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Educational Access and Poverty Reduction: The Case of Ghana 1991-2006

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Abstract

Ghana has seen notable poverty reduction alongside improvements in school participation since 1991. This paper examines the role of education in determining welfare and poverty and its reciprocal, the role of welfare and other aspects of economic privilege in the determination of school attendance and progression. Two groups of models are presented using data from the Ghana Living Standards Surveys. The results suggest that education levels play an important role in determining household welfare and that higher levels of education have relatively larger and increasing benefits. Improvements are observed in relation to lower levels of educational access over the period, while the lucrative benefits of progression beyond the compulsory phase are found largely to be the preserve of relatively economically privileged households.

Keywords: Poverty Reduction, Welfare, Consumption, Education, Development, Ghana

1. Introduction

The Millennium Development Goals (MDGs) include an international commitment to the universalisation of access to primary education by 2015 and to the reduction of absolute poverty by half. Ghana is one of few sub-Saharan African countries for which both these targets lie potentially within reach; with enrolment in primary school currently standing at around ninety per cent and absolute poverty having been reduced from its 1990 level by more than 43 per cent by 2005/6 (GSS 2007). Indeed, had economic growth benefitted the poor and more advantaged groups equally, the poverty reduction goal would have already been achieved. However, redistributive effects have typically favoured more economically advantaged groups (Coulombe and McKay 2007). These facts naturally belie considerable intra-national variation; and patterns of differential impact in terms of the benefits of economic growth, poverty reduction and educational expansion present considerable challenges for equitable and sustainable economic and educational development in Ghana.

The completion of a fifth round of the Ghana Living Standards Survey (GLSS) in 2006 provides an opportunity to explore in some detail the nature, extent and evolution of the relationships between poverty and educational access over a fifteen year period central to the realisation of the MDGs. The period is one in which the imperative to increase access to basic education in Ghana has been strengthened through a number of national and international initiatives, including the country's accession to the Education for All (EFA) Fast Track Initiative (FTI) and the implementation of the national Free Compulsory Universal Basic Education policy (FCUBE). Moreover, increased availability of donor funding in recent years, alongside relative economic buoyancy and a return to democratic government have galvanized Ghana's commitments to educational expansion and resulted in rapid growth in school enrolments.

This paper examines the determination of economic welfare at the household level, used in Ghana as the basis for poverty measurement, with a focus on educational effects. It proceeds to examine the determination of initial access to schooling and subsequent retention or drop-out among children as well as the determination of educational attainment among young adults over the period since 1991. The approach adopted employs descriptive analysis and regression modelling. It begins by briefly describing the data and conceptual framework (Section 2) and proceeds to outline the selection of variables and modelling procedures (Section 3). Results are reported and discussed in Sections 4 and 5 and conclusions are drawn in Section 6.

Data

The Ghana Living Standards Surveys collect data with the aim of measuring levels and changes in standards of living useful for evaluating and informing policy decisions. The third, fourth and fifth surveys are independent cross-sections which employ stratified and clustered sampling. Clusters or primary sampling units (PSUs) are census enumeration areas, typically villages. A price questionnaire is administered to allow for corrections for costs of living by area and point in time. With regard to education, GLSS 3, 4 and 5 included a similar questionnaire module which asked households to respond in relation to a number of simple indicators of access to basic education and to higher levels of attainment.

2. Conceptual Framework and Literature Review

Education and household welfare

The greater prevalence of poverty among the less well educated is a pattern which may be found in practically every context, although the relationships between education and poverty are complex, contingent and disputed, especially because poverty acts as a cause of low education levels as well as a consequence (see Knight, Shi and Quheng, 2008). It is well established in developing country contexts that household economic welfare levels are a key determinant of children's school enrolment, completion and attainment (Canagarajah and Coulombe, 1997; Dreze and Kingdon, 2001; Filmer and Pritchett, 1999). Equally, household welfare levels are strongly associated with the human capital assets of household members, most particularly their educational attainment. Notwithstanding the complexity of this system of co-determining relationships, there are sound intuitive, theoretical and empirical reasons to believe there are certain important synergies between educational development and poverty reduction, not least those based in the Human Capital Theory (Schultz 1961, Becker 1964) and in both the household consumption and household production function models (Becker, 1965). Moreover, while poverty may be considered both as cause and consequence of low levels of education, both are also closely linked to and mediated by contextual factors outside of the household, including local levels of economic development and educational infrastructure.

The estimation of Mincerian 'rates of return' to education in terms of wage premia in formal employment provides a robust approach to measuring human capital benefits but in Ghana, like many countries in sub-Saharan Africa, less than fifteen per cent of the labour force is employed in the formal wage sector (GSS 2007). Alternative approaches have estimated income-based returns to education in self-employment and in agriculture (Appleton and Balihuta, 1996; Jamison and Lau, 1982; Kingdon and Soderbom, 2007; Lockheed, Jamison

and Lau, 1980), reporting a range of findings, with more recent work suggesting lower returns to education outside waged work (Kingdon and Soderbom 2007). The sub-Saharan African region generally is a context in which a great variety of income returns have been reported including very low and even negative estimates, with conflicting patterns according to the level of education. One study in Ghana, for example, found that when the public sector was excluded, there were virtually no returns to education (Glewwe and Ilias, 1996). Pritchett's (2001) review of studies in Africa reports low rates of return for basic education more generally. Although income returns to education are important in the determination of poverty, they do not centre directly on living standards and do not address important poverty-oriented questions such as those concerning how income is shared between income earners and dependents. An approach which centres on per capita household 'consumption' or 'economic welfare' may be considered a more direct instrument for the analysis of poverty and consumption measures are the mainstay of the World Bank's approach for the purposes of international comparison. A familiar method used by the World Bank and drawing on an approach developed by Foster, Greer and Thorbecke (1984) defines extreme poverty as a consumption level below the equivalent of $1 a day and moderate poverty as a level below $2. Many questions of 'living standards' are appropriately considered in absolute terms. These include life expectancy, prevalence of disease, access to social services including education, access to water, sanitation and electricity and the satisfaction of nutritional needs. In line with the World Bank approach, but taking account of the specifics of nutritional needs in Ghana, the Ghana Statistical Service (GSS) defines two Ghana-specific poverty lines in terms of nutritionally based money metric consumption (welfare) levels. 'Welfare', measured in terms of 'consumption' of goods and services is a standard proxy for utility or standard of living in economic approaches, although clearly it has its limitations given the broad range of contributors to overall 'well-being'. Nevertheless, 'consumption' plays a key role in the determination of living standards and may be measured by way of the money value of expenditure on goods and services.

Quantitative work around the determinants of consumption includes regressions of consumption functions which 'predict' consumption values using a range of factors including household size, education levels and assets held by the household (Canagarajah and Pörtner, 2003; Coulombe, 2005; Glewwe, 1991). The consumption function may be considered an aggregation of the equations which describe the returns to various assets including wage equations and agricultural production functions. Consumption function regressions may seek simply to establish correlates or predictors of consumption or may set out to establish determinants of consumption. The difference lies in whether there is a direct interest in causality. Clearly, for the purposes of policy-relevant analysis, causality is central since the ultimate aim may be to manipulate determinants of consumption, with the aim of reducing poverty. In this case, modelling must seek to include exogenous or independently determined explanatory variables. Canagarajah and Pörtner (2003) distinguish genuinely exogenous from 'pre-determined endogenous' variables where the latter, although they do not vary with current consumption, reflect a decision likely to have been made on the basis of welfare or utility considerations. The number of children in a household, for example, may reflect a strategy to avoid poverty. Importantly, in the case of education, it is likely that the level of education of an individual today bears some relation to the wealth of the household in which he or she grew up and so may be co-determined with past consumption. Indeed, while current assets may determine current consumption levels, the acquisition of assets in the past is likely to have been determined by past wealth, correlated with past consumption. These forms of endogeneity are important explanations for the inter-generational persistence of poverty. Canagarajah and Pörtner (2003) sought to avoid 'pre-determined endogenous'

variables as far as possible, although of course their model does include educational effects. They focus on 'community' variables including the presence of markets, banks, motorable roads, the prevalence of malaria and the availability of public transport alongside wider contextual indicators such as the level of rainfall, emphasising the point that since their dependent variable is consumption at the household level, and factors defined at the community level cannot be considered to be determined by individual household utility-maximising decisions, they may be taken to be exogenous. Conversely, the approaches of Adjasi and Osei (2007) and of Coulombe (2005) are concerned only with consumption correlates. Their studies find significant associations at the household level in Ghana between consumption and a range of indicators of living standards including connection to electricity and mains water, toilet facilities, type of fuel used and construction materials used in housing (particularly for roofing). They also find positive values for the education of the household head and for those in formal employment, particularly in managerial and administrative occupations. Clearly, selection into certain occupational groupings is likely to be correlated with education and consumption levels although interestingly Teal's (2001) study found this is only significant in the public sector. An approach which may be considered to lie between that of estimating correlates and exogenous determinants is adopted both by Teal (2001) and Glewwe (1991). Their models allow for the examination of consumption determinants *given* prior asset accumulations and household characteristics so that effects estimated are conditioned upon the particular distribution of assets which prevails in the data.

In terms of results, an early consumption study by Kyereme and Thorbecke (1991) found that an increase in the education of the household head from none to primary education was associated with a reduction in household consumption poverty by one fifth. Teal found that an additional year of education of the household head has the effect of increasing consumption by between 1.9 and 2.9 per cent depending on the model specification (Teal, 2001). Canagarajah and Pörtner (2003) found little association between consumption and lower levels of education but strongly significant correlations for higher levels with some variation by urban/rural location and by gender. Glewwe's study however found positive educational effects only for those employed in the public sector where years of schooling were used as the explanatory variable.

Participation in schooling

Exclusion from basic education, for some children and their families is literal - where there is an absence of local school provision or perhaps where the real costs of schooling are prohibitive. But for others, non-participation in schooling may be better considered in terms of a rational choice, for example where school quality and relevance is judged to be poor despite being available and affordable or where children's current earnings are judged to be high in relation to the net benefits of schooling. Clearly these forms of exclusion are also important proximate determinants of attainment (Langsten and Hassan, 2007). Modelling of the determinants of schooling participation needs to account for features of the full range of constraints and influences on the household 'decision' to send a child to school. This decision may be considered as a part of a household's long term utility or welfare maximisation strategy and hence may be analysed within the cost-benefit analysis framework of Becker's household production function (Becker, 1964). This framework conceptualises the household decision in terms of an attempt to compare the direct and opportunity costs of schooling on one hand with the future economic benefits to the household, including income returns on the other. While it is not possible to quantify all the costs and benefits of sending a

child to school, the framework is particularly useful in the context of low income countries such as Ghana where family future security may depend on children's incomes and where poverty may mean that even relatively low direct and opportunity costs of schooling play a strong role in determining participation. The household costs and benefits of sending a child to school may also be understood in terms of the supply and demand for education. Household demand for education reflects the net benefits of education which depend on features of the particular child, its parents and household and of the wider location and context. The supply of public education is of course largely determined by local and national education policy and provision.

At the level of the individual child, gender and age affect the true and perceived net benefits of education, through differences in the opportunity costs of schooling in terms of lost current earnings and in terms of differences in the returns to education and hence in future earnings (Kingdon and Theopold, 2006; UNESCO, 2005). The opportunity cost of schooling is largely determined by the rewards to and availability of child labour but work is not necessarily antithetical to schooling and indeed wages from work may even be required to afford schooling, particularly prior to free education policy implementation. Further, poverty is not necessarily the main reason for child labour and the poorest households may be those whose children neither work nor attend school (Bhalotra and Heady, 2003; Bhalotra and Tzannatos, 2003; Canagarajah and Coulombe, 1997; Ravallion and Wodon, 2000; Siddiqi and Patrinos 1995). A child's birth order and relationship to the household head have been found to affect school participation in economically poor countries including Ghana, partly because households may be constrained from educating all children to the same level (Glewwe and Jacoby, 1994).

Household assets and income/consumption levels are found to be closely associated with children's participation in schooling and clearly affect the affordability of education. These effects might be expected to rise with the level of education, given that direct and opportunity costs are often much greater at the secondary level than at the primary (Checchi, 2001). Parents' education is found to be a strong determinant of children's schooling in Ghana and sub-Saharan Africa more generally (Canagarajah and Coulombe, 1997; Sackey, 2007; UNESCO, 2005). Also, socio-economic and occupational groupings are found to be associated with school participation (Dreze and Kingdon, 2001). These groupings may be associated with preferences for education and/or child labour. Household size and composition, including the nature and extent of dependency among household members, may be expected to impact on the affordability of schooling decisions. Outside the household and immediate locale, a panoply of regional and contextual factors affect both supply and demand for schooling. These include urban/rural location, issues of ethnicity, religion and language, the dominant forms of agriculture and the overall level of development including employment opportunities (Baschieri and Falkingham, 2006; Dreze and Kingdon, 2001). Perhaps the most striking feature of the Ghanaian context overall is the North/South divide, which affects almost all indicators, including school participation (Fentiman, Hall and Bundy, 1999). On the supply side, availability, accessibility and quality of schooling are clearly important factors. Moreover, the availability of opportunities for progression to higher levels of education has been found to affect enrolment earlier on in a child's school career (Glewwe and Jacoby, 1994; Lavy, 1996). Distances to school have been found to be significant with regards to participation in Ghana, although their effects in general appear to be declining, perhaps as a result of school building and infrastructure development (Filmer, 2007; White, 2004). School quality, while difficult to measure, may be expected to influence participation

and limited work in Ghana has established positive effects of higher quality indicators (Fentiman, Hall and Bundy, 1999; Lavy, 1996).

Modelling approach and procedure

The modelling approach employed in this study involves regression of a consumption function equation to produce estimates for the values of effects of determinants of consumption, with special attention to educational variables followed by regressions predicting schooling access and attainment outcomes. The use of indicators of household assets will allow consumption to be considered in part as a return to these assets (although costs are not accounted for). Drawing upon, and in common with the approaches of Glewwe (1991) and Teal (2001), the inclusion of explanatory variables centres on predetermined rather than exogenous variables, with the consequence that interpretation is conditioned by the distribution of these variables. The outcome variable is the natural logarithm of 'welfare' as defined by the GSS – a 'per equivalent adult' money-metric measure of the value of consumption expenditure corrected for relative prices between areas and across time and divided by the number of equivalent adults in the household calculated on an age-related calorific needs scale. Explanatory variables are included to account for variation in household welfare according to household assets and the broader context in which the household is located. Because of reforms in the Ghanaian system of educational qualifications over the period, it was necessary to group old and new qualifications at similar levels. Estimates numbers of completed years of schooling are also employed where a continuous variable aids interpretation. The education, age and gender of the household head are used as a proxy for overall household human capital levels. The determination of per capita household welfare is modelled first using the household head's years of schooling in an OLS model, second using educational qualifications in a 'cluster fixed effects' approach and third using years of schooling in a random effects model to account for the importance of contextual effects. The results are reported in Tables 1, 2 and 3.

In order to model schooling access and attainment, a dichotomous variable was created for 'ever attendance' of children aged 5-17 in the household along with a polytomous variable to capture the range of attainment outcomes of adults in the 19-35 age range. The school attendance outcome is modelled using a binary probit to estimate the effects of explanatory variables reflecting characteristics of the child, household and context on the probability that a child ever attended school. Marginal effects are reported for ease of interpretation. Schooling attainment outcomes are modelled using a multinomial logit to estimate the effects of explanatory variables on the log-odds of each outcome relative to the log-odds of the base outcome (no access to schooling). For ease of interpretation, relative risk ratios (exponentiated co-efficients) are reported. Variables which did not achieve statistical significance in any of the modelling exercises or whose effects were found to be extremely small are not reported. As in the consumption model, interpretation of the effects of explanatory variables cannot treat effects as wholly causal, owing to the difficulties involved in selecting exogenous variables. For example, a smaller household size may reflect a decision to maximize children's educational opportunities and hence may not be determined independently with respect to educational outcomes. However, in the case of an individual child, household size may be considered predetermined with respect to education.

Descriptive results (using GLSS 3-5 data)

Average educational attainment levels in Ghana among the adult population increased steadily over the period between 1991 and 2006, with the number of years of schooling in the

18-36 age group rising from 6.5 to 6.9. The proportions with post-secondary qualifications increased but remained very small. The period was also marked by rural-urban migration, with 39 per cent compared to 35 per cent of households being located in urban areas at the beginning and end of the period respectively. Both household size and the number of children per household declined overall. Around 15 per cent of household heads were engaged in formal employment in GLSS 5, a very similar proportion to that for the earlier survey rounds and indeed back as far as Philip Foster's study in the 1960s (Foster, 1965). The main shift in the labour market has been towards private sector and away from the public sector in terms of shares of formal employment. Per capita household welfare levels increased steadily although not dramatically and gains were rather greater at the higher end of the welfare distribution.

With regard to children's ever-attendance at school in Ghana, the general trend is of an increase of ten percentage points from 77 to 87 per cent between 1991 and 1999 in the 5 to 17 age group, remaining at a similar level in 2006. Substantial regional disparities are apparent, with much lower rates of ever-attendance being observed in the three northern regions (Northern, Upper East and Upper West). 'Exclusion' ranged from as high as two thirds of children in the Upper East region in 1991/2 to only 3 per cent of children in the Central region by 2005/6 but fell in the northern regions to between 33 and 42 per cent by 2005/6. In the other regions the figure ranged from 3 to 15 per cent. With regard to current attendance, defined at the time of the survey visit for the same age group, the period between 1991/2 and 2005/6 was found to be characterized by a ten percentage point increase from 71 to 81 per cent. Current attendance rates, like ever-attendance rates were substantially lower across the age range for the three northern regions. It is important to view these estimates of proportions of children attending and dropping-out of school in the light of estimates of population size and of population growth. Population growth in the 5-17 age group has been comparatively rapid, with the absolute size of the group having grown by more than fifty percent over the period. Consequently, a discussion of the proportions of children gaining access to schooling tells only a part of the story since in the presence of rapid population growth, static proportions represent large increases in absolute numbers. Overall, completion rates for both the primary and secondary phases of education do not appear to have improved over the period. In 2005/6, 73 per cent of 17 year olds had completed primary school, compared with 74 per cent in 1992. With regard to lower secondary school completion, rates remained fairly static over the period overall, with around half having completed by age 20 in both 1991/2 and 2006/7.

Regression modelling results

Table 1 reports the results of a consumption function regression using ordinary least squares (OLS). Among the controls, it is notable that per capita household welfare is strongly negatively related to household size, and less strongly to the number and type of dependent children. Larger households enjoyed considerably lower welfare, with one additional equivalent adult being found to have the effect of reducing per capita welfare by 10 to 12 per cent. The status of the household head as a migrant, defined in terms of being resident in a region different from the region of birth, positively affected welfare in GLSS 4 and 5. Welfare is strongly positively related to urban as opposed to rural location and regional effects are found to be sizeable and rising over time, with areas outside northern Ghana being associated with considerably higher welfare levels (the Upper East region is the reference group). In the presence of the full range of controls, the effects of the GLSS 4 and 5 surveys when compared to GLSS 3 were positive and substantial, with per capita household welfare

rising by around 14 and 5 per cent between each survey round as a result of factors outside the model, including economic growth. Nonetheless, this represents an increase of less than one per cent per annum. The household head's education is found to have a negative linear effect and a positive quadratic effect on welfare, although the linear effect is only significant in the pooled sample. The marginal and average effects of education on welfare increase with the number of years of schooling. The total effect in the pooled sample is negative for up to two years of schooling, rising to an average effect per year of education of 1 per cent beyond 5 years and 2 per cent beyond 10 years. Across the individual surveys the household head's education is found to have a fairly consistent positive quadratic effect indicating a pattern of rising welfare benefits for successive years of schooling.

Table 2 reports the results of a 'cluster fixed effects' consumption function model including the household head's highest level of education in place of years of schooling. The results reported are 'within cluster' effects since effects common to a cluster are removed. This approach may be considered to eliminate endogeneity bias due to a correlation between cluster level factors, including economic and labour market opportunity. The results show that lower levels of education had significant effects on welfare in GLSS 4 and 5 when compared to the reference group with no schooling. Completed primary education was found to increase welfare by around eight percent in GLSS 5, the equivalent of just over one per cent per year of schooling; a figure rather lower than the finding of Kyereme and Thorbeke (1991) who used earlier survey rounds. The effects of secondary level education were fairly consistent, with middle schooling increasing welfare by up to 18 per cent, equivalent to around 2 per cent per year and Senior Secondary schooling or 'O' levels by up to 30 per cent or around three per cent per year. Higher levels of education were found typically to have increasing effects over time. The effect of a bachelor's degree was to increase the log of welfare by as much as eighty per cent in GLSS 5, equivalent to around five per cent per year of schooling. These figures are broadly consistent with Teal (2001) and with Canagarajah and Pörtner's (2003) finding of low returns to low levels of education.

Table 3 shows the results of a random effects model, with random intercepts for 1229 survey clusters. The approach is intended to explore the importance of within and between cluster education effects in more detail by employing a modelling strategy which allows them to be modelled simultaneously. 'Between cluster' effects refer to the effects of cluster-mean values of explanatory variables on cluster-mean welfare. While 'between cluster' effects are not attributable to individual households or household members, in the case of education or labour market effects, these represent the benefits of living in better educated or higher employment clusters. Nonetheless, individual households enjoy the benefits of these education or education-correlated effects. However, an additional issue of endogeneity arises in that cluster-level effects (intercepts) are assumed in a random effects approach to be uncorrelated with explanatory variables. If this assumption is violated, the approach may produce biased estimates for the explanatory variables concerned. Following Rabe-Hesketh and Skrondal (2008) the random effects approach addresses the endogeneity problem by including cluster-mean values for variables where cluster-level endogeneity may be an issue. Application of the Hausman test confirms that co-efficients are not significantly affected by endogeneity bias. Education variables at household level are transformed into deviations from the cluster mean and mean values are included separately. This approach allows the deviation values to be interpreted as within cluster (fixed) effects and the mean values to be interpreted as between cluster effects. The approach also permits the inclusion of cluster-level explanatory variables and cross-level interactions between household-level and cluster level variables with the intention of explaining patterns of inter-cluster variation. Since

formal employment in Ghana is generally associated with higher welfare levels and higher returns to education, the availability of such employment is a key factor in determining cluster-level benefits from education and a cluster-level variable is included to account for this. A term for the interaction between household and cluster-level schooling of the household head is also included.

Household level education effects are reduced when compared to the OLS model where co-efficients partly subsumed between-cluster effects. Only the quadratic effects of school years are significant with effects ranging from around 0.5 to 1 per cent per year of education at 5 years of schooling to between 1 and 2 per cent per year at 10 years of schooling. The coefficient on the formal employment variable is sizeable and significant at the 1 per cent level in the pooled data and in each survey round separately, indicating that the availability of formal employment is an important determinant of household welfare in all survey rounds. A ten per cent increase in formal employment within a cluster is found to increase individual household welfare by 12 to 19 per cent on average. In the absence of this variable, between-cluster education effects are sizeable and significant but when included they become non-significant in GLSS 3 and 4 and are reduced in GLSS5, indicating that cluster-level education effects are correlated with formal employment effects. In GLSS 5, however, even in the presence of the formal employment variable, an additional year on the mean cluster level of household heads' schooling increases household welfare by six per cent. Regional and urban/rural effects are reduced in this model suggesting that in the model reported in Table 3 they partly subsumed cluster effects, although they remain very important. In GLSS5 and in the pooled sample, the cross-level interaction term between household and cluster education (quadratic of years of schooling) is significant. In GLSS 5, an additional year of schooling of the household head at 5 years of schooling in a cluster with a 5 year mean increases welfare by an approximate additional 2 per cent and in a cluster with the same mean, the increase is approximately 4 per cent for an additional year at ten years of schooling. Better educated contexts are thus associated with higher welfare benefits of household level education. The effects of household size and composition are very similar to those in the OLS model.

Table 4 reports the results of estimation of the probability of a child ever having attended school, given certain key characteristics using a probit model. The results show that the effect of a child's gender was significant in both the pooled regression and in all of the separate survey-round regressions, with boys being more likely to have ever attended school. The gender effect declined substantially over the period, however, from a difference in probability of around eight percent to one percent. Older children were, unsurprisingly, more likely to have ever attended school, although the negative sign of the effect of the square of age indicates that the effect is curvilinear and diminishing. The overall effect of age on the probability of ever attending school declined between GLSS 3 and 5. The relationship of a child to the household head was found to exert an important negative effect, particularly in the cases of children living in the household who were servants or who were unrelated to the head when compared to the reference group of children of the household head. These effects were particularly large for servants, who were up to 40 per cent less likely to have ever enrolled. The education of a child's parents, notably including Koranic schooling of fathers, was found to exert significant effects on a child's ever-enrolment. These effects were typically diminishing over time, ranging from increasing the probability of ever-enrolment by 4 to 15 per cent depending on the level in GLSS 3 to 4 to 8 per cent in GLSS 5. Parents' educations and occupational groupings are highly correlated so that in the presence of education variables, only the household head's employment in the public sector affects ever-

enrolment significantly, increasing the probability of ever-attendance by up to seven per cent in the two earlier surveys.

Household welfare (consumption) levels were found to be positively associated with a child ever having attended school, with children in higher welfare households being more likely to have attended across the period. An increase in probability of ever-attendance of between 3 and 7 per cent was found to be associated with an increase in welfare approximately equal to doubling its value at the mean. There was no consistently significant effect of household size, nor of key household composition variables. Regional effects were found to be significant and sizeable when almost every region, except the other northern regions was compared with the reference region of Upper East. The most positive regional effect overall was for the Brong Ahafo region whose children were up to 17 per cent more likely to have ever enrolled. There appears to have been a general and substantial decrease in the size of regional effects over time, especially between GLSS 3 and 4. A significant effect was detected in the probability of ever-attendance between children residing in urban locations in the GLSS 4 and 5 data, with children being between 2 and 5 per cent more likely to have ever enrolled than in rural areas. With controls in place for the effects of the full range of explanatory variables, dummy variables for the survey rounds GLSS 4 and 5 were found to have positive co-efficients, indicating a positive effect of unobserved factors associated with the time periods, possibly including policy interventions between these surveys and the reference category (the GLSS 3 survey). In the pooled regression, children in the GLSS 4 survey were 2.9 per cent more likely to have ever attended school and those in GLSS 5 7.2 per cent more likely.

In order to examine the nature of and trends in progression through basic schooling and into post-basic education, a multinomial logistic regression model is used to compare the determination of 'selection' into five educational attainment outcomes. The sample employed is the group of adult household members aged 19 to 35 at the time of the survey. It may be expected that adults in this group will most likely have completed basic schooling. The model estimates the determinants of an adult having achieved less than completed primary schooling, completed primary schooling, completed lower secondary schooling or a higher level of education when compared to the reference category of adults who had never attended school. Relative risk ratios are reported in Table 5. In the pooled sample, males were found to be more likely to have reached all levels of educational attainment relative to never having attended school than females. This difference increases at higher levels so that males are as much as four times more likely to have progressed beyond lower secondary school. Relationship to the household head was found to affect educational attainment significantly when compared to the attainment of the head (the reference category). Spouses (most often wives) were considerably less likely to have progressed even as far as attending primary school and were only one third as likely to have reached the end of junior secondary school. Children of the household head were most likely to have made educational progress and servants least likely.

Household size and composition was found to have notable effects on educational attainment, especially with regard to higher levels of achievement. Household size was a significant determinant of all levels of progress, perhaps surprisingly changing sign in terms of its effect so that one unit of the log of household size in equivalent adults terms (around 2.7 adults) reduced the probability of a household member reaching the end of primary school when compared to never attending school by around one fifth but increased the probability of reaching levels of schooling beyond lower secondary by around the same proportion.

However, this is in the presence of specific controls for dependency within the household. The proportion of children under the age of 7 in a household was found to reduce the probability of a household member reaching post-primary education but only slightly. The same was true in relation to the number of household members over 59 years of age. Much more important was the occupational or socio-economic status of the household head. When compared to the reference group of food-farmers, other groups were found to have a relative likelihood of achieving higher levels of education up to twenty times higher. The effects of belonging to more privileged socio-economic groups were found mostly to increase by level of education, with the private and public sector employee groups being associated with the largest effects. Household members in a household with a head in formal private sector employment were almost seven times more likely to have progressed beyond junior secondary than in households headed by a food farmer and were three times more likely to have completed JSS and twice as likely to have completed primary. Household members whose heads were public sector employees were also twice as likely to have completed primary but were 4 times more likely to have completed JSS and 20 times more likely to have progressed further. Smaller but notable advantages were also found among households headed by informal private sector employees, export farmers, those in non-farm self-employment and those who were not working. These effects may be considered in part separable from the effects of income and consumption which is measured by the relative risk ratios for the log of household welfare. An additional unit of log-welfare, approximately equal to the mean level of per capita welfare, is found to increase the likelihood that a household member had progressed educationally, particularly to the end of lower secondary school or beyond, being associated with a four times greater probability of accessing post-lower secondary education.

The dummy variables included for the survey rounds are significant in relation to all levels of educational attainment, with GLSS 3 as the reference category. Although typically household members included in both GLSS 4 and 5 were more likely to have reached higher levels of education than those in GLSS3, there is little to suggest that there is a significant difference between the effects of GLSS 4 and 5, indicating that the most important improvements occurred in the period from 1991 to 1999. Urban residence was found to positively affect the probability of progression to the end of lower secondary school and beyond. Regional effects were found in some cases to be extremely large. Those in the Ashanti region, for example were found to be seven times more likely than those in the reference region of the Upper West to have accessed primary schooling, in the presence of these controls. The figure was nine times for completing primary school and 13 times for completing junior secondary. Other regions with strong positive effects included the Western, Central, Brong Ahafo and Greater Accra regions. It is notable that with regard to educational access beyond junior secondary schooling, regional effects are smaller. This may suggest that at these levels of schooling the effect of regional level supply is balanced by very large effects of affordability and socio-economic factors. When the exercise was repeated for individual survey rounds, results showed decreasing regional effects. For example in GLSS 5, the Ashanti region is associated with a four times greater likelihood of having achieved some primary schooling than the Upper West, compared to the nine times found in GLSS 4 and 12 times in GLSS 3.

Discussion

Notable improvements in initial access to basic education took place in Ghana during the 1990s, and by the end of the Millennium, only around one in ten children had never been to

school. The large gap between the three Northern regions and the rest of the country in terms of initial access narrowed substantially over the same period, as did the gender gap, in line with a key policy objective. The proportion of children who had ever been to school improved, even after controlling for important changes in socio-economic and demographic indicators, suggesting an effect of successful expansion in supply of schooling consistent with considerable investment by the Ghana Government and donors. Equally, household economic welfare levels improved over the period in the presence of controls, indicative of economic growth.

The determinants of economic welfare are found to have much in common with the determinants of educational access and attainment. Poorer and less well educated households are typically disadvantaged as a result of less favourable location factors, especially those associated with northern and rural areas. They are also disadvantaged by larger household size and a greater proportion of dependent children. Nonetheless, controlling for these important effects, education at household level is found to have notable effects on welfare and hence considerable poverty reducing potential. Significantly, education effects increase at the margin and on average so that greater additional benefits are gained from higher levels of attainment. Elementary education of the household head has a fairly small effect on economic welfare, but at ten years of schooling, a duration approximately equal to the length of the compulsory cycle, education effects are substantial, being found to increase household per capita welfare by up to twenty percent. For tertiary education, the benefits are considerably larger. Moreover, the effects of higher levels of education on welfare strengthened over the period, improving the relative welfare position of better educated households. Overall education levels improved, however, increasing the size of the group benefitting from education premiums in terms of welfare. More households also benefitted from the positive effect of urban location by 2005/6 and the negative effect of larger household size was mitigated overall by a decline in mean household size. Changes in household size may of course be related to improvements in access to education in previous periods, through the effects of education on fertility, potentially contributing to virtuous or vicious circles in the education-welfare relationship (see Knight, Shi and Quheng, 2008).

Increased educational access and declining absolute poverty in Ghana do not necessarily suggest an improving position in terms of equity and equality of opportunity. The patterns of advantage in relation to progression beyond junior secondary school, the last compulsory phase of education which incurs relatively low costs to households, are somewhat different from those for lower secondary and below. For the later and more costly stages, the advantages afforded to males, urban residents, those in favourable socio-economic groups and in favourable regions, but most particularly to those in higher welfare households are very large in 2005/6. When examining the factors associated with completing junior secondary schooling, where cost may be less of an issue, region is found to be a dominant factor. It is apparent that the balance of demand and supply constraints facing the household in relation to educational access and progress depends importantly both on the extent of local provision and on its affordability. Post compulsory education remains unaffordable for most households in Ghana, yet this is the phase of education which is found to have the highest marginal returns in consumption and thus perhaps the greatest welfare enhancing potential.

In terms of consumption returns, there is little to support the contention that returns are high in relation to lower levels of schooling in Ghana or even that they were at the beginning of the period in 1991. This finding is generally consistent with earlier work. There is some evidence that (latent) contextual factors at the cluster-level are also important in determining

the welfare benefits of education as well as welfare levels themselves. One important cluster-level factor is the availability of formal employment. Clearly, local level opportunities, both in terms of access to schooling and to productive employment are what determine the viability of the educational route to poverty reduction. Uneven distribution, particularly of the most lucrative educational opportunities but also of the most lucrative employment opportunities remains a serious issue in Ghana. Where opportunity is strongly clustered, there is considerable potential for the reinforcement of advantage and disadvantage. Boakye-Yiadom illustrates this point in relation to the urban-rural divide in Ghana.

> Ghana's rural-urban welfare gap is influenced by the concentration in urban areas of business and industrial activity, and is sustained by the resultant inequalities in education, access to healthcare, and basic amenities…[T]he concentration in the urban centres of better-educated workers tends to result in other education-related inequalities between rural and urban localities. This is linked to the fact that better educated workers generally wield considerable economic, social and political clout, compared to the less educated. (Boakye-Yiadom, 2004, pp. 30-33)

Basic education is often discussed in terms of a social and economic 'vaccine' whose direct and indirect effects contribute significantly to poverty reduction. But 'pro-poor' educational expansion in relative terms requires that the poor benefit disproportionately from increased access to the benefits of education, which in turn depends not only on trends in schooling participation but on the evolution and distribution of the relationships between educational assets and economic welfare. The evidence in Ghana does suggest that improving education has an important role to play in increasing welfare and reducing poverty in the country but at the same time, patterns of educational and economic disadvantage are found to be strongly overlapping and potentially mutually reinforcing.

6.   Conclusion

Successive education initiatives in Ghana since independence have been aimed at widening participation and reducing cost barriers which have consistently limited access for the poor. The capitation grant introduced in 2004 is a recent example, and has been associated with considerable increases in enrolment in the period since the most recent Ghana Living Standards Survey in 2005/6. This initiative, among other policy levers, may conceivably bring the goal of universal *initial* access to education into sight by 2015. Yet it is clear that significant challenges lie ahead in terms of the extension of the economic benefits of education which are most significant at higher levels of educational access where cost barriers and uneven provision along regional and urban/rural divides remain substantial. Moreover, the welfare gap between households whose heads had achieved post-basic education and those with no education appears to have widened in the period since 1991, indicating that in spite of widening access, economic inequality based on educational attainment may be worsening.

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Table 1
Household welfare and education: OLS model

VARIABLES	pooled	GLSS 3	GLSS 4	GLSS 5
Years of education	-0.007	-0.007	-0.001	-0.005
	(-2.44)**	(-1.36)	(-0.22)	(-1.15)
Square of school years	0.003	0.002	0.002	0.003
	(15.04)***	(6.01)***	(6.04)***	(11.46)***
Western	0.639	0.402	0.700	0.725
	(23.84)***	(7.08)***	(12.89)***	(19.36)***
Central	0.594	0.577	0.456	0.709
	(22.11)***	(10.00)***	(8.29)***	(19.23)***
Greater Accra	0.654	0.518	0.840	0.633
	(23.86)***	(8.63)***	(15.51)***	(16.32)***
Volta	0.498	0.438	0.445	0.561
	(18.46)***	(7.80)***	(7.61)***	(14.92)***
Eastern	0.561	0.424	0.474	0.653
	(21.07)***	(7.31)***	(8.48)***	(18.13)***
Ashanti	0.711	0.611	0.818	0.712
	(28.10)***	(10.69)***	(15.48)***	(21.19)***
Brong Ahafo	0.493	0.420	0.592	0.461
	(18.69)***	(7.43)***	(10.95)***	(12.60)***
Northern	0.291	0.311	0.198	0.306
	(10.20)***	(5.05)***	(3.43)***	(8.11)***
Upper West	0.004	0.369	-0.153	-0.334
	(0.12)	(5.45)***	(-2.65)***	(-7.79)***
Urban	0.375	0.439	0.240	0.436
	(34.91)***	(21.88)***	(12.21)***	(27.07)***
Proportion girls aged 7-14	-0.004	-0.005	-0.004	-0.003
	(-10.91)***	(-8.44)***	(-7.50)***	(-4.88)***
Equivalent adults (household size)	-0.115	-0.108	-0.119	-0.119
	(-32.94)***	(-17.70)***	(-19.68)***	(-21.78)***
Proportion boys aged 7-14	-0.005	-0.006	-0.005	-0.004
	(-11.90)***	(-10.27)***	(-8.29)***	(-5.72)***
Proportion under 7 years	-0.005	-0.006	-0.006	-0.005
	(-17.98)***	(-12.03)***	(-10.95)***	(-10.11)***
Migrant	0.039	-0.005	0.079	0.082
	(3.68)***	(-0.24)	(3.45)***	(5.00)***
GLSS4	0.137			
	(11.55)***			
GLSS5	0.182			
	(15.81)***			
Constant	13.893	13.953	14.120	13.976
	(278.73)***	(155.45)***	(144.69)***	(192.47)***
Observations	18728	4512	5985	8231
Adjusted R-squared	0.50	0.43	0.50	0.55

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Controls included for household assets

Table 2
Household welfare and household head's highest educational achievement: Cluster
fixed effects model

VARIABLES	pooled	GLSS 3	GLSS 4	GLSS 5
Some education	0.051	0.012	0.077	0.055
	(3.46)***	(0.44)	(2.67)***	(2.65)***
Primary	0.074	0.015	0.119	0.076
	(5.02)***	(0.52)	(4.25)***	(3.59)***
Middle school cert	0.173	0.160	0.179	0.178
	(13.68)***	(6.99)***	(7.13)***	(9.89)***
Vocational or commerce	0.305	0.252	0.238	0.360
	(7.72)***	(3.65)***	(3.29)***	(6.06)***
O Level	0.298	0.239	0.324	0.291
	(11.59)***	(4.65)***	(7.96)***	(6.38)***
SSS Cert	0.220	0.000	0.037	0.283
	(5.91)***	(.)	(0.54)	(6.74)***
A Level	0.523	0.562	0.478	0.534
	(13.43)***	(7.17)***	(9.50)***	(6.46)***
Teacher Training A	0.516	-0.107	0.420	0.585
	(8.28)***	(-0.86)	(3.52)***	(8.80)***
Teacher Training B	0.366	0.210	0.381	0.528
	(10.31)***	(3.93)***	(7.11)***	(7.34)***
Technical/professional cert	0.391	0.175	0.381	0.449
	(11.59)***	(1.65)	(6.68)***	(10.07)***
Technical/professional dip	0.614	0.538	0.747	0.552
	(10.01)***	(4.29)***	(5.97)***	(8.43)***
Bachelor degree	0.710	0.615	0.512	0.828
	(13.40)***	(4.79)***	(5.63)***	(12.62)***
Master's degree	0.973	0.586	1.064	1.119
	(7.12)***	(2.55)**	(7.63)***	(6.30)***
Doctorate	1.193	1.079	0.000	1.200
	(5.28)***	(2.38)**	(.)	(5.61)***
	(-1.81)*	(-0.03)	(0.32)	(-3.08)***
Constant	14.620	14.564	14.692	14.596
	(358.41)***	(188.74)***	(193.28)***	(243.38)***
Observations	18735	4514	5986	8235
Number of clusters	1229	365	300	564
Adjusted R-squared	0.33	0.36	0.32	0.34

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Controls included for household size, assets and composition and for contextual effects/survey round

Table 3
Household welfare: random intercepts and contextual variables

VARIABLES	Pooled	GLSS 3	GLSS 4	GLSS 5
Years of education (deviation)	0.001	-0.005	0.003	0.003
	(0.37)	(-0.92)	(0.72)	(0.76)
square of school years (deviation)	0.001	0.002	0.001	0.002
	(7.06)***	(3.65)***	(3.09)***	(5.28)***
Cluster mean (school years)	0.013	-0.026	0.025	0.061
	(0.80)	(-0.96)	(0.65)	(2.61)***
Cluster mean (school years squared)	0.002	0.003	0.000	-0.000
	(1.72)*	(1.35)	(0.01)	(-0.24)
Western	0.509	0.387	0.455	0.528
	(7.91)***	(3.26)***	(3.17)***	(5.98)***
Central	0.549	0.595	0.199	0.611
	(8.68)***	(5.11)***	(1.42)	(6.94)***
Greater Accra	0.464	0.464	0.419	0.347
	(6.92)***	(3.73)***	(2.87)***	(3.63)***
Volta	0.438	0.508	-0.081	0.441
	(6.86)***	(4.46)***	(-0.41)	(5.15)***
Eastern	0.494	0.464	-0.024	0.513
	(7.65)***	(4.05)***	(-0.12)	(5.95)***
Ashanti	0.584	0.573	0.454	0.550
	(9.52)***	(4.97)***	(3.20)***	(6.68)***
Brong Ahafo	0.426	0.376	0.368	0.347
	(6.82)***	(3.29)***	(2.55)**	(4.01)***
Northern	0.251	0.227	0.172	0.274
	(4.18)***	(2.09)**	(1.27)	(3.60)***
Upper West	-0.109	0.327	-0.122	-0.340
	(-1.68)*	(2.83)***	(-0.80)	(-3.92)***
Urban	0.268	0.299	0.077	0.324
	(9.68)***	(6.92)***	(1.68)*	(7.73)***
proportion girls aged 7-14	-0.004	-0.005	-0.004	-0.003
	(-14.21)***	(-8.11)***	(-8.38)***	(-7.89)***
equivalent adults	-0.117	-0.124	-0.122	-0.115
	(-49.15)***	(-25.25)***	(-28.57)***	(-32.24)***
proportion boys aged 7-14	-0.005	-0.006	-0.005	-0.005
	(-18.84)***	(-10.07)***	(-11.51)***	(-10.78)***
proportion under 7 years	-0.005	-0.006	-0.005	-0.004
	(-22.49)***	(-12.17)***	(-12.91)***	(-12.84)***
Proportion in formal employment	1.415	1.464	1.880	1.194
	(6.07)***	(4.03)***	(3.89)***	(3.71)***
Interaction: years of schooling squared and cluster mean of years of schooling sq.	0.0007	-0.0002	0.0005	0.0008
	(2.26)**	(-0.24)	(0.81)	(2.09)**
GLSS4	0.111			
	(3.73)***			
GLSS5	0.152			
	(3.65)***			
ICCC	0.411	0.336	0.366	0.415
Constant	14.157	14.143	15.577	14.882
	(31.71)***	(19.49)***	(18.85)***	(22.11)***
Observations	18736	4515	5986	8235
Number of clusters	1229	365	300	564
Log likelihood	-13374	-3205	-4079	-5798

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Controls included for household size, assets and composition and for contextual effects.

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Table 4
Ever attendance at school: Probit model: Marginal effects (Pooled GLSS Ages 5-17)

	pooled	GLSS 3	GLSS 4	GLSS 5
Age in years	0.064	0.108	0.058	0.041
	(17.79)***	(13.19)***	(9.08)***	(8.59)***
Square of age	-0.002	-0.004	-0.002	-0.002
	(-16.76)***	(-11.99)***	(-8.63)***	(-8.53)***
Male	0.034	0.087	0.034	0.010
	(7.02)***	(7.81)***	(4.25)***	(1.65)*
Relationship to head: Servant	-0.296	-0.397	-0.254	-0.306
	(-5.13)***	(-5.25)***	(-2.20)**	(-2.70)***
Relationship to head: Other non-relative	-0.109	-0.189	-0.234	-0.064
	(-4.07)***	(-2.21)**	(-3.80)***	(-2.50)**
Mother's education: Primary	0.038	0.044	0.028	0.044
	(5.05)***	(2.98)***	(2.37)**	(4.52)***
Mother's education: Middle School/JSS	0.063	0.104	0.067	0.036
	(9.34)***	(7.72)***	(7.15)***	(3.25)***
Father's education: Primary	0.061	0.065	0.055	0.054
	(8.90)***	(4.23)***	(4.31)***	(6.52)***
Father's education: Middle School/JSS	0.077	0.099	0.064	0.073
	(11.03)***	(7.48)***	(4.86)***	(7.99)***
Father's education: O level	0.083	0.107	0.086	0.055
	(8.85)***	(5.73)***	(7.27)***	(2.68)***
Father's education: A level	0.103	0.159	0.084	0.072
	(8.83)***	(13.22)***	(3.17)***	(2.96)***
Father's education: Tertiary	0.084	0.141	0.073	0.067
	(7.14)***	(8.95)***	(3.15)***	(5.02)***
Father's education: Koranic	0.102	0.155	0.090	0.084
	(10.94)***	(16.40)***	(5.19)***	(9.25)***
Head is Public sector employee	0.055	0.055	0.077	-0.026
	(2.88)***	(1.77)*	(3.93)***	(-0.71)
Log of household welfare	0.031	0.073	0.015	0.035
	(4.35)***	(5.76)***	(1.13)	(3.61)***
GLSS4	0.029			
	(2.82)***			
GLSS5	0.072			
	(7.80)***			
Urban	0.037	-0.009	0.054	0.033
	(3.62)***	(-0.35)	(3.70)***	(2.39)**
Western	0.102	0.144	0.102	0.076
	(9.50)***	(5.36)***	(5.14)***	(6.40)***
Central	0.104	0.123	0.105	0.093
	(10.71)***	(3.68)***	(6.38)***	(11.03)***
Greater Accra	0.078	0.138	0.069	0.046
	(5.35)***	(4.26)***	(2.44)**	(2.41)**
Volta	0.086	0.164	0.077	0.037
	(6.40)***	(6.22)***	(3.17)***	(1.67)*
Eastern	0.101	0.149	0.110	0.058
	(8.84)***	(5.53)***	(6.15)***	(3.81)***
Ashanti	0.106	0.175	0.080	0.079
	(8.85)***	(6.31)***	(3.23)***	(6.22)***
Brong Ahafo	0.111	0.181	0.093	0.075
	(11.57)***	(8.62)***	(4.64)***	(5.82)***
Observations	32804	8324	10680	13664
pseudo R-squared	0.219	0.285	0.177	0.242

Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Controls included for household assets, composition, age and sex of head of household.

Table 5
Educational attainment outcomes: Multinomial logistic model (pooled GLSS Ages 19 to 35)

	Primary drop-out		Primary completer		L. sec. completer		Higher levels	
	rrr	z stat	rrr	z stat	rrr	z stat	rrr	z stat
Male	1.279	2.65***	1.809	6.70***	2.684	12.68***	4.060	15.07***
Spouse of head	0.665	-3.71***	0.647	-4.17***	0.542	-6.88***	0.381	-7.33***
Child of head	1.550	2.85***	1.859	4.35***	2.309	6.43***	3.716	8.59***
Grandchild of head	1.613	1.37	2.065	2.24**	2.568	2.79***	2.718	2.67***
Servant	0.691	-0.42	0.255	-2.39**	0.271	-2.44**	0.043	-3.60***
Log of hhold size	0.801	-2.55**	0.832	-2.15**	0.954	-0.59	1.230	2.08**
proportion under 7 years	1.003	1.19	1.000	-0.06	0.994	-3.36***	0.984	-6.84***
proportion over 59 years	0.995	-1.18	0.992	-1.93*	0.988	-3.52***	0.998	-0.51
public sector employee	1.834	2.86***	2.312	5.84***	4.096	11.56***	20.412	20.24***
formal private sector employee	1.317	1.29	1.983	3.75***	2.985	6.73***	6.655	10.01***
informal private sector employee	1.269	1.41	1.556	2.53**	1.533	2.77***	1.697	2.70***
export farmer	1.410	2.28**	1.547	2.93***	1.401	2.34**	1.135	0.55
self-employed non-farm	1.518	4.36***	1.891	6.11***	1.896	6.67***	2.490	7.27***
not working	1.804	1.92*	1.669	1.91*	2.075	3.00***	4.527	5.31***
Log of household welfare	1.174	2.31**	1.335	4.01***	1.889	9.24***	4.053	14.68***
GLSS4	1.429	2.97***	1.412	2.85***	1.288	2.01**	1.898	4.03***
GLSS5	1.553	4.37***	1.368	3.00***	1.008	0.08	1.816	4.72***
Urban	0.902	-0.86	1.056	0.47	1.376	2.83***	1.871	4.44***
Western	4.463	6.84***	6.517	8.27***	8.147	9.15***	2.174	2.89***
Central	6.963	9.01***	7.550	8.37***	8.252	8.54***	1.788	2.04**
Greater Accra	4.171	5.84***	6.403	7.42***	8.835	8.57***	3.238	4.21***
Volta	5.647	7.84***	7.702	8.21***	7.763	7.86***	2.229	2.63***
Eastern	5.158	7.41***	7.653	8.80***	9.540	9.72***	2.102	2.69***
Ashanti	7.331	9.20***	9.651	9.73***	13.008	10.65***	2.731	3.68***
Brong Ahafo	4.441	6.52***	7.652	8.36***	8.758	8.32***	1.938	2.42**
Northern	0.749	-1.19	0.919	-0.32	0.561	-2.35**	0.557	-1.71*
Upper East	1.530	1.63	1.402	1.43	1.189	0.51	0.981	-0.06
Constant	0.135	-1.37	0.018	-2.77***	0.000	-7.26***	0.000	-15.67***
Observations	18993							
pseudo R squared	0.193							

Relative risk ratios (rrr) reported. Base outcome is 'never attended school'. *, ** and *** denote the 10, 5 and 1 % significance levels respectively. Z values are robust to data clustering. Controls included for child age and its quadratic and age/sex of the household head.