

# **Determinants of Demand for Schooling in Kenya: A Regional Analysis\***

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## **ABSTRACT**

This paper investigate regional and gender differences in the determinants of demand for schooling (enrollment and grade attainment) in Kenya. Probit and ordered probit regression methods are used to model enrollment and attainment respectively. The paper investigates the impact of child and household characteristics, household welfare indicators and community variables. We find that household characteristics, quality and cost of schooling are important determinants of demand for education services in Kenya. Our results further suggest that there are regional and gender differences in responsiveness of demand for schooling. Specifically, demand in rural areas is more responsive to policy changes than in urban areas, while girls would be more affected by policy changes than boys. The findings call for regional targeting in efforts to boost and sustain demand for schooling in Kenya. In rural areas, the immediate policy action should focus on improving quality of education, while in urban areas; poverty and cost of schooling are critical concerns. For the country as a whole, poverty alleviation would go along way in boosting education demand as the poorest groups are found to be more responsive to changes in the cost of education.

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## 1 INTRODUCTION

Investment in human capital is an important path to development, more so in third world countries. Low levels of human capital are widely considered to be a major impediment to economic growth and eradication of poverty in many Sub-Saharan African countries. Furthermore, returns to investment in schooling for both men and women in developing countries are well documented (Glick and Sahn, 2000). Most studies also recognize the importance of increasing access to schooling for girls because it is believed that improvements in women's education will help to eliminate gender inequalities in employment opportunities and earnings and also have important non-market benefits on family welfare through improved child nutrition and lower fertility (Strauss and Thomas, 1995). Recognition of the importance of human capital development has led many governments to invest a lot of resources into the education sector in their endeavors to boost economic growth through development and accumulation of human capital.

Since the early 1990s, the education sector in Kenya has been fraught by a multiplicity of problems including declining enrollment, low grade attainment, regional and gender disparities in enrollment and grade attainment, late entry into school and high drop out and repetition rates. For instance, although over 90% of all children enroll into primary schools in rural areas, less than half ever complete primary school. The same scenario exists in secondary schools where even after many primary school graduates drop after the Kenya Certificate of primary education (KCPE), less than half of those who enter secondary schools ever make it to the final grade. In addition, poor performance in school leaving examinations remain a major hurdle needing attention in Kenya, which directly points at the need to improve the quality of teaching in schools holding child cognitive ability constant.

To solve the problems besetting the education sector, the Kenyan government devoted a substantial fraction of its resources to the education sector in the 1990s. However, during this period, declines in secondary school enrollment rates overturned the gains in education participation achieved in the 1980s (Bedi et al., 2004). In 2003, with the swearing in of the NARC government, Kenya declared free primary education with the aim of encouraging enrollment by children from poor households. However, even with tuition waiver, parents still have to incur other educational expenses including books, uniforms, transport among other expenses. Furthermore, the cost of schooling in private primary and all secondary schools remain as high since the subsidy only covers public primary schools.

Given high levels of poverty in Kenya, the impact of the tuition waiver may not be so much to increase primary school enrollment but increased substitution of private for public schools for children whose parents would still afford to send their children to school. This would be expected to have adverse implications on the quality of public primary schooling due to capacity constraints. In addition to offering free primary education, the government therefore needs to consider improvements in overall quality of schooling, which is dependent on school infrastructure and inputs (equipment) and the quantity and quality of teaching staff. In addition, distance to school, performance in examinations together with other socio-economic constraints need to be addressed.

This paper investigates the determinants of demand for schooling for Kenya, using household survey data. We focus on the impact of child and household characteristics, indicators of household welfare and community variables, specifically measures of school quality. Our study makes an important contribution by investigating both enrollment and attainment in primary and secondary schooling. In addition we explore regional and gender disparities in these schooling outcomes in Kenya. We consider both enrollment and attainment because in the first instance, each of them illuminate a different aspect of schooling choice and thus is of interest in its' own right. In the second instance, each of them are imperfect and so checking for consistency of results by using both provide a useful informal test of the robustness of the findings (Glick and Sahn, 2000).

The rest of the paper is organised as follows. The next section presents the methodology, Section 3 and 4 discuss the demand for primary and secondary schooling respectively. Section 5 presents the analysis for grade attainment. Section 6 presents policy simulations while section 7 concludes.

## **2 METHODOLOGY**

### **2.1 Theoretical Framework**

Education can be viewed as an investment in human capital, implying a trade off between enhanced future earnings and foregone earnings during enrolment in the educational system (Nielsen 2001). Education could also be seen as both a consumption and an investment good in that it is valued for it's own sake and because it provides future financial returns (Gentler and Glower, 1990). Parents consider whether the utility of taking a child to school exceeds the utility of keeping the child at home. If the expected utility from taking the child to school exceeds the utility of keeping the child at home, then parents enrol their child in school and

vice-versa. If the supply of schooling is unconstrained, the decision to take a child to school is taken by the household alone and depends on all factors affecting the utility of sending the child to school.

The decision to send a child to school can be modelled using economic models of household behaviour (Strauss and Thomas 1995). First we assume that every household has a utility function which depends on the human capital of its children and the consumption of all other goods and services. An investment in another year of schooling raises a child's human capital at the cost of reduced consumption of other goods and services. This is because the price of sending children to school involves both direct monetary costs and indirect costs of children's time in terms of reduced work (Gertler and Glewwe, 1990).

Conditional on deciding to take a child to school, the expected household utility can be denoted as:

$$U_i = U(S_i, C_i) + \varepsilon_i \dots\dots\dots(1)$$

Where  $S_i$  is the increment to a child's human capital from another year of education from school,  $C_i$  is the consumption possible after incurring both the direct and indirect costs of sending a child to school  $i$ .  $\varepsilon_i$  is a random taste shifter. If parents decide not to send their child to school, the household utility simplifies to

$$U_0 = U(C_0) + \varepsilon_0 = U(0, C_0) + \varepsilon_0 \dots\dots\dots(2)$$

The budget constraint associated with the household utility function takes the form:

$$C_i + P_i = C_0 = Y \dots\dots\dots(3)$$

Where  $P_i$  is the total cost of sending the child to school, which includes both direct and indirect costs and  $Y$  is the household disposable income.

Combining (1) and (2) and given the constraints defined in (3), the unconditional utility maximization problem can be written as

$$U^* = \max (U_0, U_s) \dots\dots\dots(4)$$

Where  $U^*$  is maximum utility, and  $U_0$ ,  $U_1$ , and  $U_s$  are the conditional utility functions specified in (1) and (2).

## 2.2 Empirical Specification

The solution to the utility maximization problem gives the probability that each alternative is chosen. In a discrete choice model, the probability that an alternative is chosen can be interpreted as a demand function, derived from the solution of the utility maximization problem. The probability that any alternative is chosen equals the probability that this choice yields the highest possible utility among all the alternatives.

A parsimonious form of the conditional utility function that does not impose a constant marginal rate of substitution is the semi-quadratic, which is linear in human capital and quadratic in consumption (Gertler and Glewwe, 1990). The probability that parents send their child to school can therefore be derived by expressing the conditional utility function as:

$$U_1 = \beta_1 S + \beta_2 C_1 + \varepsilon_i \dots\dots\dots(5)$$

Where  $\beta_s$  are parameters to be estimated,  $\varepsilon_i$  is a zero mean random taste disturbance with finite variance and is uncorrelated across individuals.

Given that consumption net of schooling expenditures can be expressed as  $C_1 = Y - P^2$ , we can express equation (5) as:

$$U_1 = \beta_1 S + \beta_2(Y - P) + \varepsilon_i \dots\dots\dots(6)$$

Where equation (6) is the utility derived from sending one's child to school. The utility of not sending a child to school can be expressed as:

$$U_0 = \beta_2(Y) + \varepsilon_0 \dots\dots\dots(7)$$

Parents will send their child to school if  $U_1 - U_0 > 0$  or  $(\beta_1 S - \beta_1 P + \varepsilon_i - \varepsilon_0 > 0)$ . The probability of attending school therefore becomes:

$$\Pr[Z=1] = \Pr [(\beta_1 S - \beta_1 P + \varepsilon_z > 0)]. \dots\dots\dots(8)$$

The decision to send or not to send a child to school is influenced by a number of factors which affect the expected utility of the decision choice. Three groups of factors are widely

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<sup>2</sup> We however do not include this net consumption in our model because from the data available, we lacked a suitable exogenous measure of consumption and so were unable to estimate a structural model of schooling demand. Instead we estimate a reduce form model and use other measures of wealth as proxies for consumption.

debated in the literature (Nielsen 2001, Gertler and Glewwe 1990, Bedi et al. 2002, Strauss and Thomas 1995, Glewwe and Jacoby, 1994). These factors are individual, household and community characteristics. Among the individual characteristics, household size, gender, age and age rank among siblings are important. Age reflects the absolute opportunity cost of education, while age rank reflects the relative opportunity costs in the family of brothers and sisters (Nielsen 2001, Ray 2000). Gender of the child is potentially important given the possibility of parental preferences for boys' over girls' education, which arises from expected lower returns for girls arising from labour market discrimination, lower female participation and lower remittances from daughters than sons. The opportunity cost of sending the girl child to school is also expected to be higher than for the boy child due to expected loss of income and housework from the girl child, though loss of income could be higher for boys schooling.

Important household characteristics include household income and other assets, parents' education, gender of the household head, household composition, religion and ethnicity. Incomes and assets are important because a poor household may not afford to send a child to school unless there was access to credit. Parental education is expected to have a positive impact on enrolment (Ray 2000, Gertler and Glewwe 1990) and is important because it reflects the income potential of the household and probably also the attitude towards education. Educated parents are more able to assist children in learning, as they are likely to recognize the values of their children's education and resist the temptation of pulling them out of school even when they have low income (Ray 2000, Handa, 1996).

Community characteristics that reflect the future return to education are also potentially important. These include school factors such as quality of the school, measured by pupil teacher ratio, student trained teacher ratio and conditions of the school facilities. Others include direct cost of sending a child to school and distance to school, which is a measure of availability/accessibility. Perceived benefits of attending school also influence enrolment because cognitive skills as measured by performance in school are highly rewarded in the labour market (Gertler and Glewwe, 1990).

In the next section, we explore the impact of the above factors on demand for primary and secondary schooling. We first describe the data used in the analysis, then employ probits models of enrolment and ordered probit models for grade attainment to model education demand.



### **3 DEMAND FOR PRIMARY SCHOOLING**

#### **3.1 Data and Variables**

The empirical analysis is based on Welfare Monitoring Survey III (WMSIII) collected by the Central Bureau of statistics and the Planning Unit of the Ministry of Planning and National development. Data was collected from a sample of 50,713 individuals from 10,873 households. The dataset is augmented with data on education performance and quality of schooling from the Ministry of Education.

We base our analysis for primary schooling on children aged 6-15 years in order to allow for late entry. Though the minimum primary schooling age should be 14 years (given 8 years of primary school), we give an allowance of 1 more year to allow for late entry and grade repetition which is common in rural Kenya<sup>3</sup>. The sample statistics of the variables used in the analysis are presented in Table 1. School enrolment is based on information for children in various grades of primary education the year prior to the survey, because the information available for attendance in the survey year does not indicate the grade. We however adjust the sample to cater children who were enrolled and those enrolled in the survey year. From the data, comparing the grade attainment and attendance show that only 1% of the children dropped out of school during the survey year. The statistics show that 97% of all children in this age set were reported to be enrolled in primary schools in the sample. This percentage is equally representative of boys and girls with girls reporting a lower enrollment by only 1%. The rural sample is consistent with the full sample, while the urban sample shows much lower levels of enrollment and more variation (5%) between boys and girls. The mean age of children enrolled in primary school is 10 years with a standard deviation of 3 years. This is consistent across regions but the mean age by gender of child is 11 years with a standard deviation of 4 (see appendix Table A1).

From the dataset, we generated variables for age squared, child of household head, parental education and employment status and household composition proxied by number of children and adults of various ages. We also generated interaction terms for gender of child and parents' education and number of under children under five years and females older than 14 years. At a glance the statistics show that on average, most of the children (90%) enrolled in primary school are actual children of the household head, compared to other relations. Household composition seems to suggest that there are no major differences in family

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<sup>3</sup> Although we allow for only 1 year, we note that there were 5004 pupils enrolled in primary school aged between 15 & 17 years. For this reason, the analysis could also be extended a sample of children between age 6 and 17 and then also extend the analysis to determinants of late enrollment.

structure between rural and urban areas. With a mean of only 1 child aged less than 5 years, 2 children aged between 6 and 12 years, 1 child aged 13-17 years and 2 adults aged between 18 and 65 years in rural and urban areas.

There are large regional and gender differentials in parental education with parents in urban areas reporting almost twice as many years of schooling as their counterparts in rural areas. Surprisingly, urban mothers report the highest mean number of years of schooling at 9.22 years, compared to fathers who report 8.98. Mothers in rural areas report a lower mean years of schooling than fathers. Overall, the data portrays a rural average of primary but an urban average of secondary education for all parents. Further more about 60% of the fathers were reported to be employed compared to only 40% of all mothers. There are no marked regional differences in parental employment status.

We proxy household welfare/assets by a vector of variables including the poverty status<sup>4</sup> of the household, the number of rooms in a house, the material of the walls of the house, total land managed by a household and whether the household owns its own dwelling house. Again there are no major regional variations in these indicators. The average number of rooms is approximately 3 in rural but 2 in urban areas; about 57% and 58% of the pupils are from poor households in rural and urban areas respectively. As expected, almost all households (95%) own their dwelling houses in rural areas compared to only 23% in urban areas.

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<sup>4</sup> Poverty status refers to whether or not a household is poor based on a predetermined consumption expenditure based poverty line

Table 1: Sample Statistics: All boys and girls aged 6 to 15 years

Variable	Full Sample		Rural Sample		Urban Sample	
	Mean	Std dev.	Mean	Std dev.	Mean	Std dev.
<b><i>Child Characteristics</i></b>						
Child enrolled in school	0.97	0.18	0.97	0.17	0.93	0.25
Age of child in years	10.22	2.87	10.24	2.86	10.07	2.93
Gender of child	0.50	0.50	0.51	0.50	0.49	0.50
Child of Household Head	0.88	0.32	0.88	0.33	0.90	0.30
<b><i>Household characteristics</i></b>						
Age of Household Head	44.72	11.56	45.22	11.72	40.32	8.98
Mothers education	5.36	5.34	4.92	5.08	9.22	6.02
Father's education	5.48	6.06	5.08	5.76	8.98	7.30
Father is employed	0.41	0.49	0.42	0.49	0.36	0.48
Mother is employed	0.57	0.50	0.57	0.50	0.55	0.50
Number of children aged < 5	0.90	0.96	0.90	0.96	0.86	0.94
Number of children aged 6-12	2.35	1.24	2.41	1.24	1.87	1.06
Number of children aged 13-17	1.20	1.03	1.23	1.03	0.95	0.98
Number of females aged > 14	1.67	0.95	1.67	0.95	1.62	0.91
Number of adults aged 18-65	2.42	1.24	2.42	1.25	2.40	1.12
Number of adults aged >65	0.09	0.31	0.10	0.32	0.02	0.15
Gender of child & father's education	5.02	6.41	4.85	6.24	6.48	7.51
Gender of child & mother's education	2.00	5.53	1.89	5.28	2.98	7.30
Children aged < 5 & females aged >14	1.55	2.27	1.56	2.30	1.49	2.09
<b><i>Indicators of Household Welfare</i></b>						
number of rooms in house	2.72	1.34	2.76	1.30	2.35	1.57
poverty status of the household	0.57	0.50	0.57	0.50	0.58	0.49
material of the wall	1.91	1.43	1.85	1.41	2.45	1.47
Total land managed by household	23.02	136.16	23.11	135.83	22.27	139.02
Own dwelling house	0.87	0.33	0.95	0.23	0.23	0.42
<b><i>Community Characteristics</i></b>						
Time taken to nearest primary school	3.16	1.30	3.25	1.31	2.38	0.90
Time taken to fetch water	2.38	1.52	2.50	1.53	1.38	0.83
Pupil teacher ratio	30.93	3.84	31.01	3.97	30.21	2.27
Mean KCPE scores	350.69	21.13	350.80	21.44	349.78	18.22
Number of teachers S1	433	234	423	233	518	232
Number of teachers P1	3364	1378	3370	1382	3310	1348
Number of teachers P2 & P3	1026	462	1047	459	847	453
Monthly cost of sending a child to school	90	477	58	199	364	1331
Sample Size	16527		14937		1590	

Availability of schooling and water are expected to encourage enrollment. Availability of schooling is proxied by time taken to reach the nearest primary school, with a mean of 3.3 in rural areas and 2.4 in urban areas. The impact of the availability of water is through less time required for fetching water, activities often undertaken by children. Quality of schooling infrastructure is expected to act as an incentive to parents to send their children to school. Quality is reflected in KCPE performance, pupil teacher ratios and teacher skills level. Means for KCPE performance indicate that in general, there are no marked differences in performance between boys and girls and between rural and urban regions. We are however quick to note that this data is highly aggregated because the mean scores were only available at the district level, such that all households in one district are assumed to observe the same score, which is taken as a proxy for the expected benefits accruing to a parent from schooling. Mean pupil teacher ratios are also observed to be approximately the same across regions at 30 pupils per teacher, though the standard deviations differ. Primary and secondary teacher skill levels are ranked from graduate and diploma teachers (S1) to certificate teachers (P1, P2 & P3), with S1 representing the highest and P3 the lowest skills. Due to lower numbers of P2 and P3 in some regions, we combine the two to form the lowest skill category. For primary school teachers, the sample statistics show that there are marked differences between the number of teachers with higher skills in urban and rural areas, but the reverse for lower skill levels.

The household survey data does not provide a measure of direct costs of schooling. Household expenditures on schooling are however available for households that have primary school children. The available data provides expenditures on tuition fees, uniforms, books, transport food and other expenditures. We aggregate these to obtain total schooling expenditure and then use this information to compute district wide average of the cost of schooling per child and apply this to all households. We repeat this procedure for secondary school expenditures. We do not have a measure of indirect costs of schooling since the available data does not provide any information on child labour incomes. We therefore take the direct school cost as a measure of the price of schooling. The monthly cost of sending a child to primary school is negligible at 90 Kshs. per child for the whole sample, but almost three times as high for urban areas (and only 58 Kshs. for rural areas). The rural-urban difference could be attributed to the presence of more private schools in urban areas. Sample statistics for rural and urban areas by gender are not presented because the variations are insignificant.

Further analysis of current enrollment status by age and gender of the child is presented in Table 2. The table indicates very high enrollment rates across gender, especially for primary school children (age 6 to 15). Boys' enrollment is consistently higher than girls' and the gap

widens with age. The table highlights two important issues: One, there are very high drop out rates in Kenya. Half of all boys who enroll in school will drop out before completing secondary education compared to 70% of all girls. Two, girls are more likely to withdraw from school at an earlier age than boys, probably due to early marriages or to parental preference for boys' education. Another reason for the widening gap in enrollment with age could be due to grade repetition (Glick and Sahn, 2000).

Table 2: Current Enrollment Rates by Age and Sex in Kenya

<b>Age</b>	<b>All</b>	<b>Rural</b>	<b>Urban</b>	<b>Boys</b>	<b>Girls</b>
6 - 8	0.983	0.986	0.957	0.986	0.980
9 -11	0.986	0.988	0.965	0.987	0.985
12-14	0.955	0.961	0.906	0.948	0.964
15-17	0.799	0.807	0.737	0.821	0.775
18	0.484	0.523	0.322	0.550	0.429

We also analyse late entry into school, results for which are presented in Tables 3 and 4<sup>5</sup>. There are marked regional differences in the incidence of late enrollment. 20% of rural pupils delayed entry by only 1 year, while 17% and 12% delayed by 2 and 3 years respectively. In urban area, 18% reported late enrollment of 1 year, while 10% and 5% reported 2 and 3 years respectively. Rural children are therefore more likely to delay enrollment than urban children, with 67% of all rural children delaying enrollment by at least one year compared to only 46% in urban areas. For the full sample, 65% of all children delayed enrollment by at least 1 year. The differences in years of delayed enrollment in rural and urban areas suggest that pupils enter school much later in rural compared to urban areas and probably stay longer in school due to grade repetition in rural than in urban area. Tabulation by gender of child strongly supports this argument. Urban boys are likely to go to school earlier than urban girls and therefore report a lower percentage of children with late enrollment (42%) compared to girls (50%). The reverse is observed for rural areas (which is quite surprising), though the difference is not as marked as in urban areas.

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<sup>5</sup> Late entry is computed as age minus (grades completed +6); Glewwe and Jacoby (1994). This measure could compound both delayed enrollment and grade repetition, which are both common in Kenya.

Table 3: Proportion of Children aged 6-18 years by Number of years of Late Entry into School

<b>Years delayed</b>	<b>All Regions</b>	<b>Rural</b>	<b>Urban</b>
-2	3.46	3.18	5.75
-1	11.44	10.56	18.61
0	20.16	19.01	29.46
1	20.23	20.46	18.41
2	16.85	17.74	9.55
3	11.58	12.36	5.21
4	8.63	8.53	9.48
5	4.09	4.32	2.16
6	1.86	2.02	0.57
7	0.88	0.91	0.56
8	0.54	0.6	0.08
9	0.24	0.25	0.09
10	0.05	0.04	0.07
11	0.01	0.01	0
Sample Size	15,954	14,391	1,563

Table4: Late Entry into School by Region and Gender (% of Children 6-18 yrs)

<b>Years delayed</b>	<b>All Regions</b>		<b>Rural</b>		<b>Urban</b>	
	<b>Males</b>	<b>Females</b>	<b>Males</b>	<b>Females</b>	<b>Males</b>	<b>Females</b>
-2	3.15	3.76	2.81	3.54	6.18	5.39
-1	10.59	12.29	9.62	11.51	19.28	18.05
0	19.96	20.35	18.52	19.52	32.85	26.6
1	20.2	20.26	20.11	20.81	21.09	16.14
2	17.32	16.37	18.3	17.17	8.51	10.44
3	11.93	11.24	12.8	11.92	4.12	6.13
4	8.3	8.97	8.76	8.29	4.11	14.01
5	4.51	3.67	4.75	3.89	2.35	2.01
6	2.13	1.59	2.33	1.71	0.38	0.72
7	0.91	0.84	0.92	0.91	0.86	0.31
8	0.65	0.43	0.72	0.47	0.00	0.14
9	0.29	0.18	0.31	0.2	0.13	0.07
10	0.00	0.04	0.04	0.05	0.15	0.00
11	0.02	0.00	0.02	0.00	0.00	0.00
Total	8,075	7,879	7,307	7,084	768	795

### 3.2 Empirical Results

Our empirical analysis of determinants of demand for schooling is based on equation 3.8. The results from the estimation of the probit model for primary enrollment are presented in Tables 5 and 6. The corresponding marginal effects are presented in appendix Table A2. We interpret results in these two tables concurrently. The measures of goodness of fit represented by the Wald Chi(2) tests (bottom of the table) indicate that the estimated models provide reasonably adequate descriptions of the data. The results show consistency across regions on one hand and across gender on the other. The probability of being enrolled increases at a decreasing rate with age. This is consistent with the hypothesis that increasing age corresponds to increasing potential labour income and thus children may be withdrawn from school as they grow older (Nielsen 2001). Older heads of households are more likely to take their children to school than younger heads. Being a child of the household head raises the probability of being enrolled in primary school in all cases. Boys are more likely to be enrolled in school than girls, though the coefficient is only significant for urban areas. This finding supports the hypothesis of parental preference for boys' education (Glick and Sahn, 2000).

In general parents' education increases the probability of enrollment. Fathers' education is a more important determinant of primary school enrollment than mothers' education across regions and across gender of the child. This result is consistent with standard results in the literature (Gertler and Glewwe,1990). The difference is however only statistically significant for boys and girls sub-sample. Further, the test for statistical difference shows that the difference is more important for girls' than for boys' enrollment. Holding household incomes and expenditures constant, parental education effects capture the positive attitude of educated parents to the accumulation of human capital rather than the availability of resources (Al-Samarrai and Reilly,2000, Nielson 2001).

We also explore whether the probability of a child being enrolled in school is affected by the parents being employed. This is based on answers to the question whether parents were employed during the last 12 months. The results show that children are more likely to be enrolled in school if the mother is working. The coefficients for father being employed are negative but insignificant implying that father's employment status may not be an important determinant of enrolment.

**Table 5: Probit Regression Results for Primary School Enrollment by Region**

Variable	Full Sample		Rural Sample		Urban Sample	
	Coeff.	Z-value	Coeff.	Z-value	Coeff.	Z-value
<i>Child Characteristics</i>						
Age	2.050	52.00***	1.938	46.57***	3.379	21.75***
Age Squared	-0.085	-46.10***	-0.079	-40.42***	-0.152	-21.00***
Gender	0.017	0.68	0.006	0.21	0.181	1.89**
Child of Household Head	0.312	7.65***	0.241	5.55***	1.139	7.40***
<i>Household characteristics</i>						
Age of Household Head	0.008	5.09***	0.008	5.15***	-0.001	-0.20
Mothers education	0.008	2.63***	0.012	3.31***	0.005	0.47
Father's education	0.015	4.72***	0.014	3.89***	0.013	1.21
Number of children aged 13-17	-0.054	-3.59***	-0.068	-4.29***	0.054	0.92
Father is employed	-0.021	-0.76	-0.019	-0.63	-0.046	-0.45
Mother is employed	0.154	5.93***	0.178	6.44***	0.114	1.19
Number of adults aged 18-65	-0.027	-1.88**	-0.033	-2.15**	0.051	0.81
Number of adults aged >65	-0.085	-1.68*	-0.138	-2.69***	0.712	1.91**
Gender of child & father's education	0.010	4.02***	0.013	4.93***	-0.017	-2.40***
Gender of child & mother's education	0.018	5.97***	0.018	5.20***	0.012	1.34
Children	-0.004	-0.32	-0.010	-0.76	0.141	2.57***
Number of children aged < 5	-0.049	-1.91**	-0.035	-1.30	-0.352	-3.3***
Number of children aged 6-12	-0.006	-0.59	-0.002	-0.15	-0.019	-0.39
Number of females aged > 14	0.038	1.74*	0.052	2.25**	-0.123	-1.35
<i>Indicators of Household Welfare</i>						
Number of rooms in house	0.079	7.33***	0.089	7.61***	0.011	0.29
Poverty status of the household	-0.070	-2.65***	-0.073	-2.63***	-0.093	-0.87
Material of the wall	0.016	1.73*	0.022	2.24**	-0.044	-1.4
Total land managed by household	0.0001	0.91	0.0001	1.06	0.000	1.3
Own dwelling house	0.166	4.04***	0.247	4.28***	0.090	0.73
<i>Community Characteristics</i>						
Time taken to nearest primary school	-0.043	-4.41***	-0.044	-4.29***	-0.086	-1.65*
Time taken to fetch water	-0.024	-2.76***	-0.020	-2.33***	0.070	1.27
Pupil teacher ratio	-0.002	-0.61	-0.005	-1.59*	0.008	0.43
KCPE scores	0.005	7.58***	0.006	9.31***	0.009	2.88***
Number of teachers S1	0.044	0.53	-0.007	-0.08	0.519	1.1
Number of teachers P1	0.126	7.00***	0.194	9.78***	-0.129	-1.43
Number of teachers P2 & P3	-0.221	-5.29***	-0.464	-9.03***	0.466	3.15***
Monthly cost of sending a child to school	-0.119	-4.86***	-0.162	-2.53***	-0.086	-2.72***
Constant	-13.603	-40.90	-13.674	-38.44	-21.269	-13.64
Number of Observations	16367		14782		1585	
Lr chi2(31)	7817.89***		7199.79***		977.58***	
Log Likelihood	-6680.32		-5958.77		-541.31	

\*, \*\*, \*\*\*, significant at 10%, 5% and 1% levels respectively



Family composition has an important impact on enrollment. The larger the numbers of both children and working age adults, the lower the probability of enrollment, implying competition for resources. Furthermore, larger families may derive less utility from sending an additional child to school because having one child in school may be less important if some are already enrolled (Gertler and Glewwe 1990). This finding contradicts studies which argue that the greater the number of children per household, the less the time required per child for household production activity and thus the higher the likelihood of enrollment (Al-Samarrai and Rilley, 2000).

The presence of more young children less than 5 years of age and children aged between 13 and 17 years lowers the probability of enrollment. This confirms arguments that additional children between 13 and 17 years would reduce the utility derived from sending any one of them to school (Gertler and Glewwe 1990). The presence of more adult members in a household significantly reduces the probability of enrollment though the coefficients for urban areas are insignificant. The presence of more adult females seems to lower the probability of enrolment in urban areas. Interaction terms between gender of the child and parents education are important determinants in rural areas and for the girls sub-sample but not for the urban areas and boys sub-sample. In the later, only gender of the child and mother's education seem to be important.

A child is more likely to be enrolled in school if he comes from a non-poor household irrespective of the region of residence. This supports literature that argues of a positive relationship between household income and schooling<sup>6</sup> (Glick and Sahn 2000, Ray 2000). Poor households may be unable to afford the direct and indirect costs of schooling and may be constrained in their ability to borrow to recover the costs. The results further show that girls from poor households are much less likely to enroll in primary school than boys from poor households, probably due to observed parental preference for boys' over girls' education in the face of resource scarcity. In a way, this also supports studies which argue that children from richer households are more likely to go to school than their poorer counterparts (Glewwe and Jacoby, 1994). Glick and Sahn (2000) argue that the positive impact of income on girls' enrollment could spring from the fact that better off households can afford to hire help for childcare and other housework and therefore release girls to school. This is also confirmed by asset ownership proxied by whether or not a household owns its own dwelling house or not. The lower probability of households with no assets

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<sup>6</sup> We however caution that direct assessment of the effect of household resources is often difficult due to the presence of interaction terms and the general nonlinearity of probit models. However studies that take care of this problem find results which are robust with our findings (see Glick and Sahn, 2004)

sending their children to school implies that such households take a loan on the human capital market (Nielsen, 2001). Ownership of dwelling is not an important determinant of the probability of enrollment in urban areas, probably because few households (only 23 %) dwell in their own houses.

Community variables are proxied by distance to source of water and distance to nearest primary school. The results indicate that these two variables are important determinants of enrollment for both boys and girls. Distance to nearest primary school is an important deterrent to enrollment in all regions and also across gender of the child. The marginal effects however imply that the distance is more important for rural areas and for boys than for urban areas and for girls. Our results support findings for public schools in Madagascar (Glick and Sahn, 2000). That distance is less important in urban areas is expected because there are more schools than in rural areas, but the result for girls is puzzling.

Overall, pupil teacher ratio does not seem to be a significant determinant of enrollment except in rural areas. This finding supports earlier results for Kenya and Madagascar (Bedi et al. 2002, Glick and Sahn, 2004). According to Glick and Sahn, the insignificant impact of pupil-teacher ratio could be due to simultaneity, that is: high local demand leading to a high number of students relative to staff, obscuring a true negative effect. Examination scores are expected to provide parents with signals of whether school enrollments yield sufficient human capital benefits (Bedi et al. 2002). We therefore a priori expected children from regions with higher primary examination scores to report higher probabilities of enrollment. This expectation is confirmed by the coefficients for the benefits that parents expect to derive from sending children to school (KCPE scores) for rural areas and for the entire sample. The same scenario is observed for the regressions by gender of the child. However, the cost of education reduces the probability of sending a child to school, more so in the rural areas. There is no significant difference between the impacts of cost on the probability of boys and girls enrolling in primary school.

School infrastructure is proxied by the per capita number of teachers of different skill levels. The results show that presence of more middle grade teachers raise the probability of enrollment for both boys and girls in rural areas. Presence of more low skill teachers (P2 & P3) however lowers the probability of enrollment. In urban areas middle grade teachers seem to be less important than other teacher grades. These results imply that parents could be basing their decision to send their children to school on the perceived quality of schooling as proxied by the teacher skills level.

**Table 6: Probit Regression Results for Primary School Enrollment by Gender**

Variable	Boys		Girls	
	Coeff.	Z-value	Coeff.	Z-value
<i>Child Characteristics</i>				
Age	2.007	36.21***	2.098	36.50***
Age Squared	-0.083	-31.85***	-0.087	-32.36***
Child of Household Head	0.190	3.16***	0.411	7.29***
<i>Household characteristics</i>				
Age of Household Head	0.004	1.71*	0.013	5.93***
Mothers education	0.005	1.11	0.007	1.50
Father's education	0.033	1.86**	0.023	5.38***
Number of children aged 13-17	-0.064	-3.03***	-0.052	-2.39**
Father is employed	0.067	1.70*	-0.107	-2.62***
Mother is employed	0.145	3.97***	0.177	4.72***
Number of adults aged 18-65	-0.015	-0.70	-0.046	-2.20**
Number of adults aged >65	-0.043	-0.61	-0.145	-1.96*
Gender of child & father's education	-0.012	-0.64	0.015	5.23***
Gender of child & mother's education	0.035	4.46***	0.018	4.88***
Children aged < 5 & females aged >14	-0.006	-0.34	-0.003	-0.15
Number of children aged < 5	-0.045	-1.26	-0.051	-1.34
Number of children aged 6-14	-0.009	-0.57	-0.007	-0.44
Number of females aged > 14	0.077	2.42***	0.009	0.27
<i>Indicators of Household Welfare</i>				
Number of rooms in house	0.076	5.01***	0.080	5.20***
Poverty status of the household	-0.017	-0.46	-0.122	-3.21***
Material of the wall	0.013	1.00	0.018	1.33
Total land managed by household	0.000	0.36	0.0001	1.02
Own dwelling house	0.112	1.89**	0.230	3.99***
<i>Community Characteristics</i>				
Time taken to nearest primary school	-0.064	-4.73***	-0.020	-1.38
Time taken to fetch water	-0.031	-2.56***	-0.016	-1.32
Pupil teacher ratio	0.001	0.26	-0.007	-1.48
KCPE scores	0.004	5.17***	0.005	5.55***
Number of teachers S1	0.012	0.10	-0.105	-0.87
Number of teachers P1	0.130	5.18***	0.123	4.78***
Number of teachers P2 & P3	-0.285	-4.81***	-0.163	-2.73***
Monthly cost of sending a child to school	-0.146	-4.15***	-0.102	-2.96***
Constant	-13.105	-28.28	-14.180	-29.46
Number of Observations	8319		8048	
Lr chi2(30)	3997.98***		3899.07***	
Log Likelihood	-3391.77		-3249.00	

\*, \*\*, \*\*\*, significant at 10%, 5% and 1% levels respectively

## **4 DEMAND FOR SECONDARY SCHOOLING**

### **4.1 Sample Statistics**

Our analysis of demand for secondary schooling is based on all children between the age of 14 and 18 years. We however omit children who are still in primary and those who have completed secondary education in this age range. Of all children of this age group, 77% were enrolled in secondary schools at the time of the survey. Of these 90% were drawn from rural areas and the rest 10% from urban areas. Only 65% of urban children aged between 14 and 18 years were enrolled in secondary school, compared to 79% of rural children of the same age. Results of regional analysis, especially across gender need to be interpreted with caution given the small sample. The same variables from the WMS III used in the primary school demand model are used. For the additional data, we use trained teacher student ratio as well as number of teachers of different skills for secondary schools. The sample statistics show that the average cost of sending a child to secondary school is about 277 Kshs per month for the whole sample (Table 7). There are however large disparities in cost of education between rural and urban areas as shown by the different means (Kshs 202 and Kshs 796 for rural and urban areas respectively). The large standard deviations in costs probably emanates from large differences in cost of schooling between public and private schools. There are no marked differences in trained teacher student ratios and teachers of different skills across regions, except for other categories of teachers (approved, technical and P1).

### **4.2 Empirical Results**

The probit regression results for secondary school enrollment are presented in tables 8 and 9, and the corresponding marginal effects in appendix Table A3. The results show general consistency with the primary school results in spite of using different age groups and outcome variables. Gender of the child is an important determinant of secondary school enrollment especially in urban areas. Age of the household head and parental education are also important determinants of enrollment. Maternal education seems to be much more important than paternal schooling for both boys and girls. These results support earlier studies for African countries (Glick and Sahn, 2000, 2004).

Being a child of the household head significantly raises the probability of enrollment (Younger, 2003). Further, the marginal impact of being a child of the household head is much stronger for girls than for boys. Family structure, especially presence of many small children is negatively correlated with enrollment. The presence of young children under 5 years reduces the probability of enrollment for girls, while older children (13-17 years) and

sisters encourage enrollment of girls into secondary school. We do not uncover any important impact of family composition on boys' enrollment (Glick and Sahn, 2000).

In general, interaction terms are all positive and significant except for the interaction between young children and females older than 14 years. In rural areas, asset ownership is important except for ownership of agricultural land. Other than poverty status and the number of rooms in a house, household assets turn out to be unimportant in urban areas. This finding supports Glick et al. (2000); who argue that household resources are a more important factor in rural households' decision to enroll a child in secondary school than for urban households.

Distance to nearest secondary school is not an important determinant of enrollment in urban areas. However, distance is quite important for rural areas and for the full sample, which reflects differences in distance between rural and urban areas (Glick et al., 2000). Secondary schools in rural areas are on average 1.52 kilometers further away than those in urban areas, yet there is higher variability in the distance in rural areas. The difference in rural-urban distance to primary schools is half as much as to secondary schools at 0.84 kilometers. As expected, distance seems to be more of a deterrent to enrollment for girls than for boys.

Cost of education has the unexpected positive impact across regions and gender. This probably implies that the cost masks important differences in quality of education such that higher cost schools may not necessarily report lower enrollment than cheaper schools (Glewwe and Jacoby 1994). Like for enrollment in primary schools, student teacher ratios are unimportant except for urban areas, where the impact is insignificant. Per capita number of graduate secondary school teachers are important in determining enrollment in rural areas and for the girls, but not for urban and boys' sub-sample.

**Table 7: Sample Statistics for Secondary School Children Aged 14-18 years**

Variable	Full Sample		Rural		Urban	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
<b><i>Child Characteristics</i></b>						
Child ever enrolled in Sec. school	0.77	0.42	0.79	0.41	0.65	0.48
Age	15.87	1.44	15.82	1.43	16.19	1.49
Gender	0.51	0.50	0.52	0.50	0.43	0.50
Child of Household Head	0.84	0.36	0.86	0.35	0.72	0.45
<b><i>Household characteristics</i></b>						
Age of Household Head	47.67	11.84	48.81	11.62	39.79	10.29
Father is employed	0.39	0.49	0.41	0.49	0.30	0.46
Mother is employed	0.55	0.50	0.55	0.50	0.54	0.50
Mothers education	4.90	5.49	4.28	5.03	9.19	6.53
Father's education	5.21	6.17	4.57	5.63	9.56	7.80
Number of children aged < 5	0.66	0.89	0.66	0.89	0.67	0.89
Number of children aged 13-17	1.74	0.92	1.79	0.90	1.36	0.95
Number of children aged 6-12	1.65	1.35	1.73	1.36	1.05	1.11
Number of females aged > 14	2.07	1.09	2.09	1.11	1.97	1.00
Number of adults aged 18-65	2.87	1.46	2.87	1.48	2.86	1.30
Number of adults aged >65	0.10	0.33	0.11	0.35	0.01	0.10
Gender of child & father's education	4.67	6.36	4.43	6.11	6.34	7.66
Gender of child & mother's education	1.96	5.61	1.72	5.03	3.60	8.39
Child aged < 5 & females aged >14	1.48	2.44	1.50	2.48	1.40	2.09
<b><i>Indicators of Household Welfare</i></b>						
number of rooms in house	2.82	1.39	2.88	1.36	2.40	1.56
Poverty status of the household	0.57	0.50	0.57	0.50	0.56	0.50
material of the wall	1.96	1.42	1.90	1.41	2.36	1.43
total land managed by household	30.82	159.54	24.61	139.09	73.45	255.73
Own dwelling house	0.86	0.35	0.95	0.21	0.24	0.43
<b><i>Community Characteristics</i></b>						
Time taken to nearest sec. school	4.62	1.78	4.82	1.77	3.25	1.10
Time taken to fetch water	3.11	1.95	3.35	1.94	1.44	0.91
Monthly cost of sending a child to school	277.13	1208.77	201.52	540.55	796.47	3032.0
Trained teacher/student ratio	16.29	2.22	16.44	2.28	15.29	1.40
Number of graduate teachers	696.76	405.81	689.84	413.06	744.23	348.55
Number of S1 and Diploma teachers	328.49	201.26	327.94	207.82	332.26	148.60
Other teachers (Number)	128.84	150.76	124.88	148.94	156.01	160.21
Sample size	6879		5800		679	

Table 8: Probit Regression Results for Secondary School Enrollment by Region

Variable	All Regions		Rural		Urban	
	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value
<b><i>Child Characteristics</i></b>						
Age	4.187	7.37***	2.905	4.48***	10.358	6.18***
Age Squared	-0.116	-6.68***	-0.077	-3.85***	-0.304	-5.90***
Gender	0.097	1.63*	-0.019	-0.28	0.646	3.34***
Child of Household Head	0.669	7.98***	0.525	5.29***	0.971	4.10***
<b><i>Household characteristics</i></b>						
Age of Household Head	0.010	2.93***	0.008	2.26**	0.020	1.73*
Father is employed	-0.154	-2.73***	-0.142	-2.14**	-0.133	-0.77
Mother is employed	-0.038	-0.74	-0.009	-0.15	-0.099	-0.57
Mothers education	0.027	4.57***	0.023	3.04***	0.021	1.31
Father's education	0.029	4.61***	0.013	1.76*	0.078	4.19***
Number of children aged < 5	-0.114	-1.57*	-0.072	-0.84	-0.323	-1.57
Number of children aged 13-17	0.033	1.08	-0.011	-0.32	0.173	1.69
Number of children aged 6-12	-0.024	-1.15	0.008	0.33	-0.067	-0.83
Number of females aged > 14	0.055	1.55	0.071	1.76*	-0.114	-0.86
Number of adults aged 18-65	-0.059	-2.39	-0.127	-4.46***	0.080	0.93
Number of adults aged >65	-0.142	-1.40	-0.187	-1.72*	-1.596	-1.51
Gender of child & father's education	0.014	3.14***	0.014	2.53***	-0.005	-0.41
Gender of child & mother's education	0.009	1.68*	0.000	-0.06	0.047	3.15***
Child aged < 5 & females aged >14	-0.022	-0.80	-0.032	-0.97	0.091	0.98
<b><i>Indicators of Household Welfare</i></b>						
number of rooms in house	0.139	7.39***	0.099	4.64***	0.216	3.33***
Poverty status of the household	-0.315	-6.07***	-0.093	-1.54	-0.762	-4.54***
material of the wall	0.010	0.54	0.041	1.97**	-0.134	-2.01**
total land managed by household	0.000	-1.00	-0.0001	-0.06	0.000	-0.26
Own dwelling house	-0.379	-4.84***	0.044	0.30	-0.409	-2.01**
<b><i>Community Characteristics</i></b>						
Time taken to nearest sec. school	-0.059	-3.75***	-0.080	-4.54***	0.125	1.87*
Time taken to fetch water	-0.009	-0.60	0.015	0.95	-0.023	-0.25
Monthly cost of sending a child to school	0.156	9.68***	0.735	17.54***	0.031	1.28
Trained teacher/student ratio	0.032	2.22**	0.038	2.35***	-0.058	-0.92
Number of graduate teachers	0.339	2.17**	0.427	2.42***	-0.381	-0.69
Number of S1 and Diploma teachers	-0.473	-1.71*	-0.650	-2.13**	1.537	1.37
Other teachers (Number)	0.109	0.60	0.144	0.66	0.229	0.47
Constant	-39.996	-8.67	-30.016	-5.70	-90.754	-6.68
Number of observations	6411		5737		674	
Lr Chi2(30)	1398.03***		1188.05***		380.99***	
Log likelihood	-1665.77		-1248.39		-205.35	

\*, \*\*, \*\*\*, significant at 10%, 5% and 1% levels respectively

Table 9: Probit Regression Results for Secondary School Enrollment by Gender

Variable	Boys		Girls	
	Coeff.	z-value	Coeff.	z-value
<i>Child Characteristics</i>				
Age	4.407	5.27***	4.021	4.70***
Age Squared	-0.123	-4.78***	-0.111	-4.23***
Child of Household Head	0.223	1.92**	0.996	7.57***
<i>Household characteristics</i>				
Age of Household Head	0.003	0.61	0.014	2.86***
Father is employed	-0.234	-2.82***	-0.057	-0.69
Mother is employed	-0.044	-0.56	-0.033	-0.44
Mothers education	0.023	2.54***	0.033	3.51***
Father's education	0.004	1.45	0.031	3.59***
Number of children aged < 5	-0.099	-0.97	-0.236	-1.89*
Number of children aged 13-17	-0.076	-1.70*	0.097	2.22**
Number of children aged 6-12	0.001	0.02	-0.028	-0.89
Number of females aged > 14	-0.033	-0.60	0.047	0.88
Number of adults aged 18-65	-0.047	-1.25	-0.062	-1.78*
Number of adults aged >65	-0.231	-1.53	-0.060	-0.40
Gender of child & father's education	0.038	4.21***	0.004	0.76
Gender of child & mother's education	0.020	1.28	0.009	1.25
Child aged < 5 & females aged >14	-0.008	-0.16	0.007	0.18
<i>Indicators of Household Welfare</i>				
Number of rooms in house	0.176	6.20***	0.099	3.66***
Poverty status of the household	-0.132	-1.70*	-0.353	-4.66***
material of the wall	-0.004	-0.16	0.008	0.31
total land managed by household	0.000	1.43	0.000	-1.60
Own dwelling house	-0.464	-3.94***	-0.336	-2.98***
<i>Community Characteristics</i>				
Time taken to nearest sec. School	-0.056	-2.33**	-0.053	-2.37***
Time taken to fetch water	0.004	0.20	-0.013	-0.64
Monthly cost of sending a child to school	0.664	13.14***	0.084	4.62***
Trained teacher/student ratio	0.024	1.11	0.034	1.60
Number of graduate teachers	-0.044	-0.18	0.696	3.19***
Number of S1 and Diploma teachers	0.237	0.55	-1.010	-2.59***
Other teachers (Number)	0.383	1.49	-0.153	-0.56
Constant	-41.021	-6.04	-39.397	-5.65
Number of observations		3239		3172
Lr Chi2(30)		899.79***		685.62***
Log likelihood		-761.89		-805.31

\*, \*\*, \*\*\*, significant at 10%, 5% and 1% levels respectively



## 5 GRADE ATTAINMENT

### 5.1 Sample Statistics

To confirm the robustness of our results for schooling outcomes, we also estimate demand for schooling through highest grade attained by all children aged 6-18 years. This age range allows us to include those kids who never enrolled (attainment is zero). A tabulation of grade attainment by region and gender for all children of this age set is presented in Table 10. The table indicates that there were more males than females in the rural areas for this age set but the reverse in urban areas. Grade attainment was highest in standards 1 and 2 but declined continuously thereafter, implying high drop out rates and probable grade repetition across regions for both girls and boys. For instance, in rural areas, only 1% of the children were in the highest grade in secondary education compared to 4.5% in the urban areas (Table11). At the regional level, there is higher concentration of students at higher grades in urban than in rural areas, while there is also a marked difference in concentration of boys compared to girls at higher levels, more so in secondary education. Overall, the mean grade in urban areas is higher than in rural areas and the difference is statistically significant at the 0.01 level.

Table 10: Grade Attainment by Boys and girls Aged 6-18 years

Grade	Full Sample		Rural		Urban	
	Male	Female	Male	Female	Male	Female
No schooling	9.71	8.27	9.98	8.42	7.47	7.21
Standard 1	12.66	12.81	13.01	12.99	9.68	11.53
Standard 2	12.22	11.75	12.24	12.26	12.07	8.14
Standard 3	11.60	11.42	11.67	11.82	11.02	8.61
Standard 4	10.86	10.94	11.14	11.35	8.56	7.97
Standard 5	9.58	9.89	9.90	10.06	6.93	8.63
Standard 6	8.91	8.83	8.97	8.99	8.43	7.67
Standard 7	8.62	9.26	8.73	9.49	7.64	7.65
Standard 8	8.86	10.06	8.70	8.52	10.16	20.99
Form 1	1.95	2.13	1.83	2.07	2.96	2.57
Form 2	2.15	1.94	1.63	1.82	6.46	2.76
Form 3	1.41	1.07	1.14	0.91	3.65	2.21
Form 4	1.48	1.63	1.06	1.29	4.99	4.07
Total	9,213	8,923	8,308	7,971	905	952

Table 11 shows that the overall mean grade attained by all girls is significantly higher than for all boys at the 0.01 level of significance. The mean grade attained is also higher for girls than for boys in rural areas and the difference is statistically significant at the 5% level. The same result is observed for urban areas but the difference is not statistically significant. Our data further suggests a multimodal distribution in the grade attainment, with a sharp spike at the last class of primary schooling for urban children, probably indicating many children repeating the examination class. For all regions, there is a sharp drop in grade attainment following standard 8 (completed primary) which is consistent with expectations on years of schooling (Glick and Sahn, 2000).

Table 11: Proportion of Children Aged 6-18 Years by Grade Attainment

Highest level reached	All Regions	Rural	Urban
No schooling	9.00	9.21	7.33
Standard 1	12.73	13.00	10.66
Standard 2	11.99	12.25	9.98
Standard 3	11.51	11.74	9.74
Standard 4	10.90	11.24	8.25
Standard 5	9.73	9.98	7.83
Standard 6	8.87	8.98	8.02
Standard 7	8.94	9.10	7.64
Standard 8	9.46	8.62	15.92
Form 1	2.04	1.94	2.75
Form 2	2.04	1.72	4.49
Form 3	1.24	1.03	2.88
Form 4	1.55	1.17	4.50
Total	18,136	16,279	1,857

We further analyze grade attainment by age, region and gender of the child (Table 12). The results show modest regional disparities in grade attainment across region and for boys and girls. Rural areas report lower mean grade attainment than urban areas and the difference is highest for children aged 15-17 years, where urban children report almost two grades higher than rural children. The regional difference in grade attainment also increases with age, except for the 18 year olds. There are very insignificant gender differences in attainment by age and surprisingly, girls do not seem to be disadvantaged in attainment relative to boys at all age groups, except for the 18 year olds.

Table 12: Mean Grade Attained by Age, Region and Gender

<b>Age</b>	<b>Full sample</b>	<b>Rural</b>	<b>Urban</b>	<b>Boys</b>	<b>Girls</b>
6 – 8	1.06	1.04	1.18	1.02	1.09
9 -11	2.93	2.85	3.67	2.83	3.02
12-14	5.23	5.10	6.46	5.19	5.27
15-17	7.73	7.46	9.80	7.66	7.80
18	9.06	8.85	9.94	9.07	9.05

## 5.2 Empirical Results

Grade attainment is the most emphasized schooling indicator in the literature, mostly because it is an indicator of cumulative investment in an individual’s education (Behrman and Knowles 1999, Glick and Sahn, 2000). We use the ordered probit model to explain attainment because this approach allows us to incorporate several features of the data (such as ordered discrete choices of whether to go to the next grade or not) that simpler alternatives such as ordinary least squares cannot. The ordered probit model also allows for right-censoring of grade attainment. Censoring arises because for children still enrolled, their final grade is not yet known, and treating their education level as identical to those who have completed their schooling at that grade will result in biased estimates of the effects of the regressors on the true grade attainment. To take care of censoring and minimize selectivity problems, we choose an upper age limit of 18 years as it is known that the final grade attained for those still in school will be at least as high as the last grade. We exclude older children who have finished schooling because we do not have background information on households that they grew up in (See Glick and Sahn, 2000 for more detailed discussion on the censoring problem).

The ordered probit regression results are presented in tables 13 and 14. Like for enrollment we present results by region and by gender of the child. The  $X^2$  test for equality of the coefficients for boys and girls and for all regions indicate that the variables are jointly significant in explaining grade attainment and that the underlying ordered probit model fits the data better than the intercept only model. Further, the equality of the slope effects is rejected at all conventional levels of significance for all specification. From the literature, it is argued that household composition can influence the demand for schooling by altering the marginal costs of children’s time. However, household structure, more so the number of children may be jointly determined with schooling investments. This implies that the effect of siblings on schooling outcomes may be biased. To solve for the possible endogeneity of

children, the second best approach is to estimate a reduced form model of schooling demand, by omitting the number of children (Glick and Sahn, 2000). In addition to our regression in tables 13 and 14, we therefore re-estimate the models without the variables for number of children of various age categories. The results are presented in appendix Tables A4 and A5. We note here that the results for all other covariates remain more or less the same even after omitting the children variables, an indication that in Kenya, the choice of the number of children and investment decisions may not be jointly determined. These results are robust with findings for Guinea by Glick and Sahn, (2000).

Turning back to tables 13 and 14, the results are consistent with the probits for enrollment. However, boys seem to be disadvantaged in grade attainment in rural areas but not in urban areas. Parental education is important for both boys and girls, though father's education seem to be more important for girls than for boys. The positive impact of parental education confirms the argument that the education of parents can raise the utility from sending their child to school in three ways. First, parent's education may be positively correlated with children's ability, which in turn results in more education received per year of school attended and thus higher utility per year of children's schooling. Secondly, better educated parents may place a higher value on their children's education. Third, educated parents can provide an environment conducive to better learning, such as directly helping children with schoolwork, which will also raise the human capital received per year by the child (Gertler and Glewwe, 1990).

Maternal employment is an important determinant of grade attainment for both boys and girls, especially in rural areas, but father's employment status does not seem to be an important factor for grade attainment. Larger household size/family composition as proxied by number of children below 5 years, older children and adults is negatively correlated with attainment, more so for rural areas. However, presence of older sisters is a positive factor for attainment. It is important to note that the number of young siblings and older sisters has a stronger impact on girls' attainment than on boys'. This points at the importance of household time allocation factors on girls' schooling opportunities and outcomes. An alternative explanation is the child quantity-quality model which predicts a negative association of the number of children in the household and the average level of schooling (Glick and Sahn, 2000). Results for household welfare variables indicate that assets (proxied by number of rooms and material of the main dwelling house) and poverty status are important determinants of grade attainment.

Table 13: Ordered Probit Results for Grade Attainment for Children aged 6-18 years by Region

Variable	Full Sample		Rural Sample		Urban Sample	
	Coeff.	Z-value	Coeff.	Z-value	Coeff.	Z-value
<b>Child Characteristics</b>						
Age	0.897	47.95***	0.852	43.35***	1.468	21.23***
Age Squared	-0.018	-23.82***	-0.016	-20.83***	-0.034	-12.76***
Gender	-0.066	-4.09***	-0.076	-4.50***	0.034	0.60
Child of Household Head	0.222	8.76***	0.201	7.39***	0.643	7.42***
<b>Household characteristics</b>						
Age of Household Head	0.011	11.23***	0.010	9.77***	0.017	4.65***
Mothers education	0.017	8.82***	0.015	7.12***	0.019	3.33***
Father's education	0.023	11.66***	0.021	9.84***	0.024	4.30***
Number of children aged 13-17	-0.026	-2.79***	-0.029	-2.99***	0.009	0.26
Father is employed	-0.001	-0.05	0.044	2.31**	-0.217	-3.69***
Mother is employed	0.069	4.24***	0.079	4.53***	0.053	0.95
Number of adults aged 18-65	-0.043	-4.96***	-0.051	-5.63***	-0.005	-0.17
Number of adults aged >65	-0.065	-2.07**	-0.070	-2.18**	0.479	2.05**
Gender of child & father's education	0.004	2.74***	0.002	1.52	0.002	0.57
Gender of child & mother's education	0.019	10.19***	0.019	9.15***	0.021	4.22***
Child aged < 5 & females aged >14	-0.001	-0.18	-0.002	-0.26	-0.001	-0.05
Number of children aged < 5	-0.120	-6.88***	-0.128	-7.03***	-0.067	-1.05
Number of children aged 6-12	-0.017	-2.54***	-0.007	-1.04	-0.058	-2.15**
Number of females aged > 14	0.036	2.80***	0.049	3.69***	-0.070	-1.43
<b>Indicators of Household Welfare</b>						
Number of rooms in house	0.096	14.46***	0.093	13.24***	0.086	3.95***
Poverty status of the household	-0.186	-11.21***	-0.190	-10.82***	-0.318	-5.28***
Material of the wall	0.033	5.72***	0.044	7.04***	-0.062	-3.53***
Total land managed by household	0.0001	0.80	0.000	1.23	0.000	-0.53
Own dwelling house	-0.233	-8.78***	-0.016	-0.41	0.026	0.36
<b>Community Characteristics</b>						
Time taken to nearest primary school	-0.015	-2.28**	-0.009	-1.33	-0.010	-0.36
Time taken to fetch water	-0.017	-2.97***	-0.008	-1.37	-0.072	-2.12**
Pupil teacher ratio	0.003	1.18	0.003	1.56	0.000	0.04
KCPE scores	0.002	5.58***	0.003	6.09***	0.002	1.11
Number of teachers S1	0.296	5.72***	0.284	5.25***	-0.323	-1.15
Number of teachers P1	0.023	2.04**	0.043	3.44***	0.046	0.86
Number of teachers P2 & P3	-0.154	-5.88***	-0.185	-5.73***	-0.194	-2.21**
Monthly cost of sending a child to school	0.061	3.93***	0.098	2.32**	0.025	1.34
Number of Observations	17975		16127		1848	
Lr chi2(31)	24137***		20717***		3505.05***	
Log Likelihood	-30763.81		-27724.19		-2802.95	

\*, \*\*, \*\*\*, significant at 10%, 5% and 1% levels respectively

Distance to school and lack of water are also important deterrents of attainment, and as expected, the impact is stronger on girls' attainment than on boys'. Pupil teacher ratio is not an important determinants of grade attainment<sup>7</sup>. Education performance is important for both boys and girls, though the impact in urban areas is insignificant. As expected, presence of more low grade teachers will affect attainment for both boys and girls, while the other categories of teachers are positively and significantly correlated with attainment in rural areas. Quality of teachers do not seem to matter much in urban areas. Like in the enrollment model for secondary school, cost of education does not seem to be an important determinant of education attainment.

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<sup>7</sup> In this model, school quality is proxied by primary school covariates (pupil teacher ratio, performance, per capita teachers and cost of education) because the largest sample is in primary. Trying to find mean indicators combining both primary and secondary schooling give similar results.

**Table 14: Ordered Probit Regression Results for Grade Attainment for Children aged 6-18 years by Gender**

Variable	Boys		Girls	
	Coeff.	Z-value	Coeff.	Z-value
<i>Child Characteristics</i>				
Age	0.907	34.34***	0.887	33.06***
Age Squared	-0.018	-17.19***	-0.017	-15.99***
Child of Household Head	0.116	3.10***	0.300	8.58***
<i>Household characteristics</i>				
Age of Household Head	0.011	7.90***	0.011	8.04***
Mothers education	0.018	5.97***	0.012	4.27***
Father's education	0.005	0.50	0.028	10.36***
Number of children aged 13-17	-0.035	-2.72***	-0.025	-1.88*
Father is employed	0.020	0.80	-0.002	-0.08
Mother is employed	0.088	3.80***	0.050	2.14**
Number of adults aged 18-65	-0.042	-3.41***	-0.044	-3.52***
Number of adults aged >65	-0.113	-2.58***	-0.024	-0.52
Gender of child & father's education	0.023	2.06**	0.003	1.92**
Gender of child & mother's education	0.033	6.99***	0.019	8.72***
Children aged < 5 & females aged >14	0.006	0.50	-0.009	-0.80
Number of children aged < 5	-0.113	-4.73***	-0.126	-4.91***
Number of children aged 6-14	-0.028	-2.93***	-0.004	-0.43
Number of females aged > 14	0.030	1.63*	0.051	2.69***
<i>Indicators of Household Welfare</i>				
Number of rooms in house	0.113	12.08***	0.074	7.83***
Poverty status of the household	-0.190	-8.19***	-0.178	-7.46***
Material of the wall	0.025	3.07***	0.040	4.99***
total land managed by household	0.0002	2.04**	-0.00004	-0.59
Own dwelling house	-0.294	-7.71***	-0.172	-4.65***
<i>Community Characteristics</i>				
time taken to nearest primary school	-0.010	-1.15	-0.020	-2.17**
time taken to fetch water	-0.013	-1.65*	-0.020	-2.57***
Pupil teacher ratio	0.005	1.60	-0.001	-0.26
KCPE scores	0.002	3.74***	0.002	4.02***
Number of teachers S1	0.161	2.22**	0.443	5.98***
Number of teachers P1	0.036	2.27**	0.009	0.56
Number of teachers P2 & P3	-0.148	-3.99***	-0.164	-4.38***
Monthly cost of sending a child to school	0.034	1.52	0.083	3.87***
Number of Observations		9127		8848
Lr chi2(30)		12175***		12052.2
Log Likelihood		-15670.7		-15034.4

\*, \*\*, \*\*\*, significant at 10%, 5% and 1% levels respectively

## 6 POLICY SIMULATIONS

In policy simulations, we concentrate on policy simulations for demand for primary schooling as well as grade attainment for all children. This is done partly to save on space and also partly because demand for secondary schooling results are not as robust as for primary schooling in terms of the variables of policy interest. However, the same exercise could be repeated for demand for secondary schooling. Furthermore, policy simulation could be extended to household characteristics and other measures of household welfare but these are not variables of immediate policy concern from the government's point of view.

Tables 15 and 16 present the simulation results. In Table 15, we simulate the impact of eight different policy changes on primary enrollment and grade attainment. In Table 16, we present simulations of the distributional impact of four different policy measures on school enrollment by adult equivalent expenditure quintiles. We discuss results in these two tables concurrently. The first policy option that we consider is improving household welfare such that the proportion of poor households drop by 20%. The impact of such a change would have the effect of increasing enrollment by about 2% for the full sample. The impact would be slightly higher for urban (2.04%) than for rural (1.74%) areas, while the gender impact of such a change is 2.93% for girls but only 0.4% for boys. The gender differentiated impact is statistically significant at the 0.01 level of significance. The impact of such a policy change on grade attainment is much lower at 0.2% for rural areas and for all boys and girls, but only marginally higher at 0.3% in urban areas. The implication of this policy is that improving household welfare is a much more important determinant of enrollment than on actual years of schooling/grade.

The second policy option that we simulate is reducing distance to school by two kilometers. This would reduce the mean distance to the nearest primary school to 1.16, 1.25 and 0.38 for the full sample, rural and urban areas respectively. This policy change would increase enrollment by 16% in rural areas but by 32.3% in urban areas, with a statistically significant difference at the 0.01 level. The difference in the policy impact on enrollment is much higher by gender of the child, at only 9% for girls and 28% for boys. Surprisingly, the reverse impact is observed for grade attainment with attainment in rural areas increasing by 0.92% compare to only 0.15% for urban areas. Though the impact is modest, attainment for girls changes by twice as much as the attainment for boys. The distributional impact of such a policy change is mixed, with the third quintile receiving the largest increase in enrollment resulting from such a policy change. However, the poorest 20% also receive a larger share of the increment in enrollment than all quintiles except the third quintile.



Next we simulate the impact of reducing distance to source of water by 2 kilometers, which would in effect reduce the mean distance to source of water to 0.4, 0.5 and 0 kilometers for the full sample, rural and urban areas respectively and to 0.4 kilometers for boys and girls. Such a policy change would increase overall enrollment by 10% and about 8% in rural areas. The same policy would increase enrollment and attainment by twice fold for girls compared to boys. The impact in urban areas would be much more than in rural areas. A policy change of reducing pupil teacher ratio by 40% has the impact of increasing primary school enrollment by 12% in rural areas and 19% for girls. We do not uncover any important impact of this policy on boys and urban areas, or even on attainment except for girls with a very small increase of 0.11%.

Performance in primary school examinations as another measure of school quality is an important policy option for both rural and urban areas and also across gender. Increasing the mean grade score by 20% would increase enrollment in rural areas by 48% and by 120% in urban areas. The same policy measure would increase enrollment of girls by 74% and by 69% for boys. Again, the impact on attainment is much more smaller, at about 2% for rural areas and for boys, but twice as much for girls (4.31%), but only half as much (1.09%) for urban areas. The distributional impact of such a policy measure would be enormous at about 100% for the 2<sup>nd</sup> and third quintiles, but much lower for the poorest (40.6%). This implies that performance may not be such an important factor in school enrollment for the poorest, most probably because there are more important constraints such as lack of resources to send their kids to school.

We simulate two different policy scenarios for teachers: increasing the number of middle grade teachers per capita by 50% and also a similar policy change for all teachers per capita. The results show that the former policy change would be much more important for rural than for urban areas. Similarly, enrollment for boys would be more responsive than for girls, though the difference is not statistically significant. A similar pattern is observed for grade attainment, but there are more significant differences across regions and gender. The distributional impact of increasing middle grade teachers is more important for the poorest quintile (91%) than for all other quintiles. The impact is almost equal for the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> quintiles (56-60%), but very modest for the 5<sup>th</sup> quintile. These results show that improving the quality of teaching in schools would have a significant difference in enrollment across quintiles. The second policy scenario-increasing all teachers would have the reverse impact as the middle grade teachers: a larger impact in urban than in rural areas, with a statistically significant difference at the 1% level. Girls' enrollment would also be more responsive than boys with a difference of 4.45% points. This policy measure would however have little

differential impact on grade attainment across regions and gender, though girls' attainment would respond by 1% more points than for boys.

The last policy option that we simulate is reducing schooling cost by 50%. In Kenya, primary education is free of tuition fees in public schools with effect from January 2003 (with the new government). However, cost of education in private schools is still high, while in public schools, parents still have to pay for books, uniforms and transport among other expenditures (such as lunch fees). A policy of reducing the total cost of primary schooling by 50% would increase enrollment by three times as much in urban (2.97%) as in rural (1%) areas, which is expected because the regional difference in cost of schooling is even much more pronounced. The impact would also be more on boys' (1.5) than on girls' enrollment (0.97) though the difference is not statistically significant. The overall enrollment impact of this policy change would be minimal at only 1.17%. The simulations for distributional impact show that the impact of this policy change would be highest for the lowest quintile, but less important for the other quintiles.

Table 15: Policy Simulations; Primary School Enrollment and Grade Attainment for all Children

Policy		% Change in Mean Enrollment					% Change in Grade Attainment				
		All	Rural	Urban	Boys	Girls	All	Rural	Urban	Boys	Girls
1	Reduce proportion of poor household by 20%	1.73	1.74	2.04	0.4	2.93	0.23	0.23	0.27	0.23	0.22
2	Reduce distance to school by 2 km	18.97	15.7	32.3	28	8.53	0.3	0.92	0.15	0.22	0.43
3	Reduce distance to source of water by 2 km	10.31	8.05	-	3.48	6.7	0.2	0.08	0.52	0.14	0.22
4	Reduce pupil/teacher ratio by 40%	5.42	12.4	-	-	18.50	-	-	-	-	0.11
5	Improve examination performance by 20%	35.79	47.9	120	69	73.63	4.2	1.98	1.09	1.56	4.31
6	Increase middle grade teachers per capita by 50%	46.15	41.1	-	49	43.89	0.4	0.78	0.55	0.66	0.16
7	Increase all teachers per capita by 50%	19.29	14.9	22.5	17	21.45	0.3	0.38	0.32	0.21	0.31
8	Reduce cost of schooling by 50%	1.17	1.00	2.97	1.5	0.97	-	-	-	-	-

Table 16: Distributional Impact of Policy Changes on Primary Enrollment by Adult Equivalent Per Capita Expenditure

Quintile	Reduce distance to school by 1 km			Improve examination performance by 20%			Increase middle grade teachers per capita by 50%			Reduce cost of schooling by 50%		
	Pr_1 <sup>a</sup>	Pr_2 <sup>a</sup>	%change	Pr_1 <sup>a</sup>	Pr_2 <sup>a</sup>	%change	Pr_1 <sup>a</sup>	Pr_2 <sup>a</sup>	%change	Pr_1 <sup>a</sup>	Pr_2 <sup>a</sup>	%change
1	0.321	0.385	19.85	0.321	0.452	40.62	0.321	0.614	91.2	0.321	0.392	7.03
2	0.459	0.531	15.83	0.459	0.917	100	0.459	0.718	56.54	0.459	0.464	1.16
3	0.421	0.583	38.57	0.421	0.84	99.49	0.421	0.674	60.09	0.421	0.402	-4.42
4	0.588	0.69	17.33	0.588	0.992	68.65	0.588	0.927	57.46	0.588	0.591	0.44
5	0.613	0.614	0.10	0.613	0.976	59.24	0.613	0.67	9.12	0.613	0.63	2.06

<sup>a</sup>Average predicted enrollment probabilities before (Pr\_1) and after (Pr\_2) the policy change

## 7 CONCLUSION

In this paper, we investigate the determinants of education as a measure of household human capital, using Kenyan household survey data. We investigate the impact of household characteristics, namely child characteristics, parental characteristics and measures of household welfare. In addition, we investigate the impact of community level variables, namely quality of the school, direct cost of sending a child to school, distance to school and perceived benefits of attending school. We estimate models for primary and secondary school enrollment, as well as determinants of education attainment for all children of school age. Probit and ordered probit regression methods are employed to explain enrollment and attainment respectively. From the primary enrollment probit results and ordered probit results for grade attainment, we simulate the impact of changes in key policy variables on education demand in Kenya.

The results suggest that parental education, maternal employment, family composition and household welfare are important determinants of primary school enrollment. Other important factors for enrollment include distance to source of water and to school, perceived schooling benefits proxied by examinations scores and teacher skill levels. Of particular interest to note is the fact that middle grade teachers seem to matter more than the other categories of teachers. Further, we find that the cost of sending a child to school is quite an important determinant of primary school enrollment. Our results are consistent with previous studies on education demand. Our results also show regional (rural/urban) and gender differentials in responsiveness of demand for primary schooling services in Kenya. In particular, family composition, household welfare and school quality are found to be more important determinants of enrollment in rural than in urban areas, while child specific characteristics seem to matter more for urban areas. More or less the same scenario is uncovered for secondary schooling, but like in rural areas, household welfare is also an important determinant of secondary school enrollment in urban areas. We do not uncover any important impact of cost of schooling on secondary school enrollment.

Analysis of grade attainment show results that are robust with regression results for primary school enrollment. Parental education and maternal employment are important, more so in rural areas. The gender differentiated impacts of family composition variables, distance to source of water and to schools imply importance of household time allocation factors on girls' schooling opportunities and outcomes. Thus girls may have to stay home to look after younger siblings or have increased time constraints doing household chores such as fetching water as their male siblings concentrate on schooling.

Policy simulation results indicate that there are regional differentials in responsiveness of demand for schooling to various policy changes, and thus the need for different policies in terms of regional targeting. However, attainment is less responsive to all policy changes than enrollment, implying that the most critical factor in schooling may be entry into school, but upon entry, the grade attainment may not be so much policy driven. Attainment may depend much more on child cognitive ability and other factors not directly related to policy. Demand for schooling is more responsive to policy changes in rural than in urban areas. The most important policy options for rural areas include reducing distance to source of water, reducing pupil/teacher ratio, increasing the number of middle grade teachers per capita and improving performance in school. For urban areas, our results call for policies towards reduction of poverty levels, reducing distance to school, increasing the number of all teachers per capita and reducing the cost of education.

In terms of the distributional impact of these policy changes, enrollment for the lowest quintile is most responsive to cost of schooling, number of teachers per capita and distance to school. In particular, cost of schooling is significantly more important for this quintile, compared to all other quintiles, implying that resource constraint is a major deterrent to primary school enrollment. The second and third quintiles are almost as responsive, especially to school quality measures, which do not seem to matter much for the rich.

Our results have important implications for alleviation of non-monetary indicators of poverty along the goals of the Economic Recovery Strategies (ERS) and the Millennium Development Goals (MDG). In particular, one of the MDGs' goals is to achieve universal education, including full primary schooling for all children by 2015. The MDGs further aim at raising net enrollment and completion rates for grades 1 to 5, as well as increased literacy rates for the 15 to 24 year olds. On the other hand, the ERS identify lack of education and poor enrollment as key development issues. With the introduction of free primary education, policy needs to focus on completion rates in primary school as well as enrollment and completion rates in post primary education if the ERS and MDG goals are to be realized.

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## Appendix

Table A1: Sample Statistics; All Children aged 6-15 yrs by gender

Variable	Boys		Girls	
	Mean	Std. Dev.	Mean	Std. Dev
<b><i>Child Characteristics</i></b>				
Child enrolled in school	0.92	0.28	0.90	0.30
Age of child in years	11.43	3.68	11.48	3.71
Child of Household Head	0.88	0.32	0.86	0.35
<b><i>Household characteristics</i></b>				
Age of Household Head	45.73	11.62	44.87	11.90
Mothers education	5.13	5.35	5.39	5.36
Father's education	5.41	6.04	5.46	6.12
Father is employed	0.42	0.49	0.39	0.49
Mother is employed	0.56	0.50	0.56	0.50
Number of children aged < 5	0.82	0.94	0.88	0.96
Number of children aged 6-12	2.20	1.28	2.18	1.31
Number of children aged 13-17	1.32	1.03	1.25	1.04
Number of females aged > 14	1.65	0.96	1.87	1.03
Number of adults aged 18-65	2.55	1.32	2.52	1.30
Number of adults aged >65	0.09	0.32	0.09	0.31
Gender of child & father's education	5.33	6.03	4.56	6.73
Gender of child & mother's education	1.28	3.43	2.73	7.09
Children aged < 5 & females aged >14	1.43	2.24	1.64	2.36
<b><i>Indicators of Household Welfare</i></b>				
Number of rooms in house	2.76	1.33	2.71	1.35
Poverty status of the household	0.57	0.50	0.57	0.50
Material of the wall	1.91	1.41	1.94	1.46
Total land managed by household	21.94	131.72	28.75	154.87
Own dwelling house	0.88	0.33	0.85	0.35
<b><i>Community Characteristics</i></b>				
Time taken to nearest primary school	3.17	1.29	3.11	1.29
Time taken to fetch water	2.39	1.51	2.35	1.52
Pupil teacher ratio	30.92	3.83	30.98	3.79
Mean KCPE scores	350.49	21.33	350.58	20.84
Number of teachers S1	434.85	234.35	437.00	234.09
Number of teachers P1	3380.33	1378.95	3354.08	1366.60
Number of teachers P2 & P3	1033.98	460.97	1013.68	461.20
Monthly cost of sending a child to school	89.64	472.79	92.14	503.34
Number of observations	10173		9945	



Table A2: Marginal Effects for Primary School Enrollment by Region and Gender

Variable	Full sample	Rural	Urban	Boys	Girls
<b><i>Child Characteristics</i></b>					
Age	0.736	0.693	1.171	0.723	0.749
Age Squared	-0.031	-0.028	-0.053	-0.030	-0.031
Gender	0.006*	0.002*	0.063		
Child of Household Head	0.117	0.089	0.430	0.071	0.155
<b><i>Household characteristics</i></b>					
Age of Household Head	0.003	0.003	-0.0004*	0.001	0.005
Mothers education	0.003	0.004	0.002*	0.002*	0.002*
Father's education	0.005	0.005	0.004*	0.012	0.008
Number of children aged 13-17	-0.019	-0.024	0.019*	-0.023	-0.019
Father is employed	-0.008*	-0.007*	-0.016*	0.024	-0.038
Mother is employed	0.056	0.064	0.040*	0.052	0.063
Number of adults aged 18-65	-0.010	-0.012	0.018*	-0.005*	-0.016
Number of adults aged >65	-0.030	-0.049	0.247	-0.015*	-0.052
Gender of child & father's education	0.004	0.005	-0.006	-0.004*	0.005
Gender of child & mother's education	0.007	0.006	0.004*	0.012	0.006
Children	-0.001*	-0.003*	0.049	-0.002*	-0.001*
Number of children aged < 5	-0.018	-0.013*	-0.122	-0.016*	-0.018*
Number of children aged 6-12	-0.002*	-0.001*	-0.006*	-0.003*	-0.002*
Number of females aged > 14	0.014	0.019	-0.042*	0.028	0.003*
<b><i>Indicators of Household Welfare</i></b>					
Number of rooms in house	0.028	0.032	0.004*	0.027	0.029
Poverty status of the household	-0.025	-0.026	-0.032*	-0.006*	-0.043
Material of the wall	0.006	0.008	-0.015*	0.005*	0.006*
Total land managed by household	0.0001*	0.00004*	0.0002*	0.00002*	0.000*
Own dwelling house	0.061	0.092	0.031*	0.041	0.085
<b><i>Community Characteristics</i></b>					
Time taken to nearest primary school	-0.016	-0.016	-0.030	-0.023	-0.007*
Time taken to fetch water	-0.008	-0.007	0.024*	-0.011	-0.006*
Pupil teacher ratio	-0.001*	-0.002	0.003*	0.0004*	-0.003*
KCPE scores	0.002	0.002	0.003	0.002	0.002
Number of teachers S1	-0.016*	-0.002*	0.180*	0.004*	-0.037*
Number of teachers P1	0.045	0.069	-0.045*	0.047	0.044
Number of teachers P2 & P3	-0.080	-0.166	0.162	-0.103	-0.058
Monthly cost of sending a child to school	-0.043	-0.058	-0.030	-0.052	-0.036

\*Not statistically significant

Table A3: Marginal Effects for Secondary School Enrollment by Region and Gender

Variable	Full Sample	Rural	Urban	Boys	Girls
<i>Child Characteristics</i>					
Age	0.435	0.230	2.355	0.407	0.377
Age Squared	-0.012	-0.006	-0.069	-0.011	-0.010
Gender	0.010	-0.002*	0.154		
Child of Household Head	0.049	0.030	0.176	0.018	0.060
<i>Household characteristics</i>					
Age of Household Head	0.001	0.001	0.005	0.0003*	0.001
Father is employed	-0.016	-0.011	-0.029*	-0.021	-0.005*
Mother is employed	-0.004*	-0.001*	-0.023*	-0.004*	-0.003*
Mothers education	0.003	0.002	0.005*	0.002	0.003
Father's education	0.003	0.001	0.018	0.0004*	0.003
Number of children aged < 5	-0.012	-0.006*	-0.073	-0.009*	-0.022
Number of children aged 13-17	0.003*	-0.001*	0.039	-0.007	0.009
Number of children aged 6-12	-0.003*	0.001*	-0.015*	0.0001*	-0.003*
Number of females aged > 14	0.006	0.006	-0.026*	-0.003*	0.004*
Number of adults aged 18-65	-0.006	-0.010	0.018*	-0.004*	-0.006
Number of adults aged >65	-0.015*	-0.015	-0.363*	-0.021*	-0.006*
Gender of child & father's education	0.001	0.001	-0.001*	0.003	0.0004*
Gender of child & mother's education	0.001	0.000*	0.011	0.002	0.001*
Child aged < 5 & females aged >14	-0.002*	-0.003*	0.021*	-0.001*	0.001*
<i>Indicators of Household Welfare</i>					
number of rooms in house	0.014	0.008	0.049	0.016	0.009
poverty status of the household	-0.034	-0.007	-0.182	-0.012	-0.035
material of the wall	0.001*	0.003	-0.031	0.0004*	0.001*
Total land managed by household	-0.0002*	-0.0001*	-0.0002*	0.000*	-0.0001*
Own dwelling house	-0.049	0.003*	-0.083	-0.058	-0.038
<i>Community Characteristics</i>					
Time taken to nearest sec. school	-0.006	-0.006	0.029	-0.005	-0.005
Time taken to fetch water	-0.001*	0.001*	-0.005*	0.0004*	-0.001*
Monthly cost of sending a child to school	0.016	0.058	0.007*	0.061	0.008
Trained teacher/student ratio	0.003	0.003	-0.013*	0.002*	0.003
Number of graduate teachers	0.035	0.034	-0.087*	-0.004*	0.065
Number of S1 and Diploma teachers	-0.049	-0.051	0.349*	0.022*	-0.095
Other teachers (Number)	0.011*	0.011*	0.052*	0.035*	-0.014*

\*Not statistically significant

Table A4: Ordered Probit Results for Grade Attainment by Region (No Dummies for number of Children)

Variable	Full Sample		Rural Sample		Urban Sample	
	Coeff.	Z-value	Coeff.	Z-value	Coeff.	Z-value
<b><i>Child Characteristics</i></b>						
Age	0.884	47.98***	0.840	43.39***	1.454	21.45***
Age Squared	-0.017	-23.3***	-0.016	-20.41***	-0.033	-12.71***
Gender	-0.064	-4.08***	-0.080	-4.83***	0.072	1.3
Child of Household Head	0.208	8.3***	0.192	7.14***	0.629	7.37***
<b><i>Household characteristics</i></b>						
Age of Household Head	0.013	13.35***	0.012	11.88***	0.018	4.78***
Mothers education	0.016	8.25***	0.014	6.66***	0.015	2.79***
Father's education	0.023	11.66***	0.020	9.39***	0.030	5.43***
Father is employed	-0.004	-0.25	0.040	2.11**	-0.227	-3.93***
Mother is employed	0.071	4.36***	0.074	4.26***	0.086	1.58*
Number of adults aged 18-65	-0.037	-5.44***	-0.040	-5.62***	-0.045	-1.83**
Number of adults aged >65	-0.057	-1.87**	-0.059	-1.91**	0.428	1.87**
Gender of child & father's education	0.003	2.03**	0.002	1.15	0.001	0.21
Gender of child & mother's education	0.021	11.27***	0.020	9.88***	0.024	4.95***
<b><i>Indicators of Household Welfare</i></b>						
Number of rooms in house	0.094	14.46***	0.094	13.45***	0.077	3.64***
Poverty status of the household	-0.197	-12.01***	-0.198	-11.41***	-0.335	-5.68***
Material of the wall	0.039	6.78***	0.050	8.06***	-0.062	-3.52***
Total land managed by household	0.000	0.82	0.0001	1.34	0.000	-0.6
Own dwelling house	-0.249	-9.49***	-0.044	-1.11	0.035	0.49
<b><i>Community Characteristics</i></b>						
Time taken to nearest primary school	-0.013	-2.07**	-0.008	-1.26	-0.001	-0.04
Time taken to fetch water	-0.017	-3.02***	-0.008	-1.42	-0.071	-2.12**
Pupil teacher ratio	0.003	1.26	0.004	1.74*	0.000	0.04
KCPE scores	0.002	5.66***	0.003	6.13***	0.002	1.13
Number of teachers S1	0.398	7.77***	0.386	7.23***	-0.222	-0.8
Number of teachers P1	0.013	1.19	0.032	2.61***	0.034	0.64
Number of teachers P2 & P3	-0.154	-5.87***	-0.184	-5.71***	-0.182	-2.08**
Monthly cost of sending a child to school	0.068	4.39***	0.106	2.51***	0.028	1.48
Number of Observations	17975		16127		1848	
Lr chi2(31)	23917.6***		20499.3***		3485.61***	
Log Likelihood	-30873.3		-27833		-2812.67	

\*, \*\*, \*\*\*, significant at 10%, 5% and 1% levels respectively

Table A5: Ordered Probit Results for Grade Attainment by Gender (No Dummies for number of Children)

Variable	Boys		Girls	
	Coeff.	Z-value	Coeff.	Z-value
<b><i>Child Characteristics</i></b>				
Age	0.892	34.29***	0.874	33.36***
Age Squared	-0.018	-16.82***	-0.017	-15.82***
Child of Household Head	0.102	2.73***	0.289	8.41***
<b><i>Household characteristics</i></b>				
Age of Household Head	0.013	9.42***	0.013	9.55***
Mothers education	0.017	5.56***	0.010	3.64***
Father's education	0.003	0.28	0.027	10.21***
Father is employed	0.013	0.52	0.001	0.02
Mother is employed	0.088	3.8***	0.054	2.31*
Number of adults aged 18-65	-0.037	-3.95***	-0.033	-3.36***
Number of adults aged >65	-0.109	-2.56***	-0.004	-0.1
Gender of child & father's education	0.025	2.27**	0.002	1.04
Gender of child & mother's education	0.037	7.92***	0.021	9.61***
<b><i>Indicators of Household Welfare</i></b>				
Number of rooms in house	0.108	11.7***	0.076	8.28***
Poverty status of the household	-0.202	-8.75***	-0.188	-8.01***
Material of the wall	0.030	3.64***	0.048	5.91***
Total land managed by household	0.0002	2**	0.000	-0.52
Own dwelling house	-0.316	-8.35***	-0.182	-4.96***
<b><i>Community Characteristics</i></b>				
Time taken to nearest primary school	-0.009	-1.04	-0.018	-1.93
Time taken to fetch water	-0.014	-1.81*	-0.019	-2.44***
Pupil teacher ratio	0.005	1.6	-0.0002	-0.07
KCPE scores	0.002	3.78***	0.002	4.12***
Number of teachers S1	0.254	3.52***	0.547	7.48***
Number of teachers P1	0.027	1.72*	-0.001	-0.07
Number of teachers P2 & P3	-0.143	-3.88***	-0.169	-4.53***
Monthly cost of sending a child to school	0.043	1.94**	0.090	4.17***
Number of Observations	9127		8848	
Lr chi2(25)	12084.04***		11913.84***	
Log likelihood	-15716.1		-15103.6	

\*, \*\*, \*\*\*, significant at 10%, 5% and 1% levels respectively