we have a total of 13,306 usable observations on children of which 3,553 have never attended school. Of the 9,753 who have "ever attended school", 9,440 are still in school and 313 have dropped out. These numbers display that the main problem appears to be whether an individual ever enters the school system. To focus on this issue and to avoid mixing the initial enrolment decisions with dropping out we decided to use responses to the query, "Have you ever attended school", as the basis for our dependent variable.

[19] Household schooling expenditure amounts to about 28-29 percent of the total per pupil expenditure at the primary level and about 9 percent of monthly consumption per capita. In 1993-94 annual government expenditure per student at the primary education level was around Kshs. 2078. Per capita monthly household consumption was around Kshs. 770 (see Kimalu et al. 2001).

a family owns its dwelling, the number of rooms in the house and the amount of land per capita that the household possesses. The average district score on the KCPE examination captures the expected benefits of attending school (*H*). If parental decision making is responsive to the expected benefits of attending school then this variable should exert a positive influence on enrolment. The *SI* vector consists of the pupil-teacher ratio, and three variables that represent different levels of teacher qualifications. The average pupil-teacher ratio is around 32. In terms of international comparisons this ratio is not particularly high (UNESCO, 1999). The composition of skilled teachers (defined in terms of educational qualifications) consists of around 5 percent at the highest level, followed by 55 percent at level two and 26 percent at level three. The remaining teachers (around 14 percent) are at the lowest level.[20] In terms of geographical spread, more than 90 percent of the sample lives in rural areas. For the most part we don't estimate separate specifications for rural and urban areas and given the rural-urban composition, our results should be viewed as applicable mainly to rural areas.

5. RESULTS

The results are divided into three sections. In the first part we present estimates of the school enrolment probit equations. The second section discusses price and school input elasticities obtained on the basis of the probit estimates, while the third section considers some policy scenarios.

5.1 School Enrolment

Probit estimates of school enrolment are presented in Table 7. Two sets of estimates are presented in this table. The first specification includes a set of provincial controls while these are excluded in the second specification. The results across these specifications are not very different. The main change is the effect of KCPE scores on enrolment.[21] Inclusion of the provincial controls erodes the effect of this variable. From a policy perspective it may not be very useful to say that differences in enrolment

[20] Teachers in Kenya are placed at different levels (S1, P1, P2, P3 and P4) according to their qualifications. Our classification of skilled teachers is defined as follows. The highest level, skill level 1 consists of graduate teachers or teachers with S1 qualifications. Skill level 2 corresponds to P1 teachers, skill level 3 to P2 and P3 teachers and skill level 4 corresponds to P4 and untrained teachers.

[21] Apart from the KCPE score there is a change in the sign on the teacher–skill level 3 variable, although this variables is not statistically significant. There is also a decline in the magnitude of the home ownership variable.

are "explained" by provincial controls. Since, our aim is to identify policy relevant variables that may be associated with enrolment, we base our discussion mainly on the second specification.

We begin the discussion by considering the child characteristics. There is a non-linear relationship between age and enrolment. Our estimates show that till 13, age is positively linked to enrolment. However, beyond 13 there is a rapid drop in the probability of attending school. This indicates that opportunity costs of attending school become important in reducing school participation only at the age that a child should be finishing primary school. From a policy perspective this suggest the importance of ensuring that children start school at the expected age of six.

There does appear to be a slight male advantage in terms of school enrolment. Being male increases the probability of attending school by approximately 3 percent. The order of birth is negatively linked to school enrolment (although it is statistically significant at only the 10 percent level). This implies that a first-born child is more likely to attend school as compared to children who are born later.

Turning to the family characteristics, the coefficients on maternal and paternal education reveal a well-known picture. A one-year increase in parental education is associated with a 1.5-1.7 percent increase in the probability of enrolling in school.[22] Of the three remaining family variables, home ownership and number of rooms in a house house are intended to capture the wealth status of the household, while land per capita may reflect wealth as well as household demand for labor. While the size of the house appears to be positively correlated with enrolment none of the other variables appear to play an important role in determining schooling patterns.

As may be expected, the costs of attending school exert a negative influence on the school-enrolment decision. The estimates suggest that (at the mean) doubling the cost of schooling from 44 to 88 shillings a month would reduce the probability of school enrolment by about 2-4 percent. In an attempt to identify the effects of individual cost components we estimated a specification with a set of disaggregated cost variables. These estimates are presented in Table 8, column 2. To enable comparisons, estimates from our baseline specification (i.e. Table 7, specification 2) are reproduced in

[22] In preliminary regressions we included a set of controls for parental occupational and industrial affiliation. However, the inclusion of parental education variables eroded most of the effects associated with these variables. Accordingly, we decided to work with a more parsimonious specification.

the first column. Estimates based on the disaggregated cost variables show that the negative cost effect emanates mainly from the cost of school uniforms. While students may attend school without textbooks, notebooks or other writing material it is compulsory for students to wear a uniform in school. This requirement combined with the information that expenditure on uniforms is the largest component of a household's schooling expenditure explains the large negative effects associated with this variable.

The relative novelty in our paper is the use of the KCPE exam score as a determinant of enrolment. We argue that this score provides parents with a signal of whether school enrolment yields sufficient human capital benefits. Our estimates show that there is a positive link between the KCPE score and school enrolment, indicating that parents living in districts with higher KCPE scores are more likely to send their children to school. The marginal effect suggests that an increase in the mean KCPE score by one standard deviation (36 points) is associated with a 5 percent increase in enrolment probability. While this estimate clearly demonstrates the importance of expected benefits in determining school enrolment decisions it does not suggest how these increases may be achieved. To determine the appropriate policy interventions one requires an analysis of the factors that lead to higher test scores. While our data do not permit such an analysis, based on an analysis of KCPE scores of students from 50 schools, Appleton (1995) reports that the provision of text books, and the educational qualifications of teachers (at least for boys), appear to be among important determinants of test scores.

The school input variables in our specification are the student-teacher ratio and the skill (educational) composition of teachers in a district. These variables probably exert an indirect influence on the school enrolment decision through their effect on test scores. If this were the only channel of influence then it would suggest that once KCPE scores have been included, these variables should be excluded from the enrolment specification. However, allowing only this indirect channel of influence is too restrictive. It is possible that more qualified teachers do a better job of teaching (i.e. higher test scores) as well as administering and managing a school. Accordingly, we allow these school inputs to exert a direct effect on enrolment. With regard to the student-teacher ratio there does not appear to be any link between this measure and enrolment rates. Given the relatively low student-teacher ratio this is not particularly surprising. Three variables capturing different levels of teacher skill are included in the regression. This allows teacher skills to exert a non-linear impact on enrolment. The estimates

suggest that enrolment rates are higher in those districts that have a larger share of teachers at skill levels 1 and 2. In terms of statistical significance the clearest impact is associated with teachers at skill level 2. The estimates imply that an increase in the percentage of skilled teachers at level 2 by one standard deviation (12.6) would increase enrolment by 7-8 percent. To assess the total effect of these variables, i.e. their direct influence on enrolment as well as their influence on enrolment through the KCPE scores we estimated a specification that excluded the KCPE score. These results are presented in Table 8, column 3. Comparisons of these estimates with our baseline estimates shows that the marginal effects of the teacher skill variables, especially those associated with teachers at skill level 1, are considerably larger. The coefficient on this variable suggests that a one standard deviation (2.47) increase in teachers at this level is associated with a 4 percent increase in enrolment. The larger marginal effects shows that investments in these inputs exert a direct and indirect influence on enrolment.

Finally, we turn to the link between HIV/AIDS prevalence and enrolment rates. As discussed earlier there are several channels through which the prevalence of this disease may influence enrolment rates. The most likely appears to be the effect of the disease on household ability to meet school expenses and the potential increase in the opportunity costs associated with school attendance. In terms of an empirical specification, if the first link is the main channel (i.e. inability to pay school fees) then the prevalence rates in a district and the cost of schooling should be interacted. If the main channel is through an increase in opportunity costs this would suggest a more direct effect of HIV prevalence rates on enrolment. To keep matters simple we follow the latter approach.

We merged the data on district HIV prevalence rates for several years with our micro data and re-estimated our baseline enrolment specification with the inclusion of the district level HIV prevalence rates as an additional regressor. Since the effect of the disease may take some time to manifest itself, our regressions are based on HIV prevalence rates in 1990. Estimates of this specification are presented in Table 8, column 4. Inclusion of this additional variable does not alter our baseline estimates. The coefficient on the HIV prevalence variable is negative but is not precise and does not suggest the existence of any relationship between the prevalence of HIV and enrolment rates.

Since the data on HIV/AIDS are mainly for urban areas, we decided to estimate an enrolment specification based only on the sample residing in urban areas. The results based on the urban sample differ remarkably from the total (rural) sample (see Ta-

ble 8, column 5). There is a strong and clear negative effect of the prevalence of HIV/AIDS on enrolment patterns in urban areas. The estimates indicate that a 10 percent increase in HIV prevalence is associated with a 2 percent reduction in enrolment. Using Nairobi as an example of an urban area we see that between 1990-99 enrolment rates in Nairobi fell by 12.3 percent while HIV prevalence rates increased by 6.2 percent. Our estimates suggest that a decline of 1.24 (6.2 x 0.2) percentage points may be attributed to the increased prevalence of HIV. Thus, while there is a clear negative effect of the spread of the disease on enrolment rates in urban areas, the magnitude of the effect suggests that it is only one of the factors responsible for the decline. The lack of an effect in rural areas may be due to the urban nature of the HIV data, but it may also indicate the prevalence of inadequately understood coping mechanisms which mitigate the effect of the disease.[23]

5.2 Price and Input Elasticities

So far our discussion has concentrated on the effect of the various educational characteristics on mean enrolment probabilities. Given the sharp income inequalities in Kenya, it is likely that there are sharp differences in the effect of school costs and school inputs across different households. To examine these patterns we estimate separate probit enrolment models for five per capita expenditure groups. Subsequently, these estimates are used to determine price and school input elasticities for each expenditure group.

The elasticities are presented in Table 9. The price elasticities are computed at the mean and at the mean plus one standard deviation. Looking across the table a discernible pattern is the decline in price elasticities as income rises. For the richest quintile, price increases have no impact on the school enrolment decision while at all other quintiles there is a statistically significant effect. The effect is largest at the lowest quintile where a 10 percent increase in costs would lead to a reduction in enrolment of 1.2 percent (computed at the mean). Price elasticities computed at a higher price (mean plus one standard deviation) are considerably higher. Elasticities computed at the higher level of school costs show that a 10 percent increase in school fees would reduce

[23] For example, widow inheritance, a common custom among the Luo people of Kenya may be responsible for the spread of HIV but it is also likely that this practice serves as a support mechanism which may reduce the effect of the disease.

enrolment at the lowest quintile by 3 percent.

Elasticities with respect to the KCPE score and the two school inputs are also presented in Table 9. For the entire sample an increase in the KCPE score by 1 percent translates into a 0.59 percent increase in enrolment. The effect of this quality signal is particularly large at the lower quintiles. At the lowest quintile a 1 percent increase in this measure may lead a 1.2 percent increase in enrolment while the effect at the highest quintile is more muted and results in a 0.4 percent increase in enrolment. The differential response across quintiles suggests that households at the lower end require a more convincing demonstration of the gains from education (at least as measured by the KCPE score) to send their children to school as compared to households at the upper end of the distribution. The relatively muted effect of this variable may also be explained by the greater ability of richer households to compensate for any educational deficiencies and the possibility that education is treated as a consumption and an investment good by richer households. All these reasons support the idea that richer households will be less responsive to expected benefits while making enrolment decisions as compared to poorer households.

Regardless of the expenditure quintile the student-teacher ratio does not exert an effect on school enrolment decisions. In terms of teacher skills the clearest impact between enrolment and teacher qualifications emanates from teachers at skill level 2. Across quintiles a marginal increase in this measure is associated with a 0.18-0.66 percent increase in enrolment. The pattern of elasticities across quintiles is similar to that for test scores. Once again, the relatively higher effects of this measure at the lower quintiles suggests that poorer households are more sensitive to the quality of school inputs and need to be convinced that the sacrifice of household consumption will yield adequate benefits.[24]

5.3 Policy Scenarios

Our analysis shows that there are several ways in which the school enrolment decision may be influenced by policy interventions. Interventions could consist of sub-

[24] An alternative explanation for differential effects across expenditure quintiles might lie in diminishing returns to investments in school inputs. However, a look at the district averages of the school input variable across expenditure quintiles does not show very sharp differences in district wide access to school inputs/quality. For example, at the lowest quintiles the mean (std. dev.) KCPE score is 332 (34.16) while at the highest quintile it is 333 (34.78). The percentage of trained teachers ranges from 83.8 (12.26) to 87.6 (7.79).

sidies designed to reduce the cost of schooling or measures that would increase the availability of skilled teachers or some combination of these interventions. While it is important to identify the marginal impact of each of these measures on the outcome under consideration it is also important to compare the relative costs of various policies. In this section we compare the cost effectiveness of a policy designed to increase enrolment by reducing the cost of schooling and a policy of increasing the availability of skilled teachers.

Estimates of such a cost-effectiveness analysis are presented in Table 10. Using price adjustments to increase enrolment requires a 24.4 percent reduction in school fees to increase enrolment by 1 percent (reciprocal of the elasticity). At the mean schooling expenditure of 72 shillings per month, this implies that an average subsidy of around 16 shillings per month to students who are not enrolled in school would result in a 1 percent increase in enrolment. This cost estimate does not include the cost of designing, managing and administering such a subsidy program.[25]

In terms of the school inputs, a 1.69 percent increase in KCPE scores may be expected to increase enrolment by 1 percent. However, we have limited information on how this increase may be achieved. One possibility is to increase the supply of skilled teachers at level 2. As shown in the previous section this policy may influence enrolment through its effect on KCPE scores but also directly. Since we don't have estimates of the effect of school inputs on test scores we concentrate only on the direct link. Increasing enrolment by 1 percent requires an increase in the number of skilled teachers at level 2 by 1,413 teachers (an increase of 2.44 percent). Based on salary costs in 1994 this translates into monthly costs of 158 shillings per additional enrollee. If additional teachers at skill level 2 are employed and the number of untrained teachers is reduced by the same number the costs of the policy decline to about 85 shillings a month. A further cost decrease is possible if teachers at level 3 are trained and upgraded to a higher level (see Table 10 for details). There are several other policy combinations and possibilities that that may be used to increase enrolments. However, our

[25] The total cost associated with a subsidy program depends on the manner in which the program is designed and administered. For example, a program that tries to deliver subsidies to those students who do not attend school requires a mechanism to locate and identify vulnerable households. On the other hand a program of educational subsidy which is designed in terms of a school meal program calls for increased expenditure on all students who attend school and those who may attend school in response to the program.

purpose is not to carry out such an exhaustive analysis but to illustrate the manner in which these estimates may be used to guide policy.

6. CONCLUDING REMARKS

Motivated by the recent decline in primary school enrolment in Kenya and the importance attributed to education as a means of alleviating poverty, this paper concentrated on primary school enrolment in Kenya. In particular, we examined the plausibility of various factors that may have been responsible for the decline in enrolment rates since the mid-eighties. We detected two enrolment shocks, the first between 1984 and 1985 and the second between 1989 and 1990. The first shock coincides with the introduction of a new educational structure and curriculum while the second shock coincides with the introduction of a policy of cost-sharing. Both these changes led to a sudden and sharp increase in the cost of attending school and were probably the main reasons for the enrolment shocks. After the second shock, there was a gentler decline in enrolment rates which may be attributed to further increases in the cost of schooling and reductions in the expected benefits of attending school (stagnant test scores, reduced employment opportunities). In urban areas the spread of HIV/AIDS appears to be a factor that may have further reduced enrolment. Extrapolations from our cross section results suggest that around 10 percent of the total decline in enrolment rates in urban areas may be attributed to the spread of HIV. For rural areas our data on HIV prevalence are sparse and we were unable to detect any negative effects on enrolment.

Our cross-section analysis of enrolment rates was based on a data set that merged district level information on educational measures with data from a 1994 household survey. The use of these merged data allowed us to analyze the role of demand and supply factors in determining enrolment. Enrolment was treated as a function of opportunity costs, direct costs and the expected benefits of attending school. Our analysis indicated that opportunity costs (as measured by age) are important in reducing enrolment but only when a child is 13 or older. Direct costs of schooling inhibited enrolment, with the cost of school uniforms exerting the largest negative impact on enrolment. At the mean, a 100 percent increase in school costs would reduce enrolment by 4 percent while at the lowest expenditure quintile a 100 percent increase in fees is associated with a 12 percent decrease in enrolment. In terms of policy the results suggests that a program of subsiding educational costs particularly by subsiding school uniforms would be most effective in increasing enrolment.

Consistent with our expectations, expected benefits (as captured by the KCPE score) clearly played an important role in shaping enrolment decisions. A 10 percent increase in the KCPE score is associated with a 6 percent increase in the enrolment rate. The responsiveness of households to this measure demonstrates the rationality of the school enrolment decisions. The substantially larger impact of this variable amongst low-income households reflects that poorer households need a clearer demonstration of the benefits of schooling. From a policy perspective these results show that investments in school inputs may be used to achieve the same objective as programs designed to reduce the costs of school enrolment.

To enhance our analysis we gathered information on the costs of increasing enrolment by reducing costs and by increasing expected benefits (altering school inputs) and carried out a cost-effectiveness analysis. The analysis showed the importance of analyzing not only the marginal effects of alternative policies but also their associated costs. While the analysis did not yield straightforward conclusions, as the relative costs of various policies depends on the manner in which they are designed and implemented, it did provide a basis for evaluating the cost implications of various policy alternatives.

In terms of policy measures our analysis focused mainly on the role of school inputs in determining outcomes. The concentration on school inputs is driven by data considerations. We are aware that pedagogical processes and school management policies may play an important role in determining expected benefits (and consequently enrolment) and may also be more cost-effective. Despite this limitation, our analysis is one step towards understanding the factors that motivate enrolment in Kenya.

REFERENCES

Abagi, O. (1997a). “Public and Private Investment in Primary Education in Kenya: An Agenda for Action.” IPAR Discussion Paper No.5, Nairobi.

Abagi, O. (1997b). "Status of Education in Kenya: Indicators for Planning and Policy Formulation." IPAR Special Report, Nairobi.

Abagi, O. Olweya, J and Otieno, W (2000). “Counting the Social Impact of Schooling: What Kenyans say about their School System and Gender Relations.” IPAR Discussion Paper No.24, Nairobi.

Abagi, O. (1997). “Efficiency of Primary Education in Kenya: Situational Analysis and Implications for Educational Reforms.” IPAR Discussion Paper No.4, Nairobi.

Abagi, O. and Olweya, J. (1999). “Educational Reforms in Kenya for the Next Decade: Implementing Policies for Adjustment and Revitalisation.” IPAR Special Paper Series No. 3, Nairobi.

Appleton, S. (1995). “Exam Determinants in Kenyan Primary School: Determinants and Gender Differences.” The World Bank, Economic Development Institute, Washington D.C.

Ainsworth, M. Beegle, K. and Koda, G. (2000). "The Impact of Adult Mortality on Primary School Enrolment in Northwestern Tanzania." Manuscript.

Bedi, A.S. and Edwards, J.H.Y.(2001). “The Impact of School Quality on Earnings and Educational Returns–Evidence from a Low-Income Country.” ISS Working Paper No. 338. Forthcoming. *Journal of Development Economics.*

Bedi, A.S. and Marshall, J.H. (1999). "School Attendance and Student Achievement: Evidence from Rural Honduras." *Economic Development and Cultural Change* 47, 657-682.

Bedi, A.S. and Marshall, J.H. (2001). "Primary School Attendance in Honduras." ISS Working Paper No. 320. Forthcoming. *Journal of Development Economics.*

Behrman, J. and Knowles, J.C. (1999). “Household Income and Child Schooling in-Vietnam.” *The World Bank Economic Review* 13, 211-252.

Boissiere M., Knight, J. and Sabot, R.H. (1985). “Earnings, Schooling, Ability and Cognitive Skills.” *American Economic Review* 75, 1016-1029.

Deolalikar, A.B. (1998). “Public Spending on Education in Kenya: International Comparisons.” The World Bank, Washington D.C.

Family Health International/AIDSCAP (1996). *AIDS in Kenya: Socioeconomic Impact and Policy Implications.*

Filmer, D. (1999). *Educational Attainment and Enrolment Profiles: A Resource Book based on Analysis of Demographic and Health Survey Data*. The World Bank, Washington DC.

Gertler, P. and van der Gaag, J. (1988). "Measuring the Willingness to Pay for Social Services in Developing Countries." LSMS Working Paper No. 45, The World Bank, Washington D.C.

Gertler, P. and Glewwe, P. (1992). “The Willingness to Pay for Education for Daughters in Contrast to Sons: Evidence from Rural Peru.” *The World Bank Economic Review* 6, 171-188.

Gertler, P. and Glewwe, P. (1990). “The Willingness to Pay for Education in Developing Countries: Evidence from Rural Peru.” *Journal of Public Economics* 42, 251-275.

Handa, S. and Simler, K. (2000). "Quality or Quantity? The Supply-Side Determinants of Primary Schooling in Rural Mozambique." Manuscript.Kenya Human Development Report (1999).

Kimalu, P. K., Nafula, N., Manda, D.K, Bedi A.S., Mwabu G., and Kimenyi, M.S. (2001). "Education Indicators in Kenya." KIPPRA Working Paper No.4, Nairobi.

Knight, J.B. and Sabot, R.H. (1990). *Educational Productivity and Inequality: The East African Natural Experience.* New York: Oxford University Press.

Lockheed, M., Verspoor A., and Associates (1991). *Improving Primary Education in Developing Countries*. London: Oxford University Press.

Maas, J.L (1982). “Distribution of Primary School Enrolments in Eastern Africa.” World Bank Staff Working Papers No. 511, The World Bank, Washington D.C.

Moulton, B.R. (1986). “Random Group Effects and the Precision of Regression Estimates.” *Journal of Econometrics* 32, 385-397.

NASCOP (1999). *AIDS in Kenya: Background, Projections, Impact and Interventions.* Nairobi.

Ministry of Education, Science and Technology, Statistics Section (1999). *Education-Statistics and Indicators.* Nairobi.

Patrinos, H.A., Psacharopoulos, G., (1995). “Educational Performance and Child Labor in Paraguay.” *International Journal of Educational Development* 15, 47-60.

Patrinos, H.A., Psacharopoulos, G., (1997). “Family Size, Schooling and Child Labor in Peru-An Empircal Analysis.” *Population Economics* 10, 387-405.

Republic of Kenya (1992). *Education for All: Issues and Strategies*. Government Printer, Nairobi.

Republic of Kenya (1985). *Report of the 8-4-4 Implementation, Evaluation Committee*. Government Printer, Nairobi.

Republic of Kenya. (Various Issues). *Economic Survey*. Government Printer, Nairobi.

Republic of Kenya. (Various Issues). *Statistical Abstract*. Government Printer, Nairobi.

Republic of Kenya.(Various Issues). *National Development Plans*. Government Printer, Nairobi.

Republic of Kenya (1994). *Welfare Monitoring Survey: Basic Report*. Government Printer, Nairobi.

Republic of Kenya (1965). *Sessional Paper No.1 on African Socialism and its Application to Planning in Kenya*. Government Printer, Nairobi.

Republic of Kenya (1964). *Kenyan Education Commission Report: Part I*. Government Printer, Nairobi.

Republic of Kenya (1965). *Kenyan Education Commission Report: Part II*. Government Printer, Nairobi.

Republic of Kenya (1988). *Sessional Paper no.6 on Education and Manpower Training for the Next Decade and Beyond*. Government Printer, Nairobi.

Republic of Kenya (1976). *Report of the National Committee on Education Objectives and Policies*. Government Printer, Nairobi.

Republic of Kenya/UNICEF (1994). "Comprehensive Education Sector Analysis: An Analytical Report on Education and Training in Kenya." CESA Draft Report, Nairobi.

Stover J. and Bollinger, L. (1999). "The Economic Impact of AIDS." The Policy Project. Manuscript.

UNDP (1999). Human Development Report. Oxford University Press, Oxford.

UNESCO (1999). Statistical Yearbook.

TABLES

Table 1a
Gross Primary School Enrolment Rates 1970-1989 (%)

Year	1970	1975	1980	1982	1984	1985	1986	1987	1988	1989
Total	62.1	103.9	115.2	112	107.1	99	98.1	98.2	96.5	98.2
Male	72.3	111.9	120.2	115.8	110.2	101.8	101	100.9	98.7	99.9
Female	51.8	95.9	110.1	112	103.9	96.1	95	95.4	94.4	96.3

Source: World Bank Africa Database 2001, The World Bank

Table 1b
Gross Primary School Enrolment Rates 1990-1999 (%) a

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Change (1990-99)	Cost (%) [b]
Total	92.19	91.40	91.54	87.84	88.49	86.80	86.44	87.61	88.80	86.91	-5.28	2.80
Male	94.16	93.30	93.07	88.83	89.13	87.35	87.33	88.61	89.36	88.11	-6.05	.
Female	90.21	89.40	90.00	86.84	87.83	86.25	85.54	86.60	88.24	85.71	-4.50	.
By province												
Coast	79.93	78.80	78.85	75.09	71.40	73.30	75.57	75.17	73.25	75.95	-3.98	1.85
Central	103.60	102.60	103.56	102.80	101.04	104.95	100.22	100.44	98.20	93.81	-9.80	5.03
Eastern	96.82	97.40	96.35	92.57	91.76	89.86	90.46	90.75	93.84	94.88	-1.94	1.90
Nairobi	66.32	65.30	64.57	50.46	61.47	60.65	58.91	57.12	56.87	54.07	-12.25	7.70
Rift Valley	91.73	90.90	89.53	82.35	83.93	83.32	84.01	85.35	86.68	86.94	-4.79	2.20
Western	104.08	103.00	103.90	100.53	101.65	100.46	99.88	100.33	103.40	100.31	-3.77	2.81
Nyanza	91.06	89.70	92.47	93.54	95.25	86.99	86.22	90.53	92.92	85.75	-5.31	2.28
North Eastern	23.84	22.70	21.80	16.57	21.64	14.94	20.99	24.57	24.83	26.30	+2.46	3.70

Notes: [a] Enrolment rates are based on figures from the Ministry of Education, Science and Technology, Statistics Section, 1999.
[b] Cost is defined as the primary school fee as a percentage of per capita expenditure. These computations are based on data from the Welfare Monitoring Survey, 1994.

Table 2
Primary School - Selected Statistics

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
KCPE Scores [a]	.	.	.	337.6	330.3	.	340.9	.	.	340.6
English (%)[b]	49.9	50.3	50.0	49.2	48.3	48.0	.	.	.	.
Mathematics (%)	48.4	48.1	48.4	47.5	47.4	47.6	.	.	.	.
Trained-Untrained Teacher Ratio [c]	70.2	74.5	72.7	82.0	87.4	90.1	92.8	94.3	96.6	96.1
Student-Teacher Ratio	31.2	31.5	29.9	31.4	31.2	30.5	30.2	30.9	30.8	32.3
Student-Trained Teacher Ratio	44.4	42.2	41.1	38.3	35.7	33.8	32.6	32.8	31.9	33.6

Notes: [a] Average KCPE scores out of a maximum of 700. Figures are from the Kenya National Examination Council, 2000. [b] From, Abagi (1997b) [c] Figures are from the Ministry of Education, Science and Technology, Statistics Section, 1999.

Table 3
Labor Markets in Kenya - Selected Statistics

Year	1989[a]		1997[b]	
Unemployment Rate (%)				
National	6.5		18	
By Education				
No Education	.		21	
Grade 1-4	.		15	
Grade 5-8	.		19	
Secondary	.		19	
University	.		8	
Year	1996	1997	1998	1999
Informal Sector Employment [c] (%)	61.1	63.6	65.9	68.3

Notes: Unemployment rates are for the age group 15-64. [a] Figures are from the National Population Census. [b] Own computations based on the Welfare Monitoring Survey, 1997. [c] Figures are from the Economic Survey, 2000.

Table 4a
HIV/AIDS Prevalence in Kenya (%)
Percent of HIV Positive Adults (15-49)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
National HIV Prevalence [a]	4.8	6.1	7.4	8.7	9.9	11.0	11.9	12.8	13.9	13.5	13.5
Urban	8.8	10.5	12.0	13.4	14.5	15.5	16.3	16.9	18.1	17.8	17.5
Rural	4.1	5.3	6.5	7.7	8.7	10.0	11.0	11.9	13.0	13.0	13.0

Source: [a] National AIDS and Sexually Transmitted Diseases Control Program (NASCOP), 1999 and Economic Survey 2001.

Table 4b
AIDS Prevalence Rates among Pregnant Women and Gross Primary School Enrolment Rates in the Sentinel Sites (%)

District, (Province)	HIV [a] Prevalence 1990	Enrolment [b] Rate 1990	HIV Prevalence 1999	Enrolment Rate 1999
Busia, Western	14.4	100.28	28.3	102.97
Garissa, North Eastern	4.0	26.54	6.3	22.16
Kajiado, Rift Valley	1.6	64.16	9.0	59.39
Kakamega, Western	9.1	102.13	12.3	96.02
Kisii, Nyanza	0.0	92.28	15.7	82.25
Kisumu, Nyanza	15.3.0	87.75	30.7	73.85
Kitale, Rift Valley	2.4	87.55	16.0	94.65
Kitui, Eastern	0.1	103.39	11.4	102.76
Mbale, Western	2.9	102.13	15.9	96.02
Meru, Eastern	0.0	84.29	30.0	78.56
Mombasa, Coast	12.0	73.52	14.3	62.01
Nairobi, Nairobi	10.5	66.32	16.7	54.07
Nakuru, Rift Valley	10.0	96.54	26.5	84.50
Nyeri, Central	2.8	107.02	13.7	90.34
Thika, Central	6.6	87.06	22.5	86.63
Tiwi, Coast	12.8	74.00	23.4	75.30
Correlation, (p-value)	-0.026, (0.925)		0.328, (0.214)	

Source: [a] National AIDS and Sexually Transmitted Diseases Control Program (NASCOP)
[b] Ministry of Education, Science and Technology, Statistics Section

Table 5a
Primary School Enrolment Rates, 1994

	Gross Enrolment Rate (%)	**Net Enrolment Rate (%)**
Male	88.7	80.65
Female	89.6	78.38
Total	87.8	79.55

Source: Own Computation from Welfare Monitoring Survey, 1994

Table 5b
Primary School Net Enrolment Rates by Expenditure, 1994

Per Capita Expenditure Deciles	*Male*	**Female**	**Total**
1	0.704	0.665	0.685
2	0.767	0.730	0.749
3	0.784	0.741	0.762
4	0.775	0.752	0.765
5	0.788	0.783	0.785
6	0.823	0.814	0.819
7	0.840	0.784	0.812
8	0.864	0.818	0.842
9	0.819	0.849	0.833
10	0.876	0.866	0.871

Source: Own Computation from Welfare Monitoring Survey, 1994

Table 6
Variable Definitions and Descriptive Statistics

Variable	Mean	Standard Deviation
Child characteristics		
Age	9.937	2.852
Male = 1	0.513	0.499
Order of birth	3.42	1.673
Family characteristics		
Father's schooling	5.049	4.438
Mother's schooling	3.813	4.083
House owner = 1	0.908	0.289
Number of rooms in house	2.388	1.506
Land per capita	0.638	5.408
Educational characteristics		
Cost of Primary Education (Shillings per month)	43.97	35.56
	333.04	36.18
Primary Education Test Scores(Max. = 700)	32.10	7.612
Pupil-Teacher Ratio	4.80	2.47
Teacher - Skill Level 1 - (%)	55.08	12.6
Teacher - Skill Level 2 - (%)	26.14	8.06
Teacher - Skill Level 3 - (%)		
Regional Controls		
	0.085	0.279
Lives in an Urban area = 1	0.074	0.261
Coast = 1	0.263	0.440
Rift Valley = 1	0.086	0.281
Western = 1	0.179	0.384
Eastern = 1	0.099	0.299
North Eastern = 1	0.142	0.349
Nyanza = 1	0.145	0.352
Central = 1		
Number of Observations	13,306	

Table 7
Probit Estimates of Primary School Enrolment
(Standard errors)

Variable	Spec. 1	Marginal Effects	Spec. 2	Marginal Effects
Intercept	-7.45	.	-8.67	.
	(0.753)	.	(0.634)	.
Child Characteristics				
Age	0.977	0.257	0.977	0.255
	(0.045)	(0.012)	(0.045)	(0.012)
Age squared	-0.038	-0.010	-0.038	-0.010
	(0.002)	(0.0005)	(0.002)	(0.0005)
Male	0.119	0.031	0.118	0.031
	(0.030)	(0.008)	(0.029)	(0.008)
Order of Birth	-0.011	-0.002	-0.012	-0.003
	(0.013)	(0.004)	(0.013)	(0.004)
Family Characteristics				
Father's Schooling	0.064	0.017	0.064	0.017
	(0.007)	(0.002)	(0.008)	(0.002)
Mother's Schooling	0.061	0.016	0.059	0.015
	(0.007)	(0.002)	(0.007)	(0.002)
Land per capita	-0.002	-0.0005	-0.001	-0.0003
	(0.002)	(0.0006)	(0.003)	(0.0007)
Home Ownership	0.147	0.044	0.089	0.024
	(0.106)	(0.031)	(0.103)	(0.029)
No. of Rooms in House	0.101	0.027	0.101	0.028
	(0.030)	(0.008)	(0.031)	(0.008)
Educational Characteristics				
School Costs	-0.0035	-0.0005	-0.0029	-0.0008
	(0.001)	(0.0003)	(0.0007)	(0.0002)
KCPE Score	0.0013	0.0004	0.006	0.0014
	(0.0015)	(0.0004)	(0.001)	(0.0003)
Pupil - Teacher Ratio	0.008	0.002	0.003	0.0008
	(0.007)	(0.002)	(0.006)	(0.002)
Teacher - Skill Level 1 (S1)	0.049	0.013	0.030	0.008
	(0.025)	(0.006)	(0.020)	(0.005)
Teacher - Skill Level 2 (P1)	0.024	0.006	0.023	0.006
	(0.005)	(0.001)	(0.005)	(0.001)
Teacher - Skill Level 3 (P2 & P3)	0.006	0.001	-0.089	-0.002
	(0.009)	(0.002)	(0.007)	(0.002)
Regional Controls				
Urban	0.417	0.089	0.393	0.087
	(0.128)	(0.024)	(0.123)	(0.023)
Province Indicators	Yes	Yes	No	No
Number of Observations	13,306		13,306	
Log Likelihood Value	-4879.36		-4938.60	

Notes: Dependent Variable - Has individual ever attended school. Specification 1 includes a set of 7 province indicators. The educational characteristics are district averages. Standard errors are heteroscedasticity consistent and corrected for the clustered design of the sample.

Table 8
Additional Probit Estimates of Primary School Enrolment
(Standard errors)

Variable	(1)	(2)	(3)	(4)	(5)
Educational Characteristics					
School Costs	-0.0008	.	-0.0007	-0.0008	-0.000
	(0.0002)		(0.0002)	(0.0002)	(0.000)
School Fees	.	0.0005	.	.	.
		(0.0008)			
Uniforms	.	-0.0025	.	.	.
		(0.0006)			
Transportation	.	0.0005	.	.	.
		(0.006)			
Boarding	.	-0.005	.	.	.
		(0.003)			
KCPE Score	0.0014	0.0013	.	0.0014	-0.0002
	(0.0003)	(0.0003)		(0.0003)	(0.0002)
Pupil - Teacher Ratio	0.0008	0.001	-0.0006	0.0008	-0.004
	(0.002)	(0.001)	(0.002)	(0.0016)	(0.002)
Teacher - Skill Level 1 (S1)	0.008	0.005	0.016	0.008	0.006
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
Teacher - Skill Level 2 (P1)	0.006	0.006	0.005	0.006	0.0005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0007)
Teacher - Skill Level 3 (P2 & P3)	-0.002	-0.002	-0.008	-0.002	0.0006
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
OTHER VARIABLES					
AIDS Prevalence in 1990	.	.	.	-0.0002	-0.002
				(0.001)	(0.001)
Number of Observations	13,306	13,306	13,306	13,306	1,134
Log Likelihood Value	-4938.6	-4918.98	-4998.6	-4938.58	(-227.71)

Notes: Dependent Variable - Has individual ever attended school. The table reports estimated marginal effects. Other regressors are the same as in Table 7. Standard errors are heteroscedasticity consistent and corrected for the clustered design of the sample.

Table 9
Point Elasticities by Expenditure Quintiles
(standard errors)

Characteristic	Total [a]	Quintile1 [b]	Quintile 2	Quintile 3	Quintile 4	Quintile 5
School Costs (Mean) [c]	-0.041	-0.123	-0.066	-0.057	-0.039	-0.009
	(0.009)	(0.042)	(0.027)	(0.019)	(0.013)	(0.009)
School Costs (Mean + std. dev.)	-0.081	-0.311	-0.161	-0.145	-0.085	-0.014
	(0.022)	(0.129)	(0.076)	(0.059)	(0.034)	(0.014)
KCPE Score	0.590	1.200	0.879	0.423	0.652	0.399
	(0.116)	(0.327)	(0.258)	(0.154)	(0.143)	(0.118)
Student-Teacher Ratio	0.030	-0.083	0.128	-0.108	0.080	0.071
	(0.060)	(0.185)	(0.156)	(0.087)	(0.059)	(0.053)
Teacher - Skill Level 1 (S1)	0.046	0.210	0.000	0.135	-0.017	-0.024
	(0.030)	(0.096)	(0.067)	(0.040)	(0.031)	(0.027)
Teacher - Skill Level 2 (P1)	0.409	0.661	0.688	0.252	0.456	0.177
	(0.085)	(0.229)	(0.145)	(0.080)	(0.090)	(0.074)
Teacher - Skill Level 3 (P2 & P3)	-0.079	0.011	0.050	-0.262	0.026	-0.053
	(0.061)	(0.189)	(0.125)	(0.074)	(0.059)	(0.047)
Per Capita Monthly Consumption (Shillings)	770	208	432	636	903	1673
	(614.7)	(86.2)	(56.9)	(61.3)	(99.4)	(764.9)

Notes: [a] Calculations are based on estimates reported in Table 7, specification 2. [b] Calculations are based on quintile specific estimates. [c] Point elasticities calculated at the mean of the relevant characteristic. For school costs these elasticites are calculated at the mean and the mean plus one standard deviation.

Table 10
Effectiveness of School Inputs

Characteristic	Total	Quintile 1[b]	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Reducing School Costs [a]						
Percentage change	24.4	8.13	15.2	17.5	25.9	.
Cost of policy (shillings per month per additional enrolee)	17.6	5.85	10.9	12.6	18.64	.
Increasing KCPE Scores						
Percentage Change [b]	1.69	0.833	1.137	2.364	1.533	2.506
Increasing Teachers at Skill Level 2						
Percentage Change [c]	2.44	1.15	1.453	3.968	2.192	5.649
Cost of policy – scenario A (shillings per month per additional enrolee)	158	75	94	257	142	366
Cost of policy – scenario B [d]	84.6	40	51	139	77	197
Cost of policy – scenario C [e]	20.5	10	12	33	18	47

Notes: [a] Percentage change indicates the required reduction in mean school costs to increase the enrolment rate by one percent (1/0.041 = 24.4). Calculated at the monthly schooling expenditure of 72 shillings per month, this translates into a fee reduction of 17.6 shillings per month (72 x 0.244). On the basis of 1994 figures, the total additional cost of increasing the gross enrolment rate from 88.49 (5,557,008 students) to 89.37 (5,612,577 students) at a subsidy of 17.6 shillings per month would be approximately, 17.6 x 55,569 = 976,236 shillings per month. This does not include any administration costs and is based on the idea of targeting children do not attend school.

[b] Percentage change indicates the required increase in test scores to increase enrolment rates by one percent (1/0.59).

[c] Percentage change indicates the required increase in skilled teachers at level 2 (P1) to increase enrolment rates by one percent (1/0.409 = 2.44). Based on teacher composition in 1994, this translates into an increase of 1,413 teachers. The monthly salary cost of a teacher with these skills is 6232 shillings. The total monthly costs incurred are 8,809,472 shillings. Monthly costs per additional enrolee are 158 (8,809,472/55,569). These calculations do not include the cost of training teachers and account only for the direct effect of skilled teachers on enrolment.

[d] Increase in skilled teachers at level 2 (P1) accompanied by an equal reduction in the number of untrained teachers (monthly salary cost 2879 shillings). Monthly costs per additional enrolee are 85.3 (1413 x (6232-2879)/55,569. These calculations do not include the cost of training teachers and account only for the direct effect of skilled teachers on enrolment

[e] Increase in skilled teachers at level 2 (P1) achieved by training teachers at level P2 (monthly salary 5,420 Shillings) while keeping the total number of teachers unchanged. Monthly costs per additional enrolee are 20.6 (1413 x (6232-5420)/55,569). These calculations do not include the cost of training teachers and account only for the direct effect of skilled teachers on enrolment.