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Access to Schooling and Staying in School in Sub-Saharan Africa

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Abstract

This study jointly investigates factors driving the processes of accessing and staying in school in sub-Saharan Africa. We explicitly account for the fact that staying in school or its converse, dropping out, is observed only among children who ever attend school. We use data from Demographic and Health Surveys from 12 countries. We find that access to school is typically lower for females, rural youth, and those from poorer households. Conditional on having ever attended school, these factors, as well as age in grade – an indicator of performance in school – typically help account for staying in school. We also find that, keeping girls at school is very sensitive to school performance: girls with comparatively weak performance in school are more likely than their male counterparts to drop out of school, while girls who do relatively well in school are more likely to remain in school than boys, other things equal.

Key words: Access to education, school dropout, sub-Saharan Africa, school delay

JEL classifications: I2; I21; I24; I25; O15

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1. Introduction

In sub-Saharan Africa, where schooling and educational attainment are especially low from a global perspective (Barro and Lee, 2013), efforts to promote universal primary education, one of the Millennium Development Goals, have contributed to increased school enrollment rates of youth in recent years (UNESCO, 2012). However, these efforts have fallen short, particularly among rural youth, girls, and those from economically disadvantaged households (e.g., see Kazeem et al., 2010; Mabika and Shapiro, 2012). UNESCO (2012) has recently estimated that 42 percent of school children in sub-Saharan Africa will drop out before the end of primary education. But in addition to school dropouts, the failure to achieve universal primary education may be attributed as well to limited access to schools, as reflected in failure to ever enroll in school.

That is, studies that look at school enrollment or dropout rates and the factors – like economic well-being, gender, and place of residence among others – associated with those rates are in effect examining the outcomes of two distinct processes. Most youth in the region enroll in school at some point, but there are substantial numbers of youth who do not. The frequency of this phenomenon varies across countries and is typically linked to characteristics of the children, the households in which they reside, and a number of other factors such as the proximity of schools. Hence, children enrolled in school and children who eventually drop out of school are not representative of all school-age children; they are a selected sample of all children, namely a sample of children who ever attended school.

Once enrolled in school, children seek to progress to completion of primary school. But since school enrollees are a selected sample of all children, studies that look at their dropping-out behavior (e.g., Sibanda, 2004; Huisman and Smits, 2012) or its converse, retention in school, that do not take this selection into account may suffer from sample selection bias. This paper addresses this selection bias issue by jointly examining both access to school and staying in school in a sample of 12 countries in sub-Saharan Africa. We use maximum likelihood to jointly examine whether children have ever been in school and then, conditional on having been enrolled in school, whether they remain in school. This methodology allows us to address the sample selection bias issue that has been ignored in previous work (e.g., Sibanda, 2004; Huisman and Smits, 2012). In analyzing whether children remain in school, we take into consideration the relationship between a child's age and grade in school. Deviations of age from the norm, given a child's grade and the prescribed age for starting school, have been found to be widespread in sub-Saharan Africa (Lewin, 2009; UNESCO, 2012), and Hunt (2008), Lewin (2009), and Sabates et al. (2010) suggest that over-age children in particular are more likely to drop out of school, other things equal. However, they do not provide empirical evidence on that point and it seems likely the sample selection bias issue was not taken into account in reaching the conclusion. In this paper then, we first take into consideration whether a child has ever attended school as a prelude to examining retention in school. This allows us to examine if, conditional on ever attending school, irregularities in the relationship between age and grade – reflecting delayed entry and /or grade repetition indeed increase the likelihood of dropping out of school. In addition, reflecting a suggestion by Tenikue (2010), we also test the hypothesis that there is a greater penalty for such irregularities for females.

We use data from the Demographic and Health Surveys (DHS), with our sample consisting of surveys conducted since 2005 that included information on children's progress in school between the year prior to the survey and the survey year. Our analyses focus on three factors associated with ever-enrolling in school and on remaining in school once enrolled: gender, economic well-being and place of residence. For remaining in school, we also take account of two measures of age-grade deviation. In addition, we also control for other factor that have been found to be relevant to school enrollment and dropping out including age, relationship to household head, number of other children and education of household head.

The following section provides a brief literature review that examines relevant recent work on children's schooling in sub-Saharan Africa. We then provide a descriptive overview of the data we use. This is followed by a discussion of our empirical framework and measurement. Results of estimation of the bivariate probit models with sample selection that analyze factors associated with both ever attending school and with being enrolled in school given that the child has been enrolled previously are then presented. The final section of the paper discusses our findings and their implications.

2. Literature review

While educational attainment in sub-Saharan Africa is comparatively low from a global perspective, the long-term trend has been upward, as elsewhere in the developing world (Schultz, 1993; Barro and Lee, 2013). Lloyd and Hewett (2003) documented increased school enrollments in the region, and with the stimulus of the Millennium Development Goals, it appears that the trend is continuing (UNESCO, 2012). As more children gain access to school, there has been increased interest in children's progress in school and dropping out (see, e.g., Patrinos and Psacharopoulus, 1997; Sibanda, 2004; Glick and Sahn, 2010; and Huisman and Smits, 2012). Both individual and household characteristics are typically taken into consideration, with gender differences, as well as differences by wealth or economic well-being and by place of residence having received considerable attention in the literature.

Lewin (2009), in his review of access to education in sub-Saharan Africa, provides what he describes as "an expanded vision of access." He identifies "admission and progression on schedule for age in grade, regular attendance, achievement related to national curricula norms, appropriate access to post-primary opportunities, and more equal opportunities to learn" (2009, p. 154) as the elements of this expanded vision. Our data do not allow us to examine the last four components, but we do look at the first two elements, focusing on whether children have ever been enrolled (this is what we treat as access, and hence ours is a much more limited definition of access than Lewin's) and also on age in grade.

The issue of age in grade is a widespread one in sub-Saharan Africa. While the prescribed age for starting primary school is typically 6 or 7 years old, it is often the case that youth in the region begin school at distinctly higher ages. It is common to find that school enrollment rates increase with age from age 6 up to a maximum at age 11 or so, before subsequently declining as a consequence of school dropouts. Grant and Behrman (2010), in their study of nearly 40 countries in six regions, mention that delayed school entry is a significant problem in sub-Saharan Africa, with a non-trivial number of children beginning school after age 10.

Delayed entry to school is more common in rural areas and also among those youth, rural and urban, from families of lower economic well-being (Mabika and Shapiro, 2012). And this delayed entry is one factor contributing to children being older than they should be for their grade in school.

A second factor that contributes to children having a high age in grade is grade repetition. Students in sub-Saharan Africa experience comparatively high levels of grade repetition (UNESCO, 2012), especially at the outset of primary school. This means that even after allowing for delayed entry, grade repetition will result in children of different ages being in the same grade. The combined effects of delayed entry and grade repetition contribute, then, to high proportions of children being distinctly older than they would be if they started school at the prescribed age and progressed through school without repetition.

Lewin (2009), for example, shows evidence suggesting that for many countries in the region there is a substantial range of ages of children enrolled in a given grade. For example, he notes that in Ghana, children in the first grade range from ages 4 to 11, and in grade 6 the range is 9 to 16 years. He argues that one consequence of this substantial variation in ages within a single grade is that the chances of failure and dropout will be higher for those who are over-age for their grade. He contends that these outcomes will reflect both differences in cognitive development that are exacerbated by the wide age range of students in a given class and also the likelihood that delayed entry will be associated with disadvantages such as poverty and poor health and nutritional status.

Low incomes at the microeconomic level and poor economic performance at the macroeconomic level are among the factors that constrain children's participation in school (Rebouha and Pochet, 2011). There is considerable evidence that in developing countries, family economic well-being is a key determinant of children's access to and progress in school (e.g., see Schultz, 1993; Knodel and Jones, 1996; Lloyd and Blanc, 1996; Kaboré and Pilon, 2003; Lloyd and Hewett, 2003; Huisman and Smits, 2009; Glick and Sahn, 2010; Kazeem et al., 2010; Mabika and Shapiro, 2012). For children who have entered school, Sibanda (2004), Glick and Sahn (2010), and Huisman and Smits (2012) all find that those from economically better-off households are significantly less likely to drop out of school. This suggests, then, that greater family economic well-being will be associated with a higher likelihood that a child will enter school and do so without a delay, and also a lower likelihood of a child dropping out of school, other things equal.

In many developing-countries settings there are distinct gender differences in favor of boys in the school enrollment of youth (e.g., see Proteau, 1998; Glick and Sahn, 2000; Huisman and Smits, 2009; Kazeem et al., 2010). This suggests that other things equal, girls may be less likely to enter school and, given entry, more likely to drop out of school than boys. However, Grant and Behrman (2010) have shown that while there is indeed a greater likelihood that boys will ever be enrolled in school, gender differences in grade progression and school dropout favor girls.

In addition, it is worth noting that Lloyd and Hewett (2003) present evidence suggesting that the gender gap in primary education in sub-Saharan Africa has diminished considerably over time, reflecting growth in school enrollment rates of girls in conjunction with stagnation of enrollment rates of boys. Lloyd and Hewett echo an argument made earlier by Knodel and Jones (1996), suggesting that differences by economic well-being in access to and participation in schooling have become more important than differences by gender. Lewin (2009) also makes this observation.

Further, enrollment differences by place of residence are often evident in developing countries, with urban youth typically having greater access to school and higher school enrollment rates than their rural counterparts (Ersado, 2005; Lewin, 2009; Mabika and Shapiro, 2012). This suggests that entry to school will be less likely and dropping out of school will be more likely among rural youth than urban youth, other things equal.

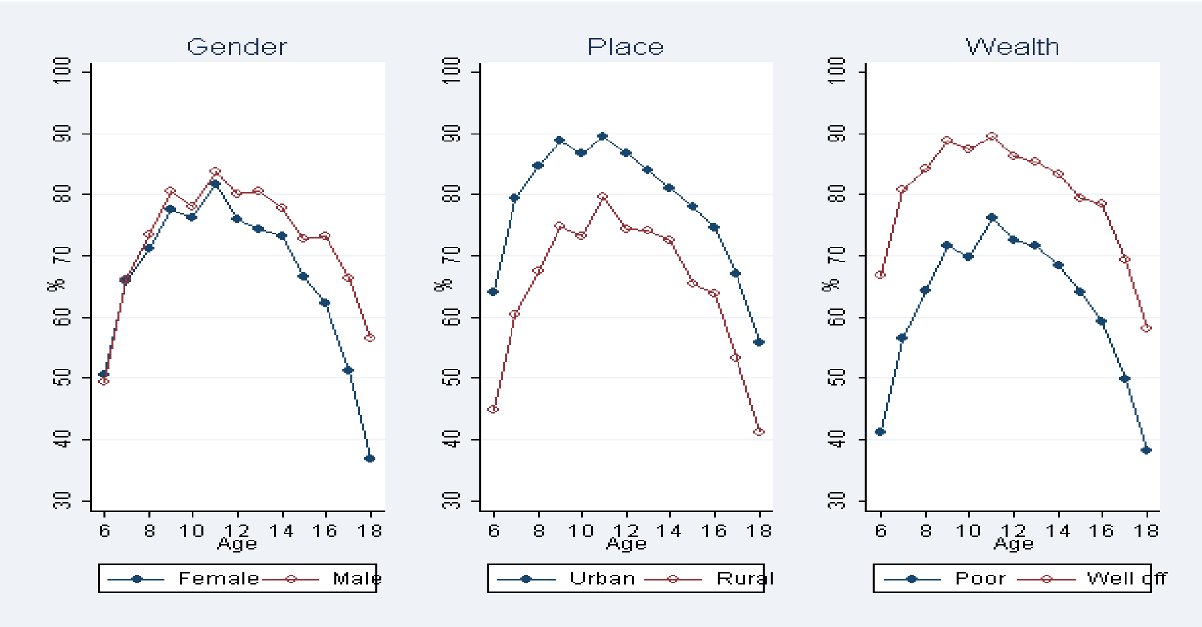
A number of other factors have also been found to be significantly related to children's school enrollment and dropping out behavior. In our analysis, we take into consideration, a child's relationship to the head of the household (reflecting the prevalence of child fostering in Sub-Saharan Africa), and the education of the head of the household (Chernichovsky, 1985; Parrish and Willis, 1993; Sibanda, 2004. Akresh et al. 2012; Mabika and Shapiro, 2012; Huisman and Smits, 2012; Glick and Sahn, 2010).

3. Descriptive overview: Enrollment and never attended

As noted above, we use data from a dozen Demographic and Health Surveys that have been carried out in recent years. The countries included in our data set are Benin, Cameroon, the Democratic Republic of the Congo, Ghana, Guinea, Kenya, Malawi, Namibia, Niger, Senegal, Sierra Leone, and Zambia (Table A1 in appendix). In this section we take a look at information on school enrollment and on the most basic aspect of access to school, whether children have ever been enrolled in school. We begin with an analysis of the pooled data set for all of the countries.

Figure 1 shows enrollment rates for youth aged 6-18 by gender, place of residence and economic well-being. For five of these countries the prescribed age for entry to primary school is 7 while for the remainder it is 6; hence, the rates for age 6 are especially low. Overall, however, it is clear that many children do not begin school at the prescribed starting age. Enrollment rates rise up to age 11, where they reach a maximum at just over 80 percent. So delayed enrollment, well beyond the prescribed ages for beginning school of 6 or 7, is clearly widespread. In addition, as shown in the first panel, for ages 6-11 there are quite modest differences by gender. Subsequently, however, the gender gap widens, first slightly and then more substantially. Between delayed entry and grade repetition, it is not uncommon for youth age 15 who are still in school to be completing primary school (among all those aged 15 in our sample who have been to school, the median grade is the 6th grade). Hence, the widening of the gender gap in enrollment rates roughly corresponds to the transition from primary to secondary school.

Figure 1: Enrollment rates by age.



Enrollment rates by place of residence are shown in the second panel. The advantage of urban youth is evident, and the gap is largest at the earliest ages, highlighting the greater prevalence of delayed enrollment in rural areas. Maximum enrollment in urban places is 90 percent, compared to just under 80 percent in rural places. Beyond peak enrollment, the gap in enrollment remains fairly stable as age increases.

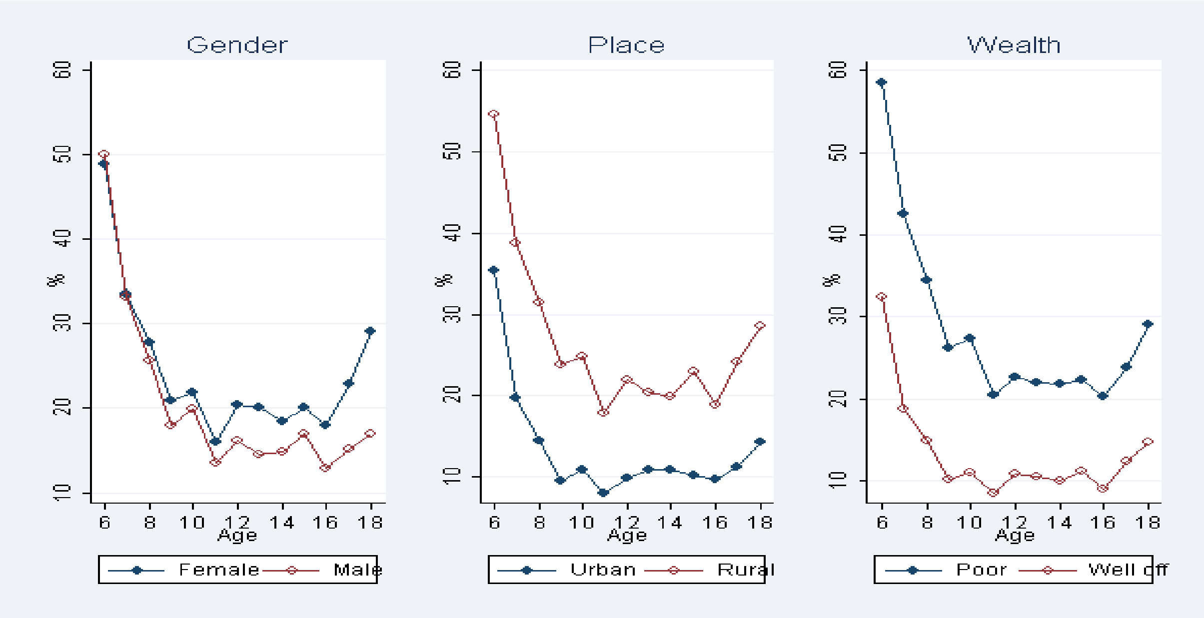
The third panel of Figure 1 shows enrollment rates according to economic well-being. We created an economic index based on household ownership of consumer durable goods (Filmer and Pritchett, 1999). Values of the index range from 0 to 6. The figure graphs the rates for children from households with an index value of 0 (poor), representing almost 24 percent of all households, along with the rates for those with index values of 3 to 6 (well-off), corresponding to the top 21 percent of households. The poor group reaches a maximum at 75 percent, while the maximum for the well-off group is nearly 90 percent. The gaps are especially large prior to peak enrollment at age 11, indicative of a greater tendency to delay enrollment for children from households of low economic well-being. In addition, note that enrollment gaps by economic well-being indeed are distinctly larger than the gender gaps, and they are also larger than the gaps by place of residence.

The graphs above show the general pattern of enrollment rates by age, and this pattern is common across all of the countries. However, the levels vary considerably. In Kenya, Namibia, Malawi, and Ghana, roughly 80 to 90 percent of youth aged 6-18 are in school, while in Niger, Guinea, and Senegal the enrollment rates for those aged 6-18 are 55 percent and below (especially low, at 31 percent, for Niger). Differences by gender, place of residence, and economic well-being likewise vary across countries. For example, the four high-enrollment countries plus Senegal all have gender equality or very close to it in enrollment rates, with Namibia actually having higher enrollment rates for girls than boys.

Rural-urban differences in enrollment rates are quite modest in Kenya and Namibia, but quite large in Guinea, Niger, Senegal, and Sierra Leone. And differences between those at the higher end of the economic index and those at the bottom are only five percentage points for Ghana but over 30 percentage points in Niger, the DRC, and Guinea. With the notable exception of gender differences in Senegal, then, it appears that differences in enrollment rates by country in these three dimensions tend to be larger among those countries with lower overall enrollment rates.

We turn now to an examination of data on access to school, as reflected in the percentage of youth who have never attended school, by age, for youth aged 6-18. Figure 2 shows the data separately for males and females, by place of residence and by economic well-being.

Figure 2: Never-attended rates by age



The pattern highlights the phenomenon of delayed entry to school, as the percentage never attended declines sharply up to age 9 and reaches a minimum at age 11. Gender differences are modest up through age 11, widen somewhat up through age 16 and then widen substantially for ages 17 and 18. That last widening is suggestive of efforts to reduce gender discrimination in access to school over the past decade. Over all, it appears that at least about 15 percent of school-age youth never attend school.

Differences by place of residence highlight that access to school is distinctly lower in rural places than in urban places. The differences are widest at the youngest ages, indicating that delayed entry is especially prevalent among rural youth. The gap narrows somewhat with age, but over all, it appears that roughly 20 percent of rural youth never attend school as compared to about 10 percent of urban children.

Data on youth never enrolled in school by economic well-being, as in Figure 2, contrasts the bottom and top groups of our economic index based on ownership of consumer durables. As compared to differences in never-attended by gender or place of residence, here we see the largest gaps between the two groups being considered. The gaps are greatest at the youngest ages and decline to age 11 before once again increasing at age 18.

In sum, then, we see differences in access to school across all three dimensions – gender, place of residence, and economic well-being – but as discussed in the literature review, those differences are greatest by economic well-being and smallest by gender.

As was the case with enrollment rates, there is considerable variation across countries in the levels of youth who have never attended school. In view of the pattern of delayed entry to school, we limited the age range to those aged 10-18 for the analyses by country. Over all, Kenya, Namibia, Malawi, and Zambia had fewer than five percent of those aged 10-18 who had never attended school, while for Niger, Guinea, and Senegal the corresponding figures were 35 percent and above. The same four countries with the highest enrollment rates along with Zambia and Senegal had only small gender differences in never attended, while Niger, Guinea, and Benin had large gender differences. Urban-rural differences in never attended were less than five percentage points for Kenya, Malawi, Namibia, and Zambia, and were 30 or more percentage points for Niger, Guinea, and Senegal. And differences by economic well-being were quite modest in Ghana, Malawi, and Namibia while being substantial in Niger, Guinea, Sierra Leone, and Senegal. As with enrollment rates, then, there is considerable variation across countries in the percentages of youth who never attended school and differentials in these percentages by gender, place of residence, and economic well-being.

4. Empirical framework

We consider the index functions Y_1^* and Y_2^* corresponding to the discrete choices (1) ever attend school and (2) attending school the year of the survey. The observed outcomes Y_1 and Y_2 are defined as follows:

$$Everattend_i \equiv \begin{cases} Y_{1i}^* = X_{1i}'\beta_1 + u_{1i} \\ Y_{1i} = 1 \ \ if Y_{1i}^* > 0 \\ Y_{1i} = 0 \quad otherwise \end{cases}$$

The variable "Attending", which indicates whether the child was enrolled at school the year of the survey, is defined only for children who have ever attended school.

$$Attending_i \equiv \begin{cases} Y_{2i}^* = X_{2i}'\beta_2 + u_{2i} \\ Y_{2i} = 1 \ \ if Y_{2i}^* > 0 \\ Y_{2i} = 0 \quad otherwise \end{cases}$$

There are three types of observations: (Y1=0), (Y1=1, Y2=0) and (Y1=1, Y2=1). The corresponding probabilities are:

$$\begin{cases} Y_1 = 0: & Prob(Y_1=0/X_1,X_2) & =P1 & = \Phi_1(-X'_1\beta_1) \\ Y_1 = 1, Y_2 = 0: & Prob(Y_1=1,Y_2=0/X_1,X_2) & =P2 & = \Phi_2(X'_1\beta_1,-X'_2\beta_2,-\rho) \\ Y_1 = 1, Y_2 = 1: & Prob(Y_1=1,Y_2=1/X_1,X_2) & =P3 & =\Phi_2(X'_1\beta_1,X'_2\beta_2,\rho) \end{cases}$$

where corr(u1, u2)= ρ, $\Phi_1$is the CDF of the univariate normal distribution function and Φ_2 is the CDF of the bivariate normal distribution function.

Thus the likelihood function estimated is written as:

$$\text{Log L} = \sum_{i=1}^{n}\left[(1-y_{i1})\log(P1) + y_{i1}(1-y_{i2})\log(P2) + y_{i1}y_{i2}\log(P3)\right]$$

Parameters are estimated by maximum likelihood.

Measurement

This paper uses two constructed variables. The first one is the educational z-score. It compares the number of completed grades of a given child to the average school attainment of children of his age. For a child of “a” years old and indexed by i, it is defined as:

$$zscore_{ia} = \frac{\text{Education}_{ia} - \mu_a}{\sigma_a}$$

where Education_{ia} is the number of completed grades of child i aged a years, μ_a (σ_a) is the average number (standard deviation) of completed grades of children aged a years.

The second constructed variable is a dummy variable that indicates whether a child displays a delay in his schooling course. It compares, for a given child, his actual number of completed grades to his theoretical number of grades. The theoretical number of grades is computed on the assumption that he enters school at the official school entry age (6 or 7 years old in our case) and advances one grade per year. If the difference between the theoretical and the actual number of completed grades (theoretical - actual) is greater than two, then the child has a school delay. Such delays may be caused by late entry to school and/or by grade repetition.

Two other important variables are used in this study. The first is “everattend.” It is a dummy variable that indicates whether a child (aged 10 to 18 years) has ever been at school at any point in time. It takes the value 1 in such a case and the value 0 otherwise. The second variable is “attending.” It is a dummy variable that indicates whether a child was enrolled at school the year of the survey. This variable is defined only for children who have ever attended school.

Table 1 shows mean values of the z-score and the delay variable for children who have ever attended school, by gender, place of residence, and economic well-being. Note that higher z-scores correspond to better progress in school. Conversely, children who are over-age for their grade, and more so than others of their age, will have lower z-scores. In effect, then, the z-score is a relative inverse measure of children being over-age. The delay variable, by contrast is an absolute measure.

The data in the table indicate that progress in school is somewhat higher for females than for males, consistent with the finding of Grant and Behrman (2010) that, conditional on having ever attended school, girls do better than boys in progressing through school. The mean z-score for urban children is substantially higher than that for rural children. The greater tendency for rural youth to delay school enrollment undoubtedly is a key contributing factor here. Finally, it is clear that greater economic well-being is associated with higher z-scores. Delayed enrolment is relevant here; in addition, economic well-being has been found to contribute to better progress in school (Glick and Sahn, 2010). As with place of residence, the differences are substantial.

Table 1. Means of variables by gender, place of residence, and economic well-being. Youth aged 10-18

Group	Mean of variables			
	Zscore*	Ever-attended (%)	Conditional enrolment (%)	Delay of 2+ years* (%)
Male	-.029	84	90	48
Female	.031	79	86	45
Urban	.329	89	88	35
Rural	-.192	78	88	54
Economic index=0	-.280	77	86	59
Economic index=1	-.129	79	87	51
Economic index=2	.013	84	89	47
Economic index=3 to 6	.409	89	90	30

*The variable is defined only for youth who have ever attended school.

5. Results

The results of our bivariate probit with sample selection analyses of whether children aged 10-18 have ever attended school using the z-score are shown in in Table 2 for each of the 12 countries in our data set. Corresponding results using the delay dummy variable are reported in Table 3. The tables show the estimated coefficients of our key variables of interest: gender, economic well-being (the wealth index), place of residence (urban), the z-score and the delay variable. As already noted, these estimated also controlled for the child's age, and the number of other children in the household in different age groups, as well as the education of the head of the household and the child's relationship to the household head. In brief, coefficient for these control variables broadly confirmed their relevance to access to schooling and continuation in school (full results are available on request).

Consider first the even-numbered columns of coefficients in Table 2, indicating the relationship between gender, economic well-being and place residence with whether a child had ever attended school. Females are significantly less likely than males to have ever attended school in nine of the countries. Malawi and Namibia are the exceptions here: in these two countries, girls are significantly more likely than boys to have ever attended school, other things equal. In Zambia, there is no significant difference. The corresponding results in Table 3 are extremely similar. Again, females are significantly less likely than males to have ever attended school in nine countries while being significantly more likely to have ever attended school in Malawi and Zambia. The only difference is that in Table 3, Senegal, rather Zambia, show no significant gender difference.

Economic well-being of the household is measured with the economic index that counts the number of durable goods owned by the household. In both Table 2 and Table 3, the coefficients of this variable are positive, and in 10 cases significantly so. The coefficients are not significant for Cameroun and Ghana. Overall, then, economically better-off households are clearly more likely to make sure that their children enter school.

In both tables, urban children in nine of the countries are significantly more likely than their rural counterparts to have ever attended school, other things equal. Kenya, Malawi and Namibia are the three countries without a significant advantage to urban youth in ever attending school.

Overall, then, it is apparent that gender, economic well-being and place of residence are important variable with respect to the disadvantage of girls, the poor and rural youth regarding access to school. At the same time, it is apparent that in some countries these inequalities are not present. Indeed, Malawi and Namibia stand out, where access to school of girls exceeds that of boys, and, (as in Kenya as well) urban youth are not advantaged, other things equal, relative their rural counterparts. Also striking is the absence of differences in access to schooling by economic well-being that is evident in Cameroon and Ghana.

The odd-numbered columns of coefficients in Table 2 show the probit equations for enrollment, conditional on having ever attended school. In addition to the variables that were included in the ever-attended equation, we add the z-score, defined above, and an interaction term between the z-score and the female dummy variable. Recall that a higher z-score means that the child in question has relatively high educational attainment, given his or her age. Hence, we anticipated that higher z-scores would be associated with a greater likelihood of the child being enrolled, and this was indeed the case for all countries except Ghana. That is, the z-score coefficients are positive and significant for 11 of the 12 countries; there is a small (in absolute value) and significant negative coefficient for Ghana.

The coefficients in Table 3 show enrollment, conditional on having ever attended school, where the delay variable is substituted for the z-score. Again, this is a dummy variable that identifies children who are over-age for their grade by more than two years. This variable, of course, is inversely related to the z-score, since over-age children will have comparatively low educational attainment given their age. In these estimates, this over-age variable has a negative and significant sign for all 12 countries. Hence, over-age children are indeed more likely to drop out of school, other things equal.

As noted before, we included interaction terms with gender in our estimates, to allow for a possible gender difference in the association between school performance (or school irregularity) and remaining in school. The interaction term between the z-score and female has a positive and significant coefficient for seven of the countries (Cameroon, the DRC, Ghana, Guinea, Malawi, Niger, and Zambia). This phenomenon of a positive coefficient means that among ever-attended girls, those who have comparatively high educational attainment, given their age, are more likely than their male counterparts to still be enrolled in school. A comparable interaction term in the specification with the delay dummy variable yields six significant negative coefficients, for six of the seven countries cited above (Ghana is the exception). This is the flip side of the equations using z-scores: females who are over-age are in these cases significantly more likely than their over-age male counterparts not to be enrolled in school, other things equal. It thus appears that for girls, there is greater sensitivity of enrollment conditional on having ever enrolled in school to the performance in school than for boys.

Greater economic well-being was reflected in significantly higher enrollment rates in Table 2, conditional on having ever attended school, in seven of the countries. This suggests a weaker relationship between economics well-being and remaining in school as compared to access to school. In Table 3, using the delay variable, there are significant and positive coefficient for the wealth index with respect to being enrolled in school for nine countries.

Coefficient for the place of residence (urban) with respect to remaining in school contrast with those for access to school. While urban youth were clearly more likely to ever attend, other things equal, the results in both tables indicates that, conditional on having ever attended school, urban youth are less likely to be enrolled. In Table 2, eleven of the coefficients (the exception is Sierra Leone) are negative and seven of them are significant. In Table 3, ten of the coefficients are negative and six of them are significant. The results were unexpected in the African context but can be related to the presence an attractiveness of small businesses in urban areas (Fafchamps and Wahba, 2006).

Robustness check

The main result of the paper is that, conditional on ever-attended school, a youth who displays some irregularities (late entry or grade repeating) in his schooling features a higher risk of dropping out of school. This risk is reinforced for females. This result is obtained from the estimation of a nonlinear model by maximum likelihood. As a robustness check, we turn to a linear probability model. The use of a linear probability model allows us, given that in some cases multiple children belong to the same household, to control for household unobserved heterogeneity. We estimate a Heckman two-step model. The first step is a selection equation (ever attended school) and the second step is the school enrollment equation estimated with a household fixed effect. Results are presented in the appendix Table A2. They show that, after controlling for household unobserved heterogeneity, our main result is not altered. Females who feature some irregularities face a higher risk of dropping out of school.

6. Conclusion

The objective of this study was to identify factors driving the processes of accessing and staying in school in sub-Saharan Africa. Despite important efforts from national governments and donors, African countries will not achieve the education MDG, which states that all children should attend school and complete primary school. That is, even though access to school in the region has increased in the last decade, it is still not universal; further, a comparatively high proportion of those who do enter school fail to complete primary school. Indeed, maintaining children in school once they have entered remains a serious problem for many countries.

Our literature review highlights the fact that school outcomes (attendance and achievement) depend both on child characteristics (gender, relationship to the household head, age) and household characteristics (economic well-being, head's educational attainment, age composition of other children in the household, and place of residence). But to our knowledge, studies have not jointly modeled both access and staying in school, raising a selection bias issue in examination of staying in school or dropping out. Our analysis addresses this issue. Further, in our examination of staying in school conditional on entering, we include a measure of a child's progress in school (via the z-score) and in alternative specifications, a measure of delay in school.

We use data from recent DHS surveys in 12 countries. Analyses show that school access, while not universal, is quite high. At the same time, delayed entry to school is a major concern: a substantial number of children start school between two and five years after the prescribed starting age. This situation is more common in rural areas and among children from poor households, and should be addressed by development actors.

Our joint multivariate analyses of ever-attending and staying in school largely confirm what is known from previous studies: children from privileged households (in terms of economic well-being, education of the household head, place of residence) or with privileged characteristics (male, child of the household head or close relationship) are more likely to access and stay in school. In addition, however, using the z-score (a measure of ability), we find that higher z-scores are associated with a greater likelihood of staying in school. Conversely, children whose age in grade indicates greater irregularity in their progress in school (delay) are less likely to remain in school. Our results also indicate that these phenomena are more prevalent for girls than for boys.

Taking these results together, it is clear that there remains considerable inequality regarding children' education in sub-Saharan Africa. At the same time, examination of the results for individual countries shows that there are variations across countries in the degree of inequality by gender, economic well-being and place of residence.

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Table 2: Estimated coefficients of bivariate probit model with sample selection, using zscore

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Benin		Cameroon		Congo Dem		Ghana		Guinea		Kenya	
VARIABLES	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended
Zscore	0.99***		0.43***		0.18***		-0.07***		0.35***		0.19***	
	(0.03)		(0.03)		(0.03)		(0.02)		(0.05)		(0.04)	
Zscore * Gender	-0.02		0.16***		0.15***		0.06*		0.20***		-0.00	
	(0.04)		(0.03)		(0.04)		(0.03)		(0.07)		(0.05)	
Gender (Female=1)	-0.19***	-0.43***	-0.22***	-0.33***	-0.21***	-0.39***	-0.05	-0.11***	-0.20*	-0.38***	-0.17***	-0.25***
	(0.06)	(0.02)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.10)	(0.03)	(0.05)	(0.05)
Wealth index	0.02	0.05***	0.02	0.02	0.12***	0.19***	-0.00	0.02	0.06*	0.10***	0.08***	0.42***
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.03)	(0.01)	(0.03)	(0.04)
Urban	-0.10**	0.22***	-0.05	0.42***	-0.06	0.50***	-0.13***	0.34***	-0.04	0.88***	-0.48***	-0.05
	(0.04)	(0.02)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.05)	(0.18)	(0.04)	(0.06)	(0.08)
Constant	2.19***	0.66***	1.86***	0.83***	1.08***	0.65***	1.59***	1.35***	2.06***	-0.05	2.07***	0.91***
	(0.11)	(0.03)	(0.08)	(0.05)	(0.13)	(0.06)	(0.07)	(0.06)	(0.31)	(0.04)	(0.17)	(0.08)
Observations	19,019		15,227		10,233		10,155		8,508		8,416	
athrho	-0.0287		0.123		0.267		-0.0323		-0.0270		0.320	
se_athrho	0.114		0.0814		0.129		0.0686		0.308		0.165	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: The estimated coefficients reported above are from estimates that also controlled for child's age, the number of other children in the household in different age groups, the children's relationship to the head of the household and the household head's level of education.

Table 2 : continued

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Malawi		Namibia		Niger		Senegal		Sierra Leone		Zambia	
VARIABLES	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended	enrolled at survey date	Ever attended
Zscore	0.43***		0.39***		0.43***		0.55***		0.11***		0.14***	
	(0.02)		(0.03)		(0.03)		(0.03)		(0.04)		(0.03)	
Zscore * Gender	0.06**		-0.06		0.16***		0.01		0.02		0.13***	
	(0.03)		(0.04)		(0.05)		(0.03)		(0.05)		(0.04)	
Gender (Female=1)	-0.23***	0.12***	0.00	0.27***	-0.07	-0.38***	-0.12***	-0.04*	-0.27***	-0.14***	-0.31***	-0.08
	(0.03)	(0.03)	(0.05)	(0.05)	(0.07)	(0.03)	(0.04)	(0.02)	(0.05)	(0.03)	(0.04)	(0.05)
Wealth index	0.05***	0.06***	0.07***	0.09***	0.09***	0.17***	-0.04***	0.14***	0.02	0.12***	0.08***	0.09***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)	(0.02)	(0.03)
Urban	-0.18***	0.08	-0.18***	0.04	-0.07	0.77***	-0.18***	0.54***	0.50***	0.66***	-0.18***	0.21***
	(0.04)	(0.06)	(0.05)	(0.06)	(0.12)	(0.03)	(0.04)	(0.03)	(0.12)	(0.04)	(0.05)	(0.06)
Constant	1.92***	1.42***	1.78***	1.14***	1.17***	-0.40***	2.08***	0.10***	1.38***	0.50***	1.69***	0.94***
	(0.06)	(0.05)	(0.13)	(0.08)	(0.23)	(0.03)	(0.05)	(0.03)	(0.30)	(0.04)	(0.20)	(0.09)
Observations	27,456		9,291		10,289		16,650		9,128		8,062	
athrho	0.164		0.268		0.0588		-1.325		0.385		0.201	
se_athrho	0.0556		0.132		0.230		0.0486		0.299		0.196	

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: The estimated coefficients reported above are from estimates that also controlled for child's age, the number of other children in the household in different age groups, the children's relationship to the head of the household and the household head's level of education.

Table 3: Estimated coefficients of bivariate probit model with sample selection, using school delay

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Benin		Cameroon		Congo Dem		Ghana		Guinea		Kenya	
VARIABLES	cenrol	everattend	cenrol	everattend	cenrol	everattend	cenrol	everattend	cenrol	everattend	cenrol	everattend
Delay of more than 2 years	-1.33***		-1.29***		-0.77***		-0.27***		-1.06***		-0.61***	
	(0.07)		(0.06)		(0.07)		(0.05)		(0.13)		(0.10)	
Delay * Gender	-0.02		-0.37***		-0.29***		-0.08		-0.55***		0.04	
	(0.10)		(0.09)		(0.10)		(0.07)		(0.21)		(0.12)	
Gender (Female=1)	-0.22**	-0.43***	-0.05	-0.33***	-0.02	-0.39***	-0.01	-0.11***	0.15	-0.38***	-0.21*	-0.25***
	(0.10)	(0.02)	(0.08)	(0.04)	(0.10)	(0.04)	(0.05)	(0.04)	(0.21)	(0.03)	(0.11)	(0.05)
Wealth index	0.05***	0.05***	0.03*	0.02	0.12***	0.19***	-0.02	0.02	0.07*	0.10***	0.07**	0.42***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.04)	(0.01)	(0.03)	(0.04)
Urban	0.00	0.22***	-0.08*	0.43***	-0.03	0.49***	-0.19***	0.34***	-0.03	0.88***	-0.51***	-0.06
	(0.04)	(0.02)	(0.05)	(0.04)	(0.06)	(0.04)	(0.04)	(0.05)	(0.18)	(0.04)	(0.06)	(0.08)
Constant	2.34***	0.66***	2.44***	0.83***	1.55***	0.64***	1.78***	1.36***	2.56***	-0.05	2.42***	0.91***
	(0.15)	(0.03)	(0.13)	(0.05)	(0.19)	(0.06)	(0.07)	(0.06)	(0.29)	(0.04)	(0.20)	(0.08)
Observations	18,951		15,174		10,187		10,145		8,502		8,412	
athrho	0.126		-0.00165		0.324		-0.0957		-0.0957		0.279	
se_athrho	0.152		0.135		0.193		0.0738		0.290		0.197	
P_value	0.563		0.995		0.265		0.601		0.793		0.330	

Note: The estimated coefficients reported above are from estimates that also controlled for child's age, the number of other children in the household in different age groups, the children's relationship to the head of the household and the household head's level of education.

Table 3: continued

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
	Malawi		Namibia		Niger		Senegal		Sierra Leone		Zambia	
VARIABLES	cenrol	everattend	cenrol	everattend	cenrol	everattend	cenrol	everattend	cenrol	everattend	cenrol	everattend
Delay of more than 2 years	-0.63***		-1.35***		-1.69***		-1.69***		-0.93***		-0.90***	
	(0.05)		(0.07)		(0.07)		(0.07)		(0.15)		(0.07)	
Delay * Gender	-0.37***		-0.00		-0.33***		-0.05		-0.08		-0.32***	
	(0.07)		(0.09)		(0.11)		(0.09)		(0.15)		(0.09)	
Gender (Female=1)	0.10*	0.12***	-0.03	0.27***	0.06	-0.38***	-0.13*	-0.03	-0.20	-0.14***	-0.16**	-0.09*
	(0.06)	(0.03)	(0.07)	(0.05)	(0.10)	(0.03)	(0.08)	(0.02)	(0.14)	(0.03)	(0.07)	(0.05)
Wealth index	0.06***	0.06***	0.05**	0.09***	0.05*	0.17***	-0.00	0.14***	0.00	0.12***	0.05**	0.09***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.01)	(0.02)	(0.01)	(0.04)	(0.02)	(0.02)	(0.03)
Urban	-0.11***	0.08	-0.20***	0.04	-0.09	0.76***	-0.02	0.55***	0.45***	0.66***	-0.35***	0.22***
	(0.04)	(0.06)	(0.05)	(0.06)	(0.11)	(0.03)	(0.06)	(0.03)	(0.15)	(0.04)	(0.05)	(0.06)
Constant	2.06***	1.42***	2.18***	1.14***	1.68***	-0.40***	2.35***	0.09***	2.00***	0.50***	2.29***	0.94***
	(0.08)	(0.05)	(0.13)	(0.08)	(0.22)	(0.03)	(0.13)	(0.03)	(0.47)	(0.04)	(0.10)	(0.09)
Observations	27,424		9,234		10,239		16,652		9,083		8,048	
athrho	0.231		0.0349		0.0620		-0.143		0.380		-4.228	
se_athrho	0.0760		0.126		0.217		0.132		0.469		0.103	
P_value	0.218		0.922		0.730		0.449		0.463		0.996	

Note: The estimated coefficients reported above are from estimates that also controlled for child's age, the number of other children in the household in different age groups, the children's relationship to the head of the household and the household head's level of education.

Appendix.

Table A1: List of countries, years of the surveys, numbers of children, and enrollment and ever-attended rates.

	Year	Number of children aged 6-18	Number of children aged 10-18	Unconditional enrollment rate	Conditional enrollment rate (%)	Ever attended rate (%)
				Children aged 10-18		
Benin	2006	31,747	19,136	64	88	73
Cameroon	2011	24,163	15,318	79	87	91
Congo Dem	2007	16,247	10,250	74	84	88
Ghana	2008	15,697	10,174	78	84	93
Guinea	2005	14,133	8,535	53	93	58
Kenya	2008	13,104	8,430	90	93	97
Malawi	2010	43,732	27,515	83	87	96
Namibia	2006	13,756	9,362	86	90	96
Niger	2006	17,448	10,350	31	79	39
Senegal	2010	26,564	16,716	56	86	65
Sierra Leone	2008	14,926	9,187	69	93	75
Zambia	2007	12,728	8,081	84	88	95

Table A2: Estimated coefficients of the second-stage equation of the two-step estimation procedure

VARIABLES	(1) Benin	(2) Cameroon	(3) Congo Dem	(4) Ghana	(5) Guinea	(6) Kenya	(7) Malawi	(8) Namibia	(9) Niger	(10) Senegal	(11) Sierra Leone	(12) Zambia
	Dependant variable: conditional school enrollment											
Zscore	0.16***	0.07***	0.03***	0.01	0.04***	0.04***	0.07***	0.07***	0.16***	0.11***	0.02***	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Zscore * Gender	0.01	0.05***	0.05***	0.02*	0.03**	-0.00	0.02***	-0.02**	-0.01	0.01	0.00	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Gender (Female=1)	0.12***	-0.05***	-0.15***	0.01	0.06***	-0.00	-0.05***	-0.03**	0.23***	0.00	0.01	-0.10***
	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)
Brother or sister of the head	-0.04	0.08*	0.15***	-0.08	0.02	0.22***	0.17***	-0.01	0.21**	0.04	0.01	0.34***
	(0.04)	(0.05)	(0.05)	(0.08)	(0.06)	(0.07)	(0.03)	(0.05)	(0.11)	(0.04)	(0.03)	(0.06)
Nephew or Niece		-0.03*	-0.18***	0.08**		-0.02	-0.01	0.03			0.08***	-0.14***
		(0.02)	(0.03)	(0.03)		(0.03)	(0.02)	(0.02)			(0.02)	(0.02)
Grand child of the head	0.07*	0.08***	0.05	0.09*	0.00	0.07*	0.08***	0.05**	0.07	-0.11***	0.05*	0.14***
	(0.04)	(0.03)	(0.04)	(0.05)	(0.03)	(0.04)	(0.02)	(0.02)	(0.05)	(0.02)	(0.03)	(0.03)
Otherreletives	0.15***	-0.17***	-0.36***	0.18***	0.09***	-0.24***	-0.05*	-0.03	0.13***	0.11***	0.08**	-0.33***
	(0.03)	(0.02)	(0.04)	(0.05)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.01)	(0.03)	(0.03)
Nonselectionhazard	-0.73***	0.11	1.07***	-1.55***	-0.48***	-0.25	-1.46***	-0.55**	-1.25***	-1.53***	-0.56***	3.57***
	(0.08)	(0.13)	(0.16)	(0.21)	(0.11)	(0.20)	(0.41)	(0.27)	(0.11)	(0.08)	(0.12)	(0.33)
Constant	1.10***	0.90***	0.75***	1.03***	1.16***	0.97***	1.00***	0.95***	1.51***	1.60***	1.09***	0.62***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.05)	(0.02)	(0.03)	(0.03)	(0.06)	(0.04)	(0.03)	(0.03)
Observations	13,755	14,034	9,016	9,283	4,866	7,890	26,491	8,881	4,758	10,862	6,989	7,677
R-squared	0.74	0.66	0.71	0.70	0.68	0.67	0.65	0.65	0.72	0.65	0.69	0.66

Robust standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

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