The Decline in Primary School Enrolment in Kenya

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Abstract

Since independence in 1963, Kenya has invested substantial resources in education. For almost three successive decades, these investments and other government policies led to impressive gains in educational access at all levels. However, in the 90s, educational participation appears to have eroded and the gains that were achieved in previous decades reversed. Aware of this trend, we use temporal and cross-section data to examine various factors that may be responsible for the decline in primary school 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 ways to influence policy, to reverse the current decline in primary school enrolment in the country.

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Abbreviations and acronyms

AIDS	acquired immunodeficiency syndrome
GDP	gross domestic product
GER	gross enrolment rate
HIV	human immunodeficiency virus
IPAR	Institute of Policy Analysis and Research
ISS	Institute of Social Studies
KCPE	Kenya Certificate of Primary Education
MOE	Ministry of Education
WMS	Welfare Monitoring Survey
NASCOP	National AIDS and Sexually Transmitted Diseases Control Programme
UNICEF	United Nations Children's Fund
UNESCO	United Nations Educational Scientific and Cultural Organisation

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1 Introduction

Investing in education is widely recognized as a key component for a country to use in development. An increase in the quantity and quality of education provided is associated with a wide range of benefits including increased productivity, reduced poverty and inequality of income, and improved health and economic growth (see Lockheed et al. 1991). Spurred by such evidence, governments in developing countries devote a substantial portion of their total expenditure to education.[1]

Kenya is no exception. Since independence, the Government of Kenya has devoted a substantial portion of its resources to education. Between 1991 and 2000, public expenditure on education accounted for 28.2% of total government expenditure.[2] These investments have established a comprehensive network of schools resulting in an impressive expansion of coverage and access to education at all levels. Adult literacy rates have almost quadrupled, from 20% in 1963 to 76% in 1997, and now the average person in the working-age population (age 15–64) has about 6 years of formal education (see Kimalu et al. 2001).

Despite these impressive gains, a variety of problems plague the Kenyan educational system. Mean scores in English and Mathematics as measured by the Kenya Certificate of Primary Education (KCPE) examination have remained virtually unchanged from 1990 to 1995. An estimated 5–6% of Kenyan primary school students drop out annually and repetition rates are estimated to be around 15–16%.

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

[2] This figure corresponds to around 5–7% of GDP spent on education during the period 1991 and 2000. This ratio is among the highest in the world (see UNESCO 1999).

While high dropout and repetition rates are causes of concern, in recent years a more worrying trend appears to be the decline in school enrolment. These declines have reversed the gains in enrolment achieved in previous years. The gross primary school enrolment rate (GER) has fallen from 98.2% in 1989 to 86.9% in 1999. Similarly, the gross secondary school enrolment rate has declined from 29.4% to 21.5%. In its National Poverty Eradication Plan 1999–2015, the Government of Kenya has stated a goal of achieving a 15% increase in primary school enrolment between 1999 and 2005 and achieving universal primary education by 2015. The pattern of declining primary school enrolment, however, suggests that it may be difficult for the government to achieve these goals.

Given the importance attached to education as a means of alleviating poverty and the concern that the decline in enrolment rates causes, in this paper we focus on school enrolment. Specifically, we assess various factors that may be responsible for the decline in primary school enrolment. We also try to identify the most cost-effective policy interventions that may be used to increase enrolment.

The remaining sections of the paper are organised as follows: Section 2 describes the analytical framework that we use to structure our empirical investigation. Section 3 briefly discusses Kenya's educational system and examines the recent trends in enrolment rates. In it, we use descriptive statistics to assess the plausibility of various explanations for enrolment patterns. Section 4 describes the data set on which we base our econometric work. Section 5 presents our estimates and section 6 concludes the paper.

2 Primary school enrolment: an analytical framework

Parents decide 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 put 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

$$U_1 = U(b, c_1)\,. \qquad [1]$$

The associated budget constraint is

$$y = c_1 + p\,, \qquad [2]$$

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

$$U_0 = U(c_0). \qquad [3]$$

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 problem of maximizing unconditional utility is

$$U^* = \max\,(U_1, U_0), \qquad [4]$$

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 if the child does not; that is, $a = 1$ if $U_1 > U_0$.

2.1 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

$$U_1 = \beta_1 b + \beta_2 c_1 + \varepsilon_1, \quad [5]$$

where the β's are coefficients to be estimated and ε_1 is a normally distributed error term. Since $c_1 = y - p$, we may rewrite equation 5 to obtain

$$U_1 = \beta_1 b + \beta_2 (y - p) + \varepsilon_1 \quad [6]$$

The utility function for the non-schooling option is

$$U_0 = \beta_2 y + \varepsilon_0 \quad [7]$$

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

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

Assuming that the composite error term ε_a is normally distributed gives rise to an estimable probit enrolment model.[3]

2.2 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 allow 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. These data are used to compute a district-wide average of the cost of attending school and are used as our measure of the direct cost of schooling.

[3] 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.

Turning to opportunity costs, we consider that attending school reduces a child's availability for work in and outside the home. If a child makes substantial contribution 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.[4] 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 the parents place on the 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.

2.3 Benefits of attending school

Parents have to ascertain the total benefits (B) associated with school attendance. The main benefit 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 persons 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. Parents can directly observe these test scores, and it is likely that parents use them to help judge the value of schooling. Bedi and Marshall (1999, 2001) provide empirical evidence on the role that expected test scores play in determining educational choices.[5]

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

[5] 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. As we do not have district

It is likely that the quality of school inputs and the curriculum both play a role in determining the expected payoff from education. School inputs may influence the decision about enrolment 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.

information on employment rates by education level, 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. School test scores, however, may be influenced by altering the quality of school inputs and 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 et al. (1985) report that cognitive skills, as measured by test scores on literacy and numeracy tests, are highly rewarded in the labour market.

3 The Kenyan educational system and trends in enrolment

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

The data collected in 1997 on the educational pyramid reveal that 44% of the working-age population had not completed primary school while 21% had attained at least 8 years of schooling, completing primary school. About 17% had begun but not completed lower secondary education (forms 1 and 2) while 13.7% had completed it. The remaining 4% had enrolled beyond lower secondary education and has at least 10 years of education (see Kimalu et al. 2001).

Although the focus of our work is on primary school enrolment in the 90s, it is illuminating to first examine enrolment patterns over a longer period. In 1970, GER in Kenya was 62% and the gap between males and females was 20 percentage points (see table 1). Because many more primary schools were built quickly and free education for grades 1 to 4 was introduced in 1974, enrolments rapidly increased. By 1980, GER had reached a peak of 115% and the gap in gender enrolment had narrowed to 10 percentage points. While there is disagreement as to whether enrolments peaked in 1980 or 1983, all sources clearly show that a first enrolment shock occurred between 1984 and 1985.[6] Enrolment rates fell from 107 to 99%. For the next 5

[6] The World Bank's Africa database (see table 1) indicates that school enrolments peaked in 1980, while information from the Government

years they remained stable. In a second shock in 1989, GER declined from 98 to 92%. Thereafter, the decline was gentler until GER reached around 88% in 1993.[7] Since then the rates have stabilized between 86 and 88%. Despite variations in the overall GER, the gender gap has narrowed considerably and since 1989 has ranged between 3 to 4 percentage points.

Regional differences in enrolment rates are substantial. In 1990, the central and western regions of the country had the highest enrolment rates of around 104%. North Eastern Province had the lowest rate of around 24%, followed, somewhat surprisingly, by Nairobi at around 66%. During the 90s enrolment rates fell in nearly all the provinces. The sharpest declines were in Nairobi and Central Province (see table 2).[8]

3.1 Explaining the trends

As outlined in the previous section, parental choices concerning school enrolment are influenced by the costs and benefits

of Kenya's economic surveys show that they peaked in 1983. There is also disagreement on the level of GER. According to the World Bank, enrolments fell from 107.1% in 1984 to 99% in 1985. The economic surveys report corresponding figures of 103 and 96%.

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

[8] The enrolment figures that we present pertain to enrolment in public (government-run) schools. If enrolment has shifted from public to private schools this would explain part of the decline in GER. In recent years the level of private participation has increased. For instance, between 1994 and 1997, the number of private schools as a percentage of all primary schools increased from 0.67 to 2.2% (MOE 1999). Estimates are that in 1997 around 2 to 3% of total enrolment was in private schools. Given the low private participation and growth of these schools in a period when enrolments were more or less stable (1994–98), it would seem that the shift from public to private schools is not particularly important in explaining enrolment patterns.

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 school enrolment; increases in school fees and in the opportunity cost of attending school are likely to reduce 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 90s is that a formal cost-sharing system was introduced in 1988. According to the cost-sharing system the government's contribution is confined to paying teachers' salaries while parents are required to pay for school uniforms, stationery, textbooks, 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, textbooks and school maintenance. The real change was the re-introduction of school levies to meet the cost of school materials and instructional equipment, which had been abolished in previous years.

The timing of this sudden added increase in financial responsibilities is consistent with the sharp decline in enrolment between 1989 and 1990. It is also consistent with the provincial trends in enrolment rates, both urban and rural. As displayed in table 2, Nairobi and Central Province are the provinces with the highest school fees as a ratio of per capita expenditure and had the largest declines in enrolment rates.

School curriculum

The 8-4-4 educational system currently prevailing in Kenya was introduced in January 1985. This new system placed consid-

erably more emphasis on providing 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 for 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 13 subjects) under this new curriculum also increased the financial requirements for textbooks. Furthermore, to complete the extended curriculum children had to spend considerably more time in school, which increased the opportunity costs of schooling. The doubling of the number of subjects, the additional time required and the financial requirements for constructing new facilities suggest that between 1984 and 1985 the total cost of attending primary school may have increased by more than 100%. This curriculum-induced price shock is clearly the main factor behind the first enrolment shock.

The new curriculum also increased the burden on teachers and students. Abagi (1997a) shows that trying to cover an extended curriculum in the same period increases pressure on students and staff and reduces student performance, as indicated by lower test scores.[9] A reduction in the expected benefits from attending school may manifest itself in a reduction in school enrolment. The reduction in learning because of increased

[9] According to Abagi (1997a) students in primary school are placed under great pressure; that is, they are taught 13 subjects, 9 of which are examined at the end of Standard 8. They also stay in school from 7 a.m. to 5 or 6 p.m. and have short holidays. He also points out that such a burden reduces the motivation for learning and leads to a deterioration in performance.

pressure caused by the new curriculum could certainly have played a role in depressing enrolment in subsequent years. However, in terms of observed indicators of performance such as the KCPE scores, it does not appear that educational performance was reduced. As table 3 shows, KCPE scores on English and Mathematics remained virtually unchanged during the 90s.

School inputs

Concentrating only on educational performance, however, does not provide a complete picture. Some sharp changes in educational inputs took place during this period. The ratio of trained to untrained teachers (those without formal teaching qualifications) increased sharply from 70% in 1990 to 96.6% in 1998. Correspondingly, while the student-to-teacher ratio remained between 31 or 32 to 1, the student to trained-teacher ratio changed drastically from 44.4 to 33.6 (see table 3). The increase in the proportion of skilled teachers may be expected to lead to improved 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.[10] However, we were unable to gather information on school inputs such as textbooks and school equipment. Since the introduction of the cost-sharing system, parents have been responsible for supplying textbooks, and it is possible that the pupil-to-textbook ratio has worsened from the 17:1 reported in 1990 (Kenya Government and UNICEF 1994).

[10] Based on an analysis of KCPE scores of students from 50 schools, Appleton (1995) reports that among school characteristics, the provision of textbooks, and among teacher characteristics, the educational qualifications of teachers (at least for boys), appear to be the most important determinants of test scores.

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 thus reduced enrolment.

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 educational system would manifest itself in a decline in GER. Between 1990 and 1999 the primary school-going population increased by 15.4% from 5.85 million to 6.75 million. Over the same period the number of primary schools increased by 18.5% and the number of primary school classes increased by 17%. These numbers suggest that the capacity of the school system is not a factor inhibiting enrolment growth. In fact, over this period, the comparatively lower rate of growth in the number of enrolled students (an increase of 8.9% between 1990 and 1999) led to a decline in average class size from 33 to 31.

Labour market conditions

One of the main benefits of acquiring education is that it improves prospects for employment. While Kenya enjoyed an annual average GDP growth rate of around 4.5% between 1963 and 1989, that rate was substantially lower, at around 2.5%, between 1990 and 1999. This decline was accompanied by a rapid increase in unemployment rate. Between 1989 and 1997, the unemployment rate rose from 6.5 to 18% (see table 4). Unemployment among people with less than a university education was not substantially different from that for those without formal education (see table 4); even among those with university education, 8% were unemployed in 1997. The

composition of employment has also undergone 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. Because of the decline in growth rates and ongoing 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% of total employment. Thus, it is likely that the reduced employment prospects for educated persons and the reduction in formal sector employment have played a role in reducing the incentive to acquire education.

HIV/AIDS

The decline in school enrolment during the 90s appears to coincide with the spread of HIV/AIDS in Kenya. AIDS was first reported in Kenya in 1984, and between 1990 and 1999 the HIV prevalence rate increased from 4.8% to 13.5% (see table 5). The prevalence of AIDS is considerably higher in urban areas (this is consistent with the greater decline in educational enrolment in urban areas) and in adults; that is, persons between 15 and 49 account for around 94% of the total number of HIV-positive persons. Most deaths associated with AIDS occur in the age range 29 to 39.

Given that the disease mainly affects persons over 15, it is unlikely that the incidence of the disease among primary school children is a major reason for the decline in enrolment.[11] However, its spread may have an impact on the education sector in several other ways (Stover and Bollinger 1999). First, increased expenditure on health care or a reduction in household income because of the death of a parent may reduce

[11] According to the *Kenya Human Development Report* (UNDP/GOK 1999), 76,744 full-blown cases of AIDS had been reported. Of these, 736 cases or about 1% were in the age group of 5- to 14-year olds.

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 the child dropping out of school. Second, children may drop out of school if they contract the disease themselves. Third, the disease may reduce the supply of experienced teachers, although, as discussed above, between 1990 and 1998 the supply of skilled teachers increased, suggesting that the prevalence of HIV does not affect their availability.[12] Thus in Kenya, the most likely channel through which HIV/AIDS affects enrolment is reduced household income and the attendant increase in opportunity cost.

While it seems most likely that HIV/AIDS has an impact on enrolment through reducing household expenditure, empirical evidence is limited. Based on 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 play a greater role than disease incidence in determining outcomes. In Tanzania, these authors used data from a demographic and health survey conducted between 1991 and 1994 in the Kagera region to examine the effect of adult mortality on primary school enrolment.[13] Their evidence does not suggest that the decline in primary school enrolment rates is strongly associated with adult mortality. They show that, regardless of wealth, households react to adult deaths by delaying the enrolment of young children (7–10) while maintaining the enrolment of older children (11–14).

We now turn to Kenya. To gather information on the prevalence of HIV/AIDS, Kenya has implemented a sentinel

[12] Since 1998 the number of skilled teachers available does appear to have declined. Recent statements by the Government of Kenya also indicate this.

[13] The Kagera region, located close to Lake Victoria, has HIV prevalence rates around 33% higher than the country average.

surveillance system. Pregnant women who visit antenatal 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 6 presents information on HIV prevalence rates across 16 sentinel sites. Except for two sites, the information presented in table 6 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 6). Temporal patterns also suggest that there is no relationship between change in HIV prevalence rates and change 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.[14] Later on in the text (see section 5) we discuss results based on a more complete analysis.

3.2 Summary

We have discussed several factors that may have had a bearing on the decline in enrolment rates in the mid-80s and the 90s. These factors may have been operating simultaneously, and it is difficult to isolate the relative effects of each of the possible factors using only descriptive statistics. However, based on the

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

preceding discussion, it does seem that the first enrolment shock between 1984 and 1985 may be attributed to the additional educational costs induced by the new educational structure and curriculum. Similarly, the second enrolment shock, between 1989 and 1990, also appears to be cost driven and may be attributed to the re-introduction of school levies. Thereafter, the more gradual decline may be caused 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.

So far, our discussion has been temporal in nature and based on descriptive statistics. To try to 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 (Kenya 1994) and district-level information obtained from the Ministry of Education. WMS II covered over 10,000 households and over 50,000 persons in all districts in Kenya. The multipurpose survey gathered information on a variety of dimensions including income and consumption, child health, fertility, and other individual and family characteristics. It contains detailed information on the education of all household members, including expenditure on education. These data were merged with district information on school inputs. Although the district-level data are highly

aggregated and ignore intradistrict 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.

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.[15] 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 7–9.

Table 7 presents figures on gross and net enrolment rates. The gross enrolment ratio for 1994 is around 88%, a figure similar to that for primary school enrolment obtained from the Ministry of Education (MOE)—see table 2. The net enrolment ratio is lower at around 80%. The higher GER 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 8 presents figures on net enrolment rates disaggregated by expenditure deciles. Net enrolment rates vary from 68.5% at the lowest expenditure decile to 87.1% 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 large. At the mean, the gap in the net enrolment ratio is about 2% in favour of males.[16]

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

[16] In our data set, two variables may be used to capture enrolment.

Corresponding to *SF* in equation 9, the measure of school costs that we use in our regressions has a mean of Ksh 44 per month (see table 9). This measure consists of household expenditure on school levies, 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 Ksh 72 per month and also includes expenditure on textbooks, individual tutorials and *harambee* contributions.[17] In terms of the individual expenditure components, school uniforms account for the largest share (29%), followed by school levies (26%), textbooks (21%) and harambee contributions (13%).

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—whether a family owns its dwelling, the number of rooms in the house and the amount of land per capita that the household possesses.

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 indicates children who have dropped out of school. In our sample we have a total of 13,306 usable observations on children; 3,553 of these children 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 show that the critical factor appears to be whether a child 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.

[17] Household schooling expenditure amounts to about 28–29% of the total per pupil expenditure at the primary level and about 9% of monthly consumption per capita. In 1993–94 annual government expenditure per student at the primary education level was around Ksh 2,078. Per capita monthly household consumption was around Ksh 770 (Kimalu et al. 2001).

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-to-teacher ratio and three variables that represent different levels of teacher qualifications. The average pupil-to-teacher ratio is around 32. This ratio, compared internationally, is not particularly high (UNESCO 1999). The composition of skilled teachers (defined in terms of educational qualifications) is around 5% at the highest level, followed by 55% at level two and 26% at level three. The remaining teachers (around 14%) are at the lowest level.[18] More than 90% of the sample lives in rural areas. We do not generally 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 from the probit estimates; the third section considers policy scenarios.

5.1 School enrolment

Probit estimates of school enrolment are presented in table 10. Two sets of estimates are presented. The first specification

[18] Teachers in Kenya are placed at different levels (S1, P1, P2, P3, 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.

includes a set of provincial controls, which are excluded in the second specification. The results are not very different, the main change being the effect of KCPE scores on enrolment.[19] Inclusion of the provincial controls erodes the effect of this variable. From a policy perspective, it may not be useful to say that differences in enrolment 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. The relationship between age and enrolment is non-linear. Our estimates show that until age 13, age is positively linked to enrolment. However, beyond age 13 the drop in the probability of attending school is rapid. This indicates that opportunity costs of attending school become important in reducing enrolment precisely at the age that a child should be finishing primary school. From a policy perspective, this suggests the importance of ensuring that children start school at the expected age of 6.

There does appear to be a slight male advantage in school enrolment. Being male increases the probability of attending school by approximately 3%. The order of birth is negatively linked to school enrolment (although it is statistically significant at only the 10% level); a first-born child is more likely to attend school than 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% increase in the probability of enrolling their children in

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

school.[20] Of the three remaining family variables, home ownership and number of rooms in a house indicate the economic status of the household, while land per capita may reflect not only wealth but also household demand for labour. 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 decision to enrol a child in school. The estimates suggest that, at the mean, doubling the cost of schooling from Ksh 44 to 88 a month would reduce the probability of school enrolment by about 2 to 4%. 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 11, column 2. To enable comparisons, estimates from our baseline specification (table 10, specification 2) are reproduced in the first column. Estimates based on the disaggregated cost variables show that the negative cost effect emanates mainly from the costs of providing 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 analysis 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

[20] 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.

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% 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. Our data do not permit such an analysis. But Appleton (1995), analysing KCPE scores of students from 50 schools, reports that the provision of textbooks and the educational qualifications of teachers (at least for boys) appear to be the most important determinants of test scores.

The school input variables in our specification are the student-to-teacher ratio and the skill (educational) composition of teachers in a district. These variables probably exert an indirect influence on school enrolment through their effect on test scores. If this were the only channel of influence, 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 teachers that are more qualified do a better job of teaching (as indicated by higher test scores) as well as administering and managing a school. Accordingly, we allow these school inputs to exert a direct effect on enrolment. There does not appear to be any link between the student-to-teacher ratio and enrolment rates. As this ratio is relatively low, this finding is not particularly surprising.

Three variables capturing different levels of teacher skill are included in the regression, allowing 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. The clearest impact in statistical significance 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%. To assess the total effect of these variables, that is, 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 11, column 3. Comparisons of these estimates with our baseline estimates show 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 an increase of one standard deviation (2.47) in teachers at this level is associated with a 4% increase in enrolment. The larger marginal effects show that investments in these inputs exert a direct and indirect influence on enrolment.

Finally, we turn to the link between the prevalence of HIV/AIDS and enrolment rates. As discussed earlier, the prevalence of this disease may influence enrolment rates through several channels. 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 an empirical specification, if the first link is the main channel (that is, inability to pay school fees), the prevalence rates in a district and the cost of schooling should be related. If the main channel is through an increase in opportunity costs, this suggests a more direct effect of HIV prevalence rates on enrolment. To keep the analysis 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 usually takes some time to manifest itself, our

regressions are based on HIV prevalence rates in 1990. Estimates of this specification are presented in table 11, column 4. Inclusion of this additional variable does not alter our baseline estimates. The coefficient on the HIV prevalence variable is negative but it is not precisely measured and does not suggest the existence of any relationship between HIV prevalence 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 table 11, column 5). The negative effect of the prevalence of HIV/AIDS on enrolment patterns in urban areas is strong and clear. The estimates indicate that a 10% increase in HIV prevalence is associated with a 2% reduction in enrolment. Using Nairobi as an example of an urban area, we see that between 1990 and 1999 enrolment rates in Nairobi fell by 12.3% while HIV prevalence rates increased by 6.2%. 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 that mitigate the effect of the disease.[21]

5.2 Price and input elasticities

So far, our discussion has concentrated on the effect of various educational characteristics on mean enrolment probabilities.

[21] For example, widow inheritance, a custom among the Luo and other peoples of Kenya, may spread HIV but it is also likely that this practice serves as a support mechanism that may reduce the effect of the disease.

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 12. The price elasticities are computed at the mean and at the mean plus one standard deviation. Looking across the table, we see that the decline in price elasticities as income rises is a discernible pattern. For the richest quintile, price increases have no impact on the school enrolment decision while at all other quintiles the effect is statistically significant. It is largest at the lowest quintile where a 10% increase in costs would lead to a reduction in enrolment of 1.2% (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% increase in school fees would reduce enrolment at the lowest quintile by 3%.

Elasticities with respect to the KCPE score and the two school inputs are also presented in table 12. For the entire sample, an increase in the KCPE score by 1% translates into a 0.59% increase in enrolment. The effect of this quality signal is particularly large at the lower quintiles. At the lowest quintile a 1% increase in this measure may lead to a 1.2% increase in enrolment while the effect at the highest quintile is more muted and may result in a 0.4% increase in enrolment. The differential response across quintiles suggests that households at the lower income end require a more convincing demonstration of the potential gains from education (at least as measured by the KCPE score) to send their children to school as compared with 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 richer households treat education as a consumption and an investment good. 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-to-teacher ratio does not affect school enrolment decisions. The level of the teachers' qualifications, however, does. The impact between enrolment and teacher qualifications emanates most clearly from teachers at skill level 2. Across quintiles a marginal increase in this measure is associated with a 0.18–0.66% 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.[22]

5.3 Policy scenarios

Our analysis shows that policy interventions influence school enrolment decisions in several ways. Interventions could consist of subsidies 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 probable impact of each of these measures on enrolment, it is also important to compare the relative costs of various policies. In this section, we compare

[22] 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 sharp differences in district-wide access to school inputs and 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).

the cost effectiveness of a policy designed to increase enrolment by reducing the cost of schooling with that of increasing enrolment by increasing the number of skilled teachers.

Estimates of such a cost-effectiveness analysis are presented in table 13. Using price adjustments to increase enrolment requires a 24.4% reduction in school fees to increase enrolment by 1% (reciprocal of the elasticity). At the mean schooling expenditure of Ksh 72 per month, this implies that an average subsidy of around Ksh 16 per month to students who are not enrolled in school would result in a 1% increase in enrolment. This cost estimate does not include the cost of designing, managing and administering such a subsidy programme.[23]

In terms of the school inputs, a 1.69% increase in KCPE scores may be expected to increase enrolment by 1%. 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 do not have estimates of the effect of school inputs on test scores we concentrate only on the direct link. Increasing enrolment by 1% requires an increase in the number of skilled teachers at level 2 by 1,413 teachers (an increase of 2.44%). Based on salary costs in 1994 this translates into monthly costs of Ksh 158 per additional pupil enrolled. If 1,413 additional teachers at skill level 2 are employed and untrained teachers are reduced by the same number, the cost due to this

[23] The total cost associated with a subsidy programme depends on the manner in which the programme is designed and administered. For example, a programme that tries to deliver subsidies to those students who do not attend school requires a means to locate and identify vulnerable households. An educational subsidy designed as a school meal programme requires increased expenditure on all students who attend school plus those who may attend school in response to the programme.

policy decline to about Ksh 85 a month. A further cost decrease is possible if teachers at level 3 are trained and upgraded to a higher level (see table 13 for details). Several other policy combinations and possibilities may also be used to increase enrolments. However, our 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 has concentrated on primary school enrolment in Kenya. In particular, we have examined various factors that may have been responsible for enrolment rates declining since the mid-80s.

We detected two enrolment shocks, the first between 1984 and 1985 and the second between 1989 and 1990. The first shock coincided with the introduction of a new educational structure and curriculum while the second coincided 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% of the total decline in enrolment rates in urban areas may be attributed to

the spread of HIV.[24] 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 information on educational measures with data from a 1994 household survey. The use of these merged data allowed us to analyse the role of demand and supply factors in determining enrolment. Enrolment was treated as a function of direct costs, opportunity costs and the expected benefits of attending school. Our analysis indicates 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% increase in school costs would reduce enrolment by 4% while at the lowest expenditure quintile a 100% increase in fees would be associated with a 12% decrease in enrolment. In terms of policy, the results suggest that a programme of subsidizing educational costs, particularly by subsidizing school uniforms, would be most effective in increasing enrolment.

Consistent with our expectations, expected benefits (as captured by the KCPE score) clearly play an important role in shaping enrolment decisions. A 10% increase in the KCPE score is associated with a 6% increase in the enrolment rate. The responsiveness of households to this measure demonstrates the rationality of school enrolment decisions. The substantially larger impact of this variable among 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

[24] Between 1990 and 1999, the total decline in enrolment rate in Nairobi (treated as an urban area) is 12.3%. The increase in HIV prevalence may account for a decline of 1.24% (6.2 x 0.2), or 10% (1.24/12.3) of the total decline.

inputs may be used to achieve the same objective as programmes designed to reduce the costs of school enrolment.

We then 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 analysing 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, based on data considerations, focused mainly on the role of school inputs in determining outcomes. We are aware that teaching methods 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.

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Appendix—tables

Table 1. Gross primary school enrolment rates 1970–89 (%)

Year	1970	1975	1980	1982	1984	1985	1986	1987	1988	1989
Total	62.1	103.9	115.2	112.0	107.1	99.0	98.1	98.2	96.5	98.2
Male	72.3	111.9	120.2	115.8	110.2	101.8	101.0	100.9	98.7	99.9
Female	51.8	95.9	110.1	112.0	103.9	96.1	95.0	95.4	94.4	96.3

Source: World Bank Africa Database 2001, World Bank

Table 2. Gross primary school enrolment rates 1990–99 (%)[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	2.8
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												
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
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
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
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
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
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

[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 (Kenya 1994).

Table 3. 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

[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 4. Labour markets in Kenya—selected statistics

Year	1989		1997[b]	
Unemployment rate (%)				
National	6.5		18	
No education	–		21	
Grade 1–4	–		15	
Grade 5–8	–		19	
Secondary	–		19	
University	–		8	
Year	1996	1997	1998	1999
Informal sector employment (%)	61.1	63.6	65.9	68.3

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 5. HIV/AIDS prevalence in Kenya (%) of HIV-positive adults (age 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

[a] National AIDS and Sexually Transmitted Diseases Control Programme (NASCOP) 1999; Economic Survey 2001.

Table 6. AIDS prevalence rates among pregnant women and gross primary school enrolment rates in the sentinel sites (%)

District, province	HIV prevalence 1990 [a]	Enrolment rate 1990 [b]	HIV prevalence 1999	Enrolment rate 1999
Busia, Western	14.4	100.28	28.3	102.97
Garissa, N. 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	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)	

[a] National AIDS and Sexually Transmitted Diseases Control Programme (NASCOP).

[b] Ministry of Education, Science and Technology, Statistics Section.

Table 7. 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

Own computation from Welfare Monitoring Survey (Kenya 1994).

Table 8. 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 (Kenya 1994).

Table 9. 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	3.420	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
Primary education test scores (max. = 700)	333.04	36.18
Pupil–teacher ratio	32.10	7.61
Teacher—skill level 1(%)	4.80	2.47
Teacher—skill level 2 (%)	55.08	12.60
Teacher—skill level 3 (%)	26.14	8.06
Regional controls		
Lives in an urban area = 1	0.085	0.279
Central = 1	0.145	0.352
Coast = 1	0.074	0.261
Eastern = 1	0.179	0.384
North Eastern = 1	0.099	0.299
Nyanza = 1	0.142	0.349
Rift Valley = 1	0.263	0.440
Western = 1	0.086	0.281
Number of observations	13,306	

Table 10. 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	

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

Table 11. Additional probit estimates of primary school enrolment (standard errors)

Variable	(1)	(2)	(3)	(4)	(5)
Educational characteristics					
School costs	–0.0008 (0.0002)	–	–0.0007 (0.0002)	–0.0008 (0.0002)	–0.000 (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 (0.0003)	0.0013 (0.0003)	–	0.0014 (0.0003)	–0.0002 (0.0002)
Pupil–teacher ratio	0.0008 (0.002)	0.001 (0.001)	–0.0006 (0.002)	0.0008 (0.0016)	–0.004 (0.002)
Teacher—skill level 1 (S1)	0.008 (0.005)	0.005 (0.005)	0.016 (0.005)	0.008 (0.005)	0.006 (0.004)
Teacher—skill level 2 (P1)	0.006 (0.001)	0.006 (0.001)	0.005 (0.001)	0.006 (0.001)	0.0005 (0.0007)
Teacher—skill level 3 (P2–P3)	–0.002 (0.002)	–0.002 (0.001)	–0.008 (0.002)	–0.002 (0.002)	0.0006 (0.001)
Other variables					
AIDS prevalence in 1990	–	–	–	–0.0002 (0.001)	–0.002 (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)

Dependent variable: Has individual ever attended school? The table reports estimated marginal effects. Other regressors are the same as in table 10. Standard errors are heteroscedasticity consistent and corrected for the clustered design of the sample.

Table 12. Point elasticities by expenditure quintiles (standard errors)

Characteristic	Total [a]	Quintile 1[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 (614.7)	208 (86.2)	432 (56.9)	636 (61.3)	903 (99.4)	1673 (764.9)

[a] Calculations are based on estimates reported in table 10, 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 elasticities are calculated at the mean and the mean plus one standard deviation.

Table 13. 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 (Ksh 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 (Ksh 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

[a] Percentage change indicates the required reduction in mean school costs to increase the enrolment rate by one% (1/0.041 = 24.4). Calculated at the monthly schooling expenditure of Ksh 72 per month, this translates into a fee reduction of Ksh 17.6 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 Ksh 17.6 per month would be approximately Ksh 17.6 x 55,569 = Ksh 976,236 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 1 % (1/0.59).

[c] Percentage change indicates the required increase in skilled teachers at level 2 (P1) to increase enrolment rates by 1 % (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 Ksh 6,232. The total monthly costs incurred are Ksh 8,809,472. Monthly costs per additional enrolee are Ksh 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 Ksh 2,879). Monthly costs per additional enrolee are Ksh 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 Ksh 5,420) while keeping the total number of teachers unchanged. Monthly costs per additional enrolee are Ksh 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.

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