Consortium for Research on Educational Access, Transitions and Equity

Human Capital, Poverty, Educational Access and Exclusion: The Case of Ghana 1991-2006

Caine Rolleston

CREATE PATHWAYS TO ACCESS
Research Monograph No. 22

January 2009



Leading education and social research
Institute of Education
University of London

Institute of Education
University of London

Consortium for Research on
Educational Access, Transitions & Equity
Funded by DFID

The Consortium for Educational Access, Transitions and Equity (CREATE) is a Research Programme Consortium supported by the UK Department for International Development (DFID). Its purpose is to undertake research designed to improve access to basic education in developing countries. It seeks to achieve this through generating new knowledge and encouraging its application through effective communication and dissemination to national and international development agencies, national governments, education and development professionals, non-government organisations and other interested stakeholders.

Access to basic education lies at the heart of development. Lack of educational access, and securely acquired knowledge and skill, is both a part of the definition of poverty, and a means for its diminution. Sustained access to meaningful learning that has value is critical to long term improvements in productivity, the reduction of inter-generational cycles of poverty, demographic transition, preventive health care, the empowerment of women, and reductions in inequality.

The CREATE partners

CREATE is developing its research collaboratively with partners in Sub-Saharan Africa and South Asia. The lead partner of CREATE is the Centre for International Education at the University of Sussex. The partners are:

The Centre for International Education, University of Sussex: Professor Keith M Lewin (Director)
The Institute of Education and Development, BRAC University, Dhaka, Bangladesh: Dr Manzoor Ahmed
The National University of Educational Planning and Administration, Delhi, India: Professor R Govinda
The Education Policy Unit, University of the Witwatersrand, South Africa: Dr Shireen Motala
The Universities of Education at Winneba and Cape Coast, Ghana: Professor Jerome Djangmah
The Institute of Education, University of London: Professor Angela W Little

Disclaimer

The research on which this paper is based was commissioned by the Consortium for Research on Educational Access, Transitions and Equity (CREATE http://www.create-rpc.org). CREATE is funded by the UK Department for International Development (DFID) for the benefit of developing countries and is coordinated from the Centre for International Education, University of Sussex. The views expressed are those of the author(s) and not necessarily those of DFID, the Institute of Education or the CREATE Team.

ISBN: 0-901881-28-7

Address for correspondence:
CREATE,
Centre for International Education, Sussex School of Education,
University of Sussex, Falmer, Brighton BN1 9QQ,
United Kingdom
Tel: + 44 (0) 1273 678464
Fax: + 44 (0) 1273 877534
Author email: c.rolleston@ioe.ac.uk
Website: http://www.create-rpc.org
Email create@sussex.ac.uk

Please contact CREATE using the details above if you require a hard copy of this publication.

Human Capital, Poverty, Educational Access and Exclusion: The Case of Ghana 1991-2006

Caine Rolleston

CREATE PATHWAYS TO ACCESS
Research Monograph No. 22

January 2009

Contents

Acknowledgements vi
Preface vii
Summary viii
1. Introduction 1
    1.1 The Data 2
    1.2 Structure of the study 3
2. Human Capital, Poverty and Household Welfare in Ghana in the 1990s 4
    2.1 Conceptual framework and literature review 4
    2.2 Modelling approach and procedure 7
    2.3 Descriptive results 8
    2.4 Regression modelling results 9
    2.5 Discussion 11
3. The Determination of Exclusion: Evidence from the Ghana Living Standards Surveys 1991 - 2006 12
    3.1 Conceptual Framework and Literature Review 12
    3. 2 Modelling Approach and Procedure 14
    3.3 Descriptive Results 15
        3.3.1 Basic Education Attendance and Completion 1991-2006 15
    3.4 Regression Modelling Results 19
        3.4.1 Initial access 19
        3.4.2 Current Attendance and Drop-Out 20
        3.4.3 Exclusion in GLSS 5 21
        3.4.4 Alternative models 23
    3.5 Discussion 23
4. Conclusion 25
References 26
Appendix 30

List of Tables

Table 1	Description of explanatory variables (household welfare equation)…….	8
Table 2	Descriptive statistics (household welfare equation)…….	30
Table 3	Results of regression of household welfare on educational qualifications of the household head (partial correlations)……..	31
Table 4	Results of regression of household welfare equation with controls….....	32
Table 5	Description of explanatory variables (school attendance equations)…..	15
Table 6	Proportions of children aged 5-17 who were currently attending school by region and survey round……..	17
Table 7	Educational access (ages 5-17): Estimated population figures using GLSS 3-5 (millions)……...	18
Table 8	Proportions of children aged 5-17 who had 'dropped-out' of basic education by region and survey round……..	33
Table 9	Proportions of children who had completed primary school by age, region and survey round……..…….....	33
Table 10	Proportions of children who had completed JSS by age, region and survey round……...	33
Table 11	Descriptive Statistics (school attendance age 5 to 19)…….	34
Table 12	Children's work and school attendance GLSS 3-5……..	35
Table 13	Results of probit regression: Dependent variable ever attendance at school (age 5 to 19)……..	36
Table 14	Results of probit regression: Dependent variable current attendance at school (age 5 to 19)…….....	37
Table 15	Results of multinomial logistic regression: Dependent variable access outcome (Age 5 to 19)……	38

List of Figures

Figure 1 Examples of linkages between education and economic welfare……..2
Figure 2 Illustration of data structure in GLSS……3
Figure 3 Occupation of household heads (2005-6)……..9
Figure 4 Adults household members with no education ……....9
Figure 5 Adults 18-35 with senior secondary or higher qualifications……9
Figure 6 Average household welfare by expenditure quintile and survey round.....9
Figure 7 Rates of ever-attendance at school age 5-17……....16
Figure 8 Enrolment in primary grade1 by age (GLSS 5)……...17
Figure 9 Current attendance at school by gender and age……..21

List of Acronyms

CREATE	Consortium for Research on Educational Access, Transitions and Equity
EA	Enumeration Area
EFA	Education for All
GLSS	Ghana Living Standards Survey
GoG	Government of Ghana
ICCC	Intra-Cluster Correlation Coefficient
GSS	Ghana Statistical Service
HHH	Household Head
JSS	Junior Secondary School
MDGs	Millennium Development Goals
OLS	Ordinary Least Squares
PSU	Primary Sampling Unit
SSS	Senior Secondary School
UNESCO	United Nations Educational, Scientific and Cultural Organisation

Acknowledgements

I am grateful to Angela Little, Geeta Kingdon, Kwame Akyeampong, Abena Oduro and Keith Lewin for their instructive comments on earlier drafts of this monograph.

Preface

Education and poverty are closely inter-connected. Caine Rolleston's analysis employs national level data from three rounds of the Ghanaian Living Standards Surveys (GLSSs) to explore the reciprocal relationships between education and household welfare. Rarely are both relations - the role of education in determining household welfare and the role of household welfare in determining school attendance and progression - explored together within the same analysis. This study demonstrates how this can be done. Additionally, by employing three surveys, trends in educational participation and welfare are explored over time and related to more general shifts in society and economy. The 'Zones of Exclusion' model which underpins the work of the CREATE research consortium and this monograph series has been applied to these secondary data sets wherever possible, enabling the author to deepen our understanding of the combinations of factors at work at different stages of access to and progression through education. This is an exemplary study and will be of value to Ghana's education policymakers and education research community. Its methodological approach will also be of value to those who analyse living standards surveys from elsewhere.

Professor Angela W. Little
Institute of Education, London
CREATE Partner Institute Convenor

Summary

The period since 1991 has seen a general improvement both in terms of household welfare and schooling participation in Ghana. This monograph explores the patterns among descriptive indicators and uses regression analysis to examine possible causal relationships with special reference to the role of education in determining welfare and its reciprocal, the role of welfare and other aspects of economic privilege in the determination of school attendance and progression. It reviews the literature on modelling of the household consumption function as well as on modelling schooling decisions based on the household production function. Two groups of models are then fitted using data from the Ghana Living Standards Surveys. The results suggest that education levels play an important role in determining household welfare and that, for higher levels of education, these effects may be strengthening. Educational expansion has, however, meant that access to the benefits from these effects has widened somewhat. Demographic change has also played an important role in welfare improvements. In terms of absolute numbers, access to schooling in Ghana has expanded dramatically. Rates of completion and of drop-out have not improved, however, and there appears to be a worsening of age-appropriate completion rates. Nonetheless, the first half of the period since 1991 saw substantial increases in rates of ever-attendance and of current-attendance at the basic education level. This growth appears to have been driven by narrowing regional differentials, increasing welfare, urbanisation, improving gender equity, smaller and less dependent households and a reduction in the number of children involved in child labour. It is in relation to progression towards higher levels of education that more significant inequity emerges and in 2006 completion of lower secondary education in Ghana remains the preserve of children in areas and households of relative economic privilege.

Human Capital, Poverty, Educational Access and Exclusion: The Case of Ghana 1991-2006

1. Introduction

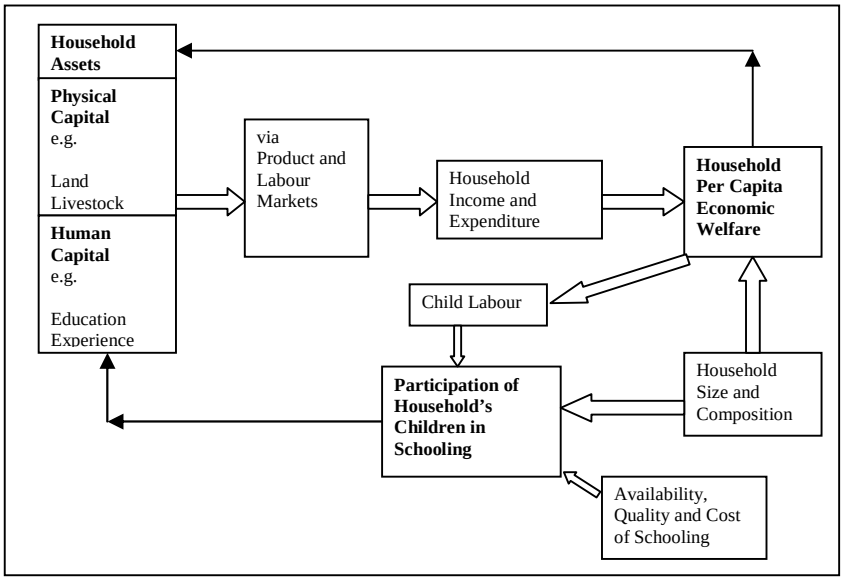
This monograph consists of two distinct but closely related analyses which employ data from rounds 3, 4 and 5 of the Ghana Living Standards Survey, conducted in 1991/2, 1998/9 and 2005/6. The first examines the determination of household welfare or consumption, focusing on the role of household human capital assets, while the second explores the determination of participation in and/or exclusion from schooling.

Exclusion from basic education is widely recognised both as a denial of a fundamental human right and as a privation of an essential economic asset in the struggle against poverty. While in global terms Ghana remains economically poor and access to basic education is relatively limited, both moderate economic growth and widening participation in education have been steady features of the country's development since the late 1980s. Since the Ghana Living Standards Surveys (GLSS) began in 1987, the surveys have revealed growth in basic educational indicators and reductions in absolute poverty. GLSS 5 found that by 2005/6, 84.8 percent of children of primary school age were attending primary school (GSS, 2007) while in 1987 (GLSS 1) the figure was 65.7 percent (GSS, 1988). Over the period between GLSS 3 and 5 (which used identical poverty measures) the 'upper poverty line' measure moved from defining 52 percent of Ghanaians as poor, to a much reduced 28.5 percent (GSS, 2007).

Both poverty reduction and the achievement of Education for All feature prominently among the Millennium Development Goals (MDGs). There are sound intuitive, theoretical and empirical reasons to believe that certain synergies exist between them, rooted partly in the neo-classical human capital theory (Schultz, 1961; Becker, 1964). Moreover, links between education and poverty are cited not infrequently in the policy literature and not least in Ghana (see GoG, 1997). The greater prevalence of poverty among the less well educated is indeed a pattern which may be found in practically every context, but nevertheless the relationships between education and poverty are complex and contingent. It is well established in developing country contexts that household 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.

Accordingly, household welfare and human capital may be considered to exist in a relationship of co-determination, such that poverty may be properly viewed as both cause and consequence of low levels of human capital (see Knight et al., 2008). Figure 1 summarises some of the key linkages explored in this monograph. The relationships between household human capital stocks, household welfare levels and household investment in human capital (in the form of the decision to enrol children in school) play a central part in the inter-generational transmission of both privilege and poverty. Understanding these empirical issues is therefore crucial for education policy-makers and is central to the research agenda of CREATE (the Consortium for Research on Educational Access Transitions and Equity).

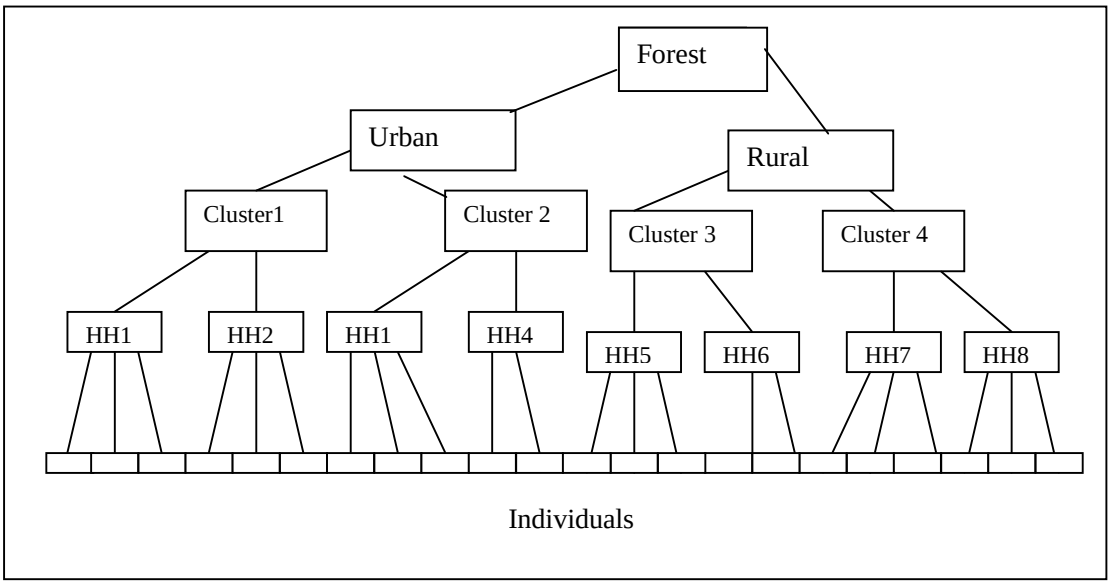
Figure 1: Examples of linkages between education and economic welfare



1.1 The 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. Stratification is by urban/rural location and by forest/coastal/savannah ecological zone (illustrated in Figure 2). Clusters or primary sampling units (PSUs) are census enumeration areas selected systematically using a 'probability proportional to size' method (GSS, 1999). A price questionnaire is administered to allow for corrections for costs of living by area and point in time and sampling weights are used to account for changes in the population size of enumeration areas between census (sampling frame) and survey. The censuses used were conducted by the GSS in 1984 and 2000. While the surveys do include a community questionnaire, this is only administered in rural areas and so cannot be used for national-level analysis. 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. The surveys did not gather data at school level, nor were questions asked of households in relation to issues of school quality, limiting the availability of supply-side data on access to education.

Figure 2: Illustration of data structure in GLSS



1.2 Structure of the study

The study is comprised of two sets of empirical analysis. Part One investigates the determination of household welfare with particular attention to human capital. Part Two explores the determination of household human capital investment (in the form of the schooling participation or otherwise of children) with particular attention to welfare, household and child characteristics and community variables. Focus is on the 'zones of exclusion' defined by the CREATE analytic model and discussed in Part Two (Lewin, 2007). Both sets of analysis are conducted with data from GLSS 3, 4 and 5; allowing a consideration of trends in the importance of determinants over the period since 1991. Both parts begin by setting out a conceptual framework drawing on appropriate literature and proceed with an account of the modelling approach and procedure followed by presentation of the results and discussion thereof. The study concludes by drawing together the findings of the two analyses. The approach adopted employs both descriptive analysis and regression modelling.

2. Human Capital, Poverty and Household Welfare in Ghana in the 1990s

2.1 Conceptual framework and literature review

Human capital theory (Schultz, 1961; Becker, 1964), provides a conceptual basis for a positive relationship between education and poverty reduction but rests on assumptions whose satisfaction cannot be taken for granted, particularly in the sub-Saharan African context (Rolleston and Oketch, 2008). Moreover, the 'conventional wisdom' of World Bank lending policy (see Psacharopoulos, 1994) - that returns to education are higher in poor countries and for lower levels of education is becoming harder to justify in the light of recent studies conducted in the wake of rapid educational expansion at the basic level (Pritchett, 2001). Nevertheless, sub-Saharan Africa remains the world's poorest region and both economic and human development will depend on ensuring that education is both economically valuable and viable. Of key importance are the spatial distribution and temporal trajectories of returns to education along the routes of development and educational expansion. If the benefits of education are lowest for the poorest and most recent beneficiaries (for whom relative costs are highest) and/or decline rapidly with expansion, the poverty-reducing potential of education policy may be undermined, particularly where there is a concern for relative poverty.

The primary strand of empirical work linking education and its economic benefits centres on the estimation of 'rates of return' to education using regression of Mincerian wage equations (Patrinos and Psacharopoulos, 2004). This robust econometric approach may demonstrate impressive wage effects of 'human capital' but in Ghana, like many countries in sub-Saharan Africa, less than sixteen percent of the labour force is employed in the formal wage sector (see Figure 3). Moreover, almost half of the wage sector is made up of public service employment where the link between earnings and productivity may be weak. Alternative approaches have estimated income-based 'returns to education' in self-employment and in agriculture (Appleton and Balihuta, 1996, Kingdon and Soderbom, 2007, Jamison and Lau, 1982, Lockheed et al., 1980). Some such studies have reported notable benefits for farmers and Teal's empirical work found that education is almost as beneficial in Ghana for the self-employed as for the employed (Teal, 2001). In recent work, however, returns in Ghana are found to be rather lower in self-employment and agriculture than in wage-employment (Kingdon and Soderbom, 2007). Jolliffe argues that much of the value from increasing the educational attainment of farm households is found in its impact on off-farm activities, including the reallocation of time away from farm work (Jolliffe, 2004) indicating that 'returns' to educating farmers may also result in diversification away from farming.

The sub-Saharan African region 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. Bennell (1996) argues that there may have been a good deal of over-estimation in the past and Knight et al. (1992) contest the methodologies which report particularly high returns to primary schooling. Glewwe and Ilias' (1996) study in Ghana found that when the public sector was excluded, there were virtually no returns to education. Pritchett's (2001) review of studies in Africa reports generally low rates of return which accord with Bigsten et al's (2000) finding that that rates of return to education may well be lower than those for physical capital. Besides highlighting methodological concerns, the variety of findings also indicates a need to examine returns in the light of wider macro-economic factors which play a role in wage determination according to education. Trade openness, economic liberalisation through structural adjustment and the extent of economic growth were found to be particularly germane in the work of Soderbom and Teal (2003). The human capital route to higher incomes assumes that education has the effect of enhancing

productivity; that labour markets are competitive; that growth in educated labour is met with sufficient employment opportunities; and that levels of physical capital and infrastructure do not limit productivity growth (Rolleston and Oketch, 2008). While the satisfaction of such assumptions clearly varies between countries and across time, intra-national variation in the 'complementary conditions' for successful educational investment may also be important.

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 et al. (1984) defines extreme poverty as a consumption level below the equivalent of $1 a day and moderate poverty as a level below $2. These measures are absolute in that they are fixed at constant monetary equivalent levels across time and space and say nothing about the overall distribution of consumption. 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 using the welfare variable computed from the GLSS (GSS, 2000).

In addition to incomes from employment, agriculture and self-employment, a range of other factors influence the abilities of individuals to meet consumption and nutritional needs. The ownership of physical assets on which returns may be earned, alongside a host of factors associated with the areas in which a household is located also affect susceptibility to poverty. On the issue of whether to measure poverty on the basis of an aggregate of all sources of income or using consumption proxied by expenditure, Friedman's 'Permanent Income Hypothesis' provides the classical case for the latter (Friedman, 1957). The hypothesis holds that consumption is a function not necessarily of current income but of long term expectations of income not yet earned. The point is that shorter term fluctuations in incomes are not strongly reflected in consumption patterns because individuals and households seek to 'smooth' consumption in accordance with their expected 'permanent income' including by borrowing, saving or releasing savings. The hypothesis suggests that consumption is a function of wealth or assets on which income may be earned rather than current income. 'Assets' may be taken to include 'human capital' such as education and experience as well as physical assets such as land and machinery.

A foundational assumption in microeconomic theory is that agents seek to maximise their total utility, given certain constraints, most obviously the resources available to them. 'Utility' itself, a concept allied to 'happiness' and the satisfaction of desires and which may be traced to the work of Jeremy Bentham (Bentham, 1789) is somewhat unobservable empirically and hence requires the identification of proxy measures. 'Welfare', measured in terms of 'consumption' of goods and services is a standard candidate in economic approaches although clearly 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. Accordingly it is possible to construct estimates of the resources needed to reach certain consumption levels which may be identified with levels of poverty, welfare, utility and

nutrition. A key determinant of the resources required to reach a given utility level is of course the prevailing set of prices of 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 (Glewwe, 1991; Canagarajah and Pörtner, 2003; Coulombe, 2005). 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. Other studies use logistic regressions to 'predict' poverty outcomes (defined by consumption measures) on the basis of a range of explanatory variables. Studies of this type have found significant 'effects' of education (Abuka et al., 2007). 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 (with respect to the outcome variable). A truly exogenous determinant of consumption will not be determined by past consumption nor be co-determined with current consumption. Such variables may be difficult to find, however. Studies differ according to their approach to endogeneity with respect to explanatory variables in the consumption function. 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. The choice of crops planted for farmers or of occupation for wage-earners is likely to reflect beliefs about the effects of these decisions on welfare and about any comparative advantage a household might possess in such activities. 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. They emphasise 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. The approaches of Adjasi and Osei (2007) and of Coulombe (2005) are concerned only with consumption correlates. Naturally, this allows much greater freedom in the selection of variables. 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. This work serves to describe the characteristics of higher and lower consumption groups but also serves to identify potential

endogeneity concerns in causal studies. 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. They include household size as an explanatory variable, treating it as pre-determined with regard to consumption levels, an assumption which must be borne in mind when interpreting their results. Equally, they include values for household 'assets' of various kinds and hence the values of the 'effects' estimated are conditioned upon the particular distribution of assets which prevails in the data used.

Differences in modelling approach complicate the interpretation of findings of consumption studies and, as with estimation of the rate of return to education, a diverse range of results can be found. Nevertheless, in the Ghanaian context, a number of studies do show consistency in finding positive educational effects, although these may be rather lower in more recent studies. 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 percent 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. When using measures of reading and mathematical ability in place of schooling variables, however, Glewwe found significant effects including for those employed in the private sector (Glewwe, 1991).

2.2 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. It requires the development of consumption and educational indicators, derived from items in the household survey questionnaires alongside a range of controls. 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). Additionally, returns to assets are affected by contextual variables including urban/rural location and other features of the locality and environment for which indicators are constructed. 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 (expressed in 1999 Cedis at the purchasing power level of Accra) and divided by the number of equivalent adults in the household calculated on an age-related calorific needs scale. It includes the value of all household expenditure including both food and non-food items (including education spending). Since regression techniques assume a normal distribution for the dependent variable, the logarithm

is used to restore 'normality' as welfare, like income has a distribution with a rather long upper tail. 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. The full list of variables, classified as household and contextual level factors is given in Table 1. Their descriptive statistics are shown in Table 2 in the Appendix. 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. 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 educational qualifications of the household head only, then with the full set of controls. The results are reported in Tables 3 and 4 in the Appendix. Tables 3 and 4 show the regression results separately for GLSS 3, 4 and 5 data. The education reference category is household heads with no formal education (i.e. those who have never attended school). Table 4 also reports the results of pooled regressions – firstly using simple ordinary least squares and secondly using cluster-level 'fixed effects' to take account of unobserved cluster level factors. 'Fixed effects' results are reported for the separate survey round regressions.

Table 1: Description of explanatory variables: household welfare equation

Household Characteristics	
Highest level of education of household head	Set of dummy variables for the household head's highest completed level of education
Log of household size	Log of the household size (in equivalent adults on calorific needs scale)
% girls aged 7 to 14	Proportion of household members who are girls aged 7-14
% boys aged 7 to 14	Proportion of household members who are boys aged 7-14
% male adults	Proportion of household adult members who are male
% under 7	Proportion of household members who are boys aged under 7
Propover59	Proportion of household members who are aged over 59
Land owned (acres)	Area of land owned by the household in acres
Sex - Head of HH	Dummy variable for the gender of the household head (female is the reference group)
Age of Head of HH	Age of the household head in years
Age squared/1000 (HHH)	Square of the household head's age divided by 1000
Contextual Characteristics	
Urban	Dummy variable 1 if cluster location is urban (rural is reference)
Region	Set of dummy variables for the child's region of residence - Upper West region is the reference category
Survey round	Dummy variable for GLSS 4 and GLSS 5 – GLSS 3 is the reference category

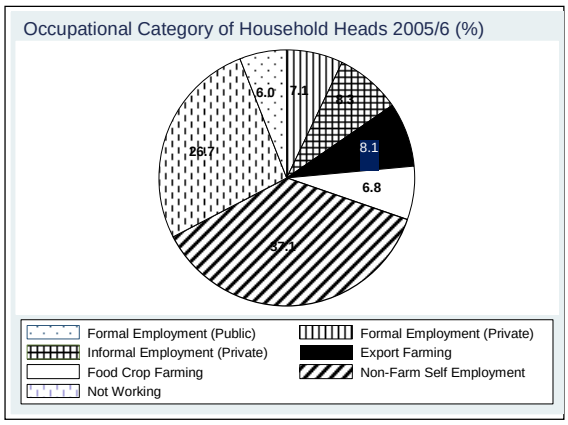
Source: Variables computed from GLSS 3, 4 and 5

2.3 Descriptive results

The proportion of adults per household with no formal education declined markedly over the period from 1991-2006 and of course reflects educational access improvements stretching back much further than this period alone. The trend is illustrated in Figure 4 which shows that greater gains appear to have been achieved between 1991 and 1999 than between 1999 and 2006. The reverse pattern is found in relation to access to higher levels of education. Figure 5 shows the increasing trend in relation to adults with senior secondary or higher level qualifications in the 18-35 age group. The proportions of household heads with technical qualifications or degrees rose more than two fold, while remaining very small at less than 6 percent in total. By 2006, a greater proportion of households were located in urban areas -

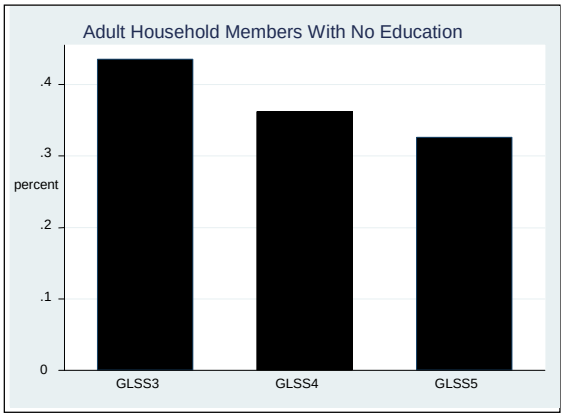
around 43 percent compared to 35 percent; and the proportion of children in the average household had declined in all three age/gender categories. Overall household size declined between 1991 and 2006 and it appears that there were also fewer male adults per household by the end of the period. Although occupational groupings are not included in the regression model owing to co-determination with household welfare, Figure 3 presents the descriptive data for GLSS 5 for illustrative purposes. Around 15 percent of household heads were engaged in formal employment, 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 difference over the period has been an increase in private sector and a decline in public sector shares of formal employment. Per capita household welfare levels increased steadily although not dramatically and gains appear to have been rather greater at the higher end of the welfare distribution. Figure 6 illustrates the trend in welfare by household expenditure quintile.

Figure 3



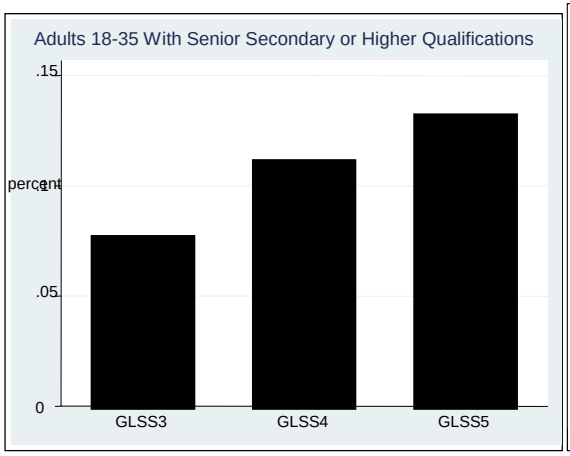
Source: Computed from GLSS 5

Figure 4



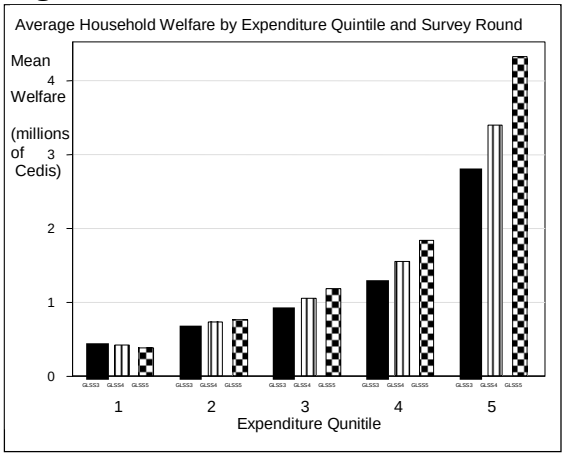
Source: Computed from GLSS 3-5

Figure 5



Source: Computed from GLSS 5

Figure 6



Source: Computed from GLSS 3-5

2.4 Regression modelling results

The results in Table 3 show the partial correlations between household welfare and the household head's qualification level. Strong and highly significant associations are found overall and in general co-efficients appear to be increasing in size over time. This suggests that, relative to households where the head had never been to school, households with educated heads became increasingly well off in the period 1991-2006. Clearly, this is not to

suggest that 'education effects' increased in size since educational qualifications are likely to be correlated with other factors important in the determination of household welfare. Nonetheless, it may be considered to indicate that better educated households became an increasingly privileged, albeit larger group over the period.

Table 4 shows, as might be expected, that the introduction of controls substantially reduces the size of education co-efficients, although they remain sizable and statistically significant. The pattern of increasing co-efficient size is also somewhat reduced, though still evident. Among the controls, it is worth noting that per capita household welfare is strongly negatively related to household size, to the number and type of dependents and to the proportion of male adults. It is positively related to urban as opposed to rural location. Regional effects which may correspond to differences in the extent of economic opportunity across Ghana are found to be sizeable in the pooled regression, with areas outside northern Ghana being associated with considerably higher welfare levels. Male household heads were found to have a positive effect on household welfare, although this declined to statistical insignificance by GLSS 5. In the presence of the full range of controls, the effects of the GLSS 4 and 5 surveys when compared to the GLSS 3 survey were positive and substantial, indicating that household welfare had risen over time as a result of factors outside the model. However, the co-efficients for both survey rounds were very similar at around 15 percent, indicating that the effect of these factors was felt mainly in the earlier part of the study period.

Education effects on household welfare are indicative of 'consumption returns' to human capital assets of the household, relative to a household whose head had no formal education, adjusting for other covariates. In relation to the household head, 'some education', which indicates schooling without formal qualifications, was found to increase household per capita welfare by between 1 and 9 percent over the period, while for heads who had gained middle school qualifications the figure was between 16 and 19 percent. Figures for higher levels of education were much higher and also showed a more clearly discernible increasing trend. For teacher training, the figure was 22 percent in GLSS 3, rising to 57 percent in GLSS 5. For technical and vocational qualifications, the effect rose from 35 percent to 51 percent and for a degree from 65 percent to 90 percent. Only in the case of senior secondary qualifications did the effect decline – from 56 percent to 37 percent. One possible explanation lies in the four fold increase in size of this group although household heads with middle school qualifications or less accounted for nearly 85 percent of all heads even by 2005/6. Using the consumption function approach at least, there appears to be strong evidence for increasing education effects by education level and for increasing effects over time at higher levels of qualification.

When comparing the two approaches used in the pooled regression, the use of 'fixed effects' for clusters (EAs) in the survey design reduces the effects of the household head's education fairly consistently by up to one third (all the individual survey round regressions use 'cluster fixed effects'). A relatively high level of intra-cluster correlation (ICCC=0.30) between household welfare levels by cluster was found to be unexplained by the inclusion of the selected covariates included in the OLS model whose contextual variables included regional dummies, an urban/rural dummy and a survey round dummy. The fixed effects approach takes account of 1,245 local effects. Moreover, clusters are often villages or other settlements which may be associated with inter-household welfare homogeneity owing to shared infrastructure, geographical, climactic and other unobserved socio-economic and demographic characteristics. They are also associated with a degree of homogeneity of educational access largely due to the availability of schooling in a locality. It is possible therefore that education effects in the simple OLS model are inflated by reflecting part of the unobserved effect of overall development at cluster level which may be better accounted for in the 'fixed effects' approach.

2.5 Discussion

Improvements in household welfare in Ghana since 1991, reflected in declining poverty, may be understood using a 'consumption function' approach to be the result both of changes in the mean values of determining factors of consumption and of changes in the effects of these factors. The effects of higher levels of education strengthened, improving the welfare position of better compared to less well educated households *ceteris paribus*. Overall education levels improved, however, increasing the size of the group benefitting from education premiums with regard to household welfare. More households benefitted from the positive effect of urban location by 2005/6 and the stable negative effect of larger household size was mitigated by a decline in mean household size. The decline in the proportion of adult male household members may be related to the decline in household size and to the decline in the positive effect of male household heads, although this last effect may also reflect an improving gender position with regard to education and the labour market. Changes in household size and structure clearly played an important part in improving welfare. Reductions in the average number of children and especially young children per household were accompanied by reductions in the negative effects of these factors. These findings may suggest that, at least up to age fourteen, children in Ghana overall do not seem to play a significant role in generating household income through work. Reductions in the numbers of young children per household might also be interpreted as creating greater opportunities for income generation activities at the household level by reducing the need for child care.

It is important to note that changes in household composition may be related to improvements in access to education in previous periods, through the effects of education on fertility, child health, children's schooling, inter-region and rural-urban migration and on gender equity. These linkages contribute to the establishment of virtuous or vicious circles in the education-welfare relationship (see Knight et al., 2008). 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)

The second part of this monograph is intended in part to explore the welfare-education relationship with a view to shedding light on the ways in which household welfare is not only a consequence of adult members' educations but itself is a cause of the education of the next generation.

3. The Determination of Exclusion: Evidence from the Ghana Living Standards Surveys 1991 - 2006

3.1 Conceptual Framework and Literature Review

The model which forms the basic analytic framework for CREATE defines full and meaningful access to basic education to include regular attendance, progression at appropriate ages with limited repetition, acceptable levels of achievement, and more rather than less equitable opportunities to progress to higher educational levels. CREATE identifies a sequence of 'zones of exclusion' (Lewin, 2007) which classify exclusion on a decreasing scale, so that children in higher zones have had more access to basic education than those in lower zones. Clearly these forms of exclusion are also important proximate determinants of attainment (Langsten and Hassan, 2007). The definitions of CREATE Zones 1 to 6 are given below.

Zone 1 Children never enrolled in school
Zone 2 Children who have dropped out before the end of primary schooling
Zone 3 Those in primary school but who are at risk of dropping out
Zone 4 Those who complete primary education but fail to enter secondary
Zone 5 Those who enter but fail to complete lower secondary school
Zone 6 Those in lower secondary school but who are at risk of dropping out

Zones 1, 2, 4 and 5 define exclusion in terms of non-attendance at school and thus do not refer directly to reasons for non-attendance. Exclusion on the CREATE model will, for some children and their families be literal - where there is an absence of local school provision or perhaps where the real costs of schooling are prohibitive. But for others, non-attendance at school 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. These possibilities represent exclusion in a slightly different sense.

Modelling of exclusion needs, ideally, to account for features of the full range 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 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

(UNESCO, 2005; Kingdon and Theopold, 2006). The opportunity cost of schooling is largely determined by the rewards to and availability of child labour. While there is clearly a possibility of co-determination of a child's work and schooling, previous studies indicate that in the Ghanaian context among other developing countries, 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 (Canagarajah and Coulombe, 1997; Siddiqi and Patrinos, 1995; Ravallion and Wodon, 2000; Bhalotra and Heady, 2003; Bhalotra and Tzannatos, 2003). Direct and indirect costs of schooling may be falling as a result of efforts to improve access, but were in past studies in Ghana found to have a significant negative effect on enrolment (Lavy, 1996). Other studies, however, indicate that high school fees may even be associated with high levels of enrolment (Canagarajah and Coulombe, 1997). 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 or 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). Again, however, there is potential for co-determination. Parents' education is found to be a strong determinant of children's schooling in Ghana and sub-Saharan Africa more generally (Sackey, 2007; Canagarajah and Coulombe, 1997; 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 and in households with larger proportions of dependents, older children are often required to act as carers. It is also possible that the age and gender of the household head may play a role, including through differences in experience and in preference for education. 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 (Dreze and Kingdon, 2001; Baschieri and Falkingham, 2006). Perhaps the most striking feature of the Ghanaian context overall is the North/South divide, which affects almost all indicators, including school participation (Fentiman et al., 1999). On the supply side, availability and accessibility 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 et al., 1999; Lavy, 1996)

3. 2 Modelling Approach and Procedure

GLSS 3, 4 and 5 each contained the following questions in the education modules of their household questionnaires. The household was asked to reply in relation to each member aged five years and above. One notable difference between the surveys was that GLSS 4 asked households only to identify the highest educational level (rather than the highest grade) each member had attained.

> Has [*name]* ever attended school?
> What was the highest level (grade in GLSS 3 and 5) completed?
> What was the highest qualification attained?
> Did [*name]* attend school at any time during the last 12 months?
> (if so) Has [*name]* left school now?

Data reported in response to these questions were used to generate school participation outcome variables. Dichotomous variables were created for 'ever attendance' and 'current attendance' and a polytomous variable was created to capture the range of access/exclusion outcomes according to the CREATE model. School attendance outcomes were modelled using a binary probit to estimate the effects of explanatory variables for characteristics of the child, household and context on the probability that a child ever attended or was currently attending school. Marginal effects are reported for ease of interpretation. Schooling access outcomes were 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. Both model types are fitted using maximum likelihood estimation.

GLSS data are not adequate to address zones 3 and 6 of the CREATE model since they are cross-sectional surveys which do not investigate factors surrounding 'risk' of drop out. Analysis is therefore limited to Zones 1, 2, 4 and 5 plus, for reference, the 'non-excluded' group of those who had completed lower secondary school.

Explanatory variables for key child, household and contextual factors were derived from a range of modules in the GLSS surveys. 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. These included the proportion of male adults in the household, the size of landholdings and the number of days lost to illness. In order to retain the maximum sample size of children of school age, variables which were only observed for a smaller sample are not included in the main modelling approach. These include parents' education, the distance to school and costs incurred for schooling. However, costs of and distance to school were included in a separate exercise. 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. Such effects need to be interpreted as conditioned on the prevailing distribution of explanatory variables at the time of the survey. In order to explore possible co-determination of variables which are not so clearly pre-determined with respect to a child's schooling participation, a separate modelling exercise was conducted with the omission of child labour, household income and occupational class variables. The full list of explanatory variables is shown in Table 5 below.

Table 5: Description of explanatory variables

Child Characteristics	
Age in years	Child's age in years
Age squared/1000	Square of child's age divided by 1000
Sex	Dummy variable for child's gender (female is reference category)
Relationship to the household head	Set of dummy variables for child's relationship to the household head – son/daughter is the reference category
Child's work	Set of dummy variables for main category of child's work – not working is the reference category
Household Characteristics	
Log of household size	Log of the household size (in equivalent adults on calorific needs scale)
% girls aged 7 to 14	Proportion of household members who are girls in the age range 7-14
% under 7	Proportion of household members who are boys aged under 7
% over 59	Proportion of household members who are aged over 59
Sex – Head of HH	Dummy variable for the gender of the household head - female is the reference category
Age – Head of HH	Age in years of household head
Age squared/1000 (HHH)	Square of household head's age divided by 1000
Occupational group of the household head	Set of dummy variables for the occupation of the household head (not working is the reference category)
Log of household welfare	Log of annual household consumption expenditure in the child's household corrected for household size and relative prices by region/survey round
Contextual Characteristics	
Survey round	Dummy variable for GLSS4 and GLSS 5 - GLSS 3 is the reference category
Urban	Dummy variable for urban/rural location - rural is the reference category
Region	Set of dummy variables for the child's region of residence - Upper West region is the reference category
Urban	Dummy variable for urban/rural location - rural is the reference category
School cost	Mean per child total spending on schooling by census cluster (millions of 1999 Ghanaian Cedis at purchasing power of Accra)
School travel time	Mean time spent travelling to school by those currently attending at the cluster level (hours)

Source: Variables computed from GLSS 3-5

3.3 Descriptive Results

3.3.1 Basic Education Attendance and Completion 1991-2006

Figure 7 shows the proportions of children in the age range 5-17 who had ever attended school by region in 1991/2, 1998/9 and 2005/6. The general trend is that the proportion rose by ten percentage points from 0.77 to 0.87 between 1991 and 1999, 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). CREATE exclusion zone 1 comprises those who had never attended; the complement of the figures represented in Figure 7. Zone 1 exclusion ranged from as high as two thirds of children in the Upper East region in 1991/2 to only 3 percent of children in the Central region by 2005/6. Zone 1 exclusion fell in the northern regions to between 33 and 42 percent by 2005/6, although this improvement appears to have occurred mainly in the period between 1991/2 and 1998/9. In the other regions the figure ranged from 3 to 15 percent.

Figure 7

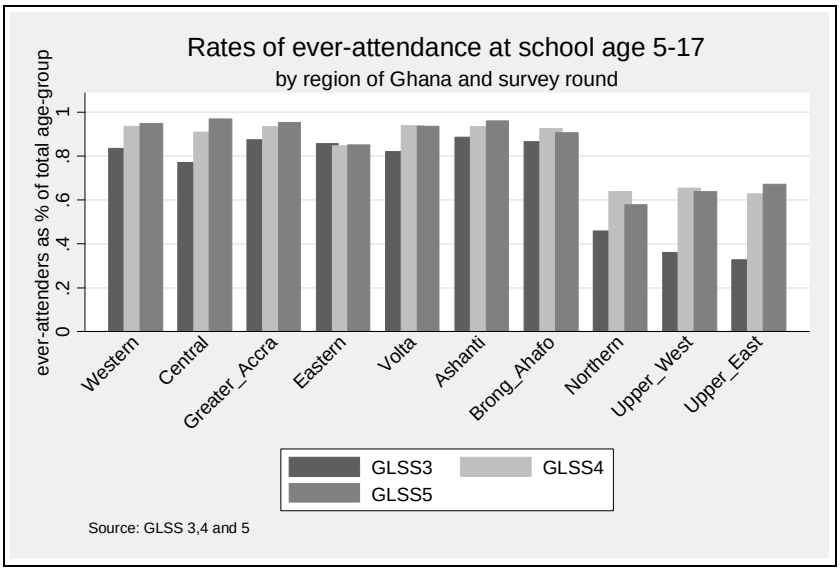


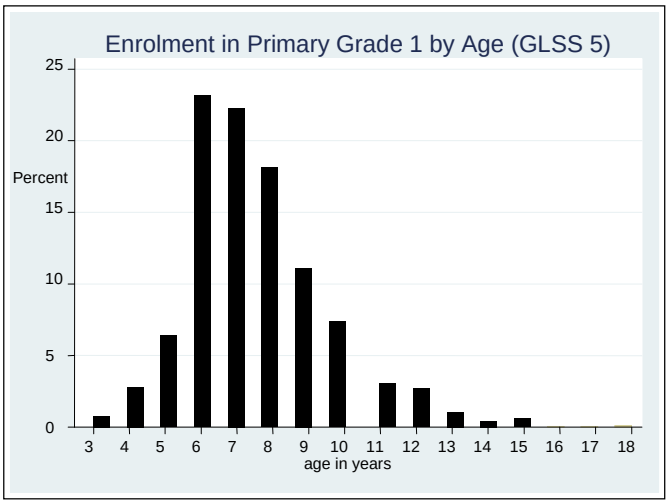
Table 6 shows the figures for current attendance, defined at the time of the survey visit for the same age range and also at ages 7 and 14 specifically. Figures are expressed as proportions of all children in the age range, including those who had never attended school. In common with the ever-attendance results, the period between 1991/2 and 2005/6 was found to be characterized by a ten percentage point increase in the overall rate of current attendance (from 0.71 to 0.81), which also appears to have occurred mainly in the period from 1991/2 to 1998/9. The figures show that current attendance rates, like ever-attendance rates were substantially lower across the age range for the three northern regions. At age 7, between 7 and 26 percent of children were not attending school in 1991 outside the northern regions. In the north, this ranged from 54 to 78 percent. The figures for the north had improved substantially by 1998/9 when 30 to 31 percent were not attending, but this growth in current attendance rates does not appear to have been sustained thereafter since the figures for 2005/6 ranged from 31 to 48 percent. Moreover, current attendance nationally at age 14 appears to have fallen from 86 percent in 1998/9 to 81 percent in 2005/6, while it remained static at age 7 over this period at 84 percent. When current attendance is considered only in relation to those who had ever attended school, there is surprisingly little variation over the period, with 88 percent of those who had ever attended currently attending in 1991/2, and 89 percent in 1998/9 and 2005/6.

Among those who were not currently attending are those who had never attended (Zone 1 considered above) and those who had dropped out of basic education before the end (Zones 2, 4 and 5). The difference between the proportions of children who had ever attended and those who were currently attending indicates the prevalence of drop-out. Although the nominal age at which basic education ends in Ghana is 14 or 15, late enrolment, grade repetition and periods of absence mean that few children reach the end by this age. Hence, the age range in the tables and figure is extended to 17 to allow for a two to three year 'age-grade delay'. The prevalence of late enrolment in grade 1, possibly the dominant cause of age-grade delay is shown for GLSS 5 in Figure 8. Overall drop-out figures, representing the extent of Zone 2, 4 and 5 exclusion[1] are shown in Table 8 in the Appendix. As a percentage of all children in the

[1] Because of limitations in the GLSS question modules, it was not possible to distinguish children who had completed JSS and left school from those who had dropped out of Senior Secondary School.

age range, exclusion via drop-out of basic education affected between 1 and 10 percent of the age group according to region with no clear trend over the time period. The national figure remained constant over the period, with around 6 percent of children being identified in Zones 2, 4 and 5. Although the figures are lower for the northern regions, owing to lower ever-attendance in these regions they represent a similar proportion of drop-outs among those who had ever been to school.

Figure 8



Source: GLSS 5

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[2]. Table 7 uses multiples provided by the Ghana Statistical Service to 'gross-up' sample data and estimate figures for the population of Ghana at each of the three survey rounds. It is clear that 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. The number of children attending school in 2005/6 is estimated to be larger than the 1991/2 figure by more than three million. 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.

Table 6: Proportions of children aged 5-17 who were currently attending school by region and survey round

	Age 7			**Age 14**			**Total age 5-17**		
	GLSS 3	**GLSS 4**	**GLSS 5**	**GLSS 3**	**GLSS 4**	**GLSS 5**	**GLSS 3**	**GLSS 4**	**GLSS 5**
Western	0.76	0.91	0.94	0.77	0.91	0.83	0.75	0.89	0.89
Central	0.74	0.86	0.92	0.78	0.93	0.88	0.71	0.85	0.90
Greater Accra	0.81	0.92	0.91	0.88	0.95	0.87	0.82	0.87	0.89
Eastern	0.83	0.75	0.83	0.90	0.79	0.87	0.80	0.80	0.79
Volta	0.73	0.90	0.88	0.79	0.89	0.94	0.77	0.87	0.86
Ashanti	0.83	0.93	0.97	0.81	0.88	0.84	0.79	0.86	0.89
Brong Ahafo	0.82	0.85	0.91	0.88	0.93	0.82	0.79	0.88	0.86
Northern	0.46	0.70	0.52	0.44	0.68	0.58	0.44	0.60	0.55
Upper West	0.35	0.69	0.63	0.31	0.68	0.58	0.34	0.64	0.60
Upper East	0.22	0.69	0.69	0.48	0.57	0.64	0.32	0.57	0.64
Total	**0.71**	**0.84**	**0.84**	**0.77**	**0.86**	**0.81**	**0.71**	**0.81**	**0.81**

Source: Computed from GLSS 3-5

[2] There is some controversy over the GSS estimates of population growth rates. See White, H. (2004) *Books, Buildings, and Learning Outcomes: An Impact Evaluation of World Bank Support to Basic Education in Ghana*, World Bank Publications.

Table 7: Educational Access (ages 5-17): Estimated Population Figures Using GLSS 3-5 (millions)

	GLSS 3 (1991/2)		GLSS 4 (1998/9)		GLSS 5 (2005/6)	
	estimate	std. error	estimate	std. error	estimate	std. error
Population	5.59	0.28	6.94	0.47	8.82	0.35
Ever-attended	4.28	0.23	5.80	0.40	7.52	0.29
Currently-attending	3.94	0.21	5.43	0.38	7.03	0.28
Dropped-out	0.34	0.03	0.37	0.03	0.49	0.03

Source: Computed from GLSS 3-5

Tables 9 and 10 in the Appendix report the proportions of children who had ever attended school in the age range 11-17 who had also completed primary school and in the age range 14-21 for those who had completed JSS. CREATE exclusion Zone 2 comprises primary school non-completers. If it is assumed that the vast majority of children who will complete primary school will do so by age 17, then the data suggest that over the period, between one fifth and a quarter of children who had ever attended school in Ghana were excluded in Zone 2. CREATE Zone 5 is comprised of JSS non-completers and Zone 4 of those who completed primary but did not go on to secondary school. Again, if it is assumed that the vast majority of children who will complete JSS will do so by age 20, then it appears that around two-fifths to a half of children who had ever attended were excluded in Zones 4 or 5. Owing to limitations in the question module of GLSS 4, it is not possible to distinguish between Zone 4 and 5 exclusion across the period although this is addressed for GLSS 5 only in the next section.

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 percent of 17 year olds had completed primary school, compared with 74 percent in 1992 (although the rate in 1999 was 80 percent). With regard to lower secondary school completion, rates appear to have remained fairly static over the period overall, with around half having completed by age 20 in both 1991/2 and 2006/7. In the case of both primary and secondary completion, a lower proportion of children had completed by the earlier age measure (13 or 17) in 2006 than in 1991, indicating a possible increase in age-delayed completion or a possible future decline in overall completion rates. In all regions, primary completion rates by age 13 peaked in 1998/9. Other patterns by region were varied, with some regions experiencing improved completion rates while in others rates remained static or declined.

Table 11 in the Appendix reports the mean values of the variables used in regression modelling for the full sample of school age children. It shows that over the period, the proportion of children undertaking work (other than domestic chores) fell from around thirty percent to sixteen percent, largely because of a decline in children reporting involvement in agricultural work. Only a very small fraction of children were involved in waged work, self-employment or unpaid work, while up to a quarter were involved in farm work. Table 12 in the Appendix shows the mean values for ever-attendance and current-attendance by work category. In GLSS 3, there was little difference between the ever-attendance rates between working and non-working children, although this difference became substantial by GLSS 4 and continued to grow to GLSS 5 so that in 2006, 92 percent of non-working children had attended school while only 62 percent of children in farm work had attended. With regard to current attendance, differences are large and grew across the survey rounds. 92 percent of non-working children were attending in each of the surveys while the figure for waged children fell from 36 percent to 6 percent and for farm workers from 82 to 71 percent. As

noted in part 1, there was a decline in the proportion of young children per household and the nature of the employment of household heads shifted away from public sector employment, with a greater proportion being employed in the private sector and informally. Household welfare (consumption) per capita rose over the period.

Mean values were calculated at the cluster level for household spending per child on education and for travelling time to and from school. Cluster means were used in modelling the effects of cost and availability of schooling at the local level since observations are only available for children who were currently attending school. Over the period, spending on education showed a steep increase in real terms from around 93,000 Cedis in 1991/2 to around 510,000 Cedis in 2005/6[3]. The mean time spent travelling to school was fairly constant over the period at around 0.6 hours.

3.4 Regression Modelling Results

3.4.1 Initial access

Table 13 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 may be used to examine characteristics associated with exclusion in CREATE Zone 1 (never-attendance). 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 two 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, consistent with an inverted U shape pattern of ever-attendance by age. This indicates that age exerts a positive effect on attendance in the earlier years of basic education and a negative effect thereafter. The overall effect of age on the probability of ever attending school declined substantially between GLSS 3 and 4, remaining stable thereafter. The relationship of a child to the household head was found to exert an important negative effect in the cases of children living in the household who were servants, unrelated to the head or who were a relative other than a son/daughter or grandchild. These effects were particularly large for servants, who were up to 48 percent less likely to have ever enrolled than sons or daughters of the household head. Important effects were found in relation to children's main work activity. Relative to children who were not working, all forms of work had negative effects on the probability of a child ever having attended school. The largest effects were those of waged work, with children involved in this kind of work being 53 percent less likely to have ever attended than those not in work in GLSS 5. A trend of increasing work effects may be observed over the period, so that by 2005/6 the effects of waged work, self-employment and farm work on the probability of having ever attended school had increased two-fold or more.

The main occupation of the household head was found to have a consistent and significant effect on the probability of ever-enrolment only in the case of heads employed in the public sector. Children in these households were 5 to 12 percent more likely to have ever attended than those whose household heads were not in work. In GLSS 3 and 5, children in households whose heads were in private sector formal employment were 3 to 11 percent more likely to have ever attended. 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

[3] expressed in 1998 Cedis at the purchasing power of Accra.

of ever-attendance of between 2 and 10 percent 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, except in the case of the proportion of young children in a household which was found to have a negative effect on the probability of ever-attendance. Children in female headed households were 2 to 3 percent more likely to have ever attended than those in male-headed households in GLSS 3 and 5.

Regional effects were found to be significant and sizeable when almost every region was compared with the reference region of Upper West. The most positive regional effect overall was for the Ashanti region. The effects of residence in the Northern and Upper East regions were small and mostly not significantly different from the Upper West. There appears to have been a general and substantial decrease in the size of regional effects between GLSS 3 and 4, with a smaller decrease being observed between GLSS 4 and 5. A significant effect was detected in the probability of ever-attendance between children residing in urban and rural locations in the GLSS 4 and 5 data, with urban children being between 2 and 5 percent more likely to have ever enrolled. 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 5.2 percent more likely to have ever attended school and those in GLSS 5 6.9 percent more likely (or 1.7 percent more than in GLSS 4).

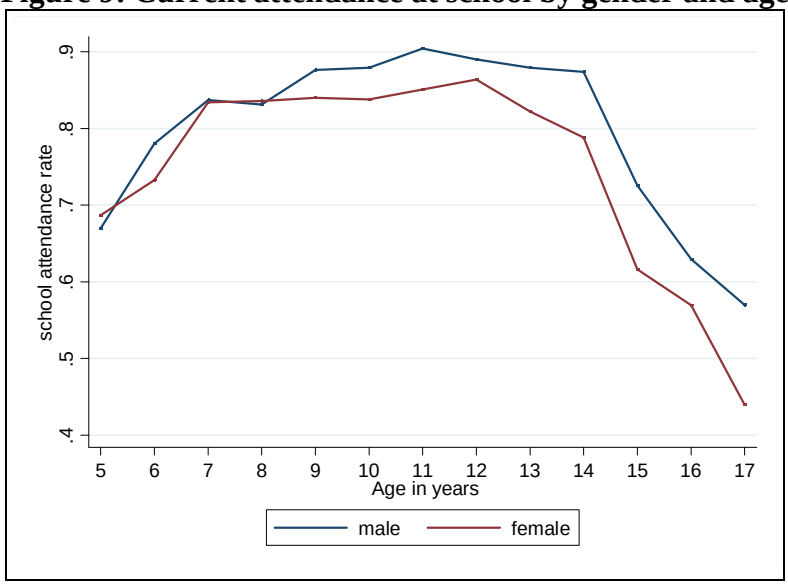
3.4.2 Current Attendance and Drop-Out

Table 15 reports the results of estimation of the probability of a child currently attending school, given certain key characteristics using a probit model The data subset used in this model includes only those children who had ever attended school so that the characteristics of current attenders may be compared to those of current 'drop-outs'. It is important to note that because the GLSS surveys are cross-sections, they identify only those who were not currently attending at the time of the survey visit. Children who have dropped out may, of course, return to schooling. With regard to the CREATE model, the results shed light on the characteristics of children in Zones 2, 4 and 5 although they also include a small number of drop-outs from post-basic education (Senior Secondary School).

The effect of gender on the probability of a child currently attending school was statistically significant in the pooled and individual survey round regressions with boys being more likely to attend. In common with the effect on ever-attendance, the difference in probability between boys and girls decreased over the period, falling from 3.6 to 1.1 percent. Most of this change appears to have occurred between GLSS 3 and 4. Older children were found to be more likely to be currently attending in the lower age range, but like the effect on ever-attendance, the effect was found to be curvilinear and diminishing consistent with a pattern of an inverted U shape (illustrated for GLSS 5 by gender in Figure 9). The effect of age does not appear to follow a discernible trend over the period. A child's relationship to the household head was found to have a smaller and less consistent effect on current attendance than on ever-attendance, although effects of a child being related to the head other than as a child or grandchild were often negative and significant. The effects of children's work were again significant and substantial where the probability of a child's current attendance at school was concerned. The negative effects of a child being in waged work, farm work and self-employment were large and were found to have risen over the period, in common with effects on ever-attendance. A higher proportion of young children in the household appeared to have

a negative effect on the probability of current attendance, as did a higher proportion of over 59s in GLSS 5. Larger household size was also found to exert a negative effect in GLSS 5 although it is notable that significant effects are more likely to occur in GLSS 5 owing to a larger sample size. Among the other explanatory variables, patterns were not clearly discernible. Effects of the household head's occupation were significant only in GLSS 3. Higher household welfare levels were found to have a positive but relatively small effect on the probability of current attendance in GLSS 3 only. Regional effects were notably different in the case of current as opposed to ever-attendance. All regional dummies attained statistical significance in the GLSS 4 current attendance model but only two were significant in the GLSS 3 model and only one regional dummy was significant in the GLSS 5 model. No significant effect was found in relation to urban/rural location and neither the GLSS 4 nor GLSS 5 dummy variable was found to have a significant effect on the probability of current attendance.

Figure 9: Current attendance at school by gender and age



Source: GLSS 5

3.4.3 Exclusion in GLSS 5

Table 15 reports the results of estimation using multinomial logistic regression of the effects of key explanatory variables on the extent of a child's access to or exclusion from basic education in 2005/6. The GLSS 5 education questionnaire allows all children to be identified in one of five mutually exclusive groups, four of which correspond to zones in the CREATE model. The reference category in the model is Zone 1 (children who have never attended school). The remaining groups of children are those who started but did not complete primary schooling (Zone 2), those who completed primary school but received no further schooling (Zone 4) and those who started but did not complete JSS (Zone 5). A final group comprises those who completed JSS or a higher level of education. Although this group does not correspond to a CREATE exclusion zone, it may be considered the full access group where basic education is concerned and is therefore a useful comparator.

The results reported are 'relative risk ratios' for each explanatory variable, indicating the likelihood or risk of a child with a given characteristic being in a particular access/exclusion group, relative to the likelihood of being in the reference group, controlling for all other explanatory variables. The groups in the model represent progressively increasing levels of educational access (decreasing levels of exclusion) so it may be expected that, for characteristics associated with educational advantage, estimated relative risk ratios for those

characteristics will be higher for higher levels of access. This is clearly illustrated in the example of household welfare. A one unit increase in the log of household welfare is found to increase a child's relative risk of being in Zone 2, relative to zone 1 by 1.82 times. The same increase in welfare increases a child's relative risk of being in Zone 4 relative to zone 1 by 2.55 times and increases the relative risk of being in Zone 5 by 3.06 times. With regard to completing JSS, the relative risk was increased by 4.12 times.

The effect of male, when compared to female gender, was found to be an increase in the relative risk of being in Zones 2, 4 and 5 relative to Zone 1, so that boys were more likely than girls to have attended basic education and subsequently dropped out but no more likely to have attended and reached completion of JSS. The relative risk of a boy, compared to a girl dropping out of basic education either during primary school, at the end of primary school or during JSS, relative to the risk of never attending was around 1.5 times greater. A child's relationship to the household head was found to have a significant effect on the relative risk of being in the higher access groups. Non-relatives and relatives other than sons/daughters or grandchildren had a relative risk of being in Zone 2 of around one half of those of a son or daughter of the household head, falling to a quarter or less with regard to the odds of completing secondary school. In the case of servants, the relative risks were very much smaller at only 8 percent of those of a son/daughter for Zone 2 and one percent or less for the other categories. Children's work was found to exert significant effects on access and exclusion. Engaging in waged work reduced a child's relative risk of being in Zone 2 relative to Zone 1 to only 10 percent of those of a child reported as doing no work. All forms of work reduced the relative risk of a child being in higher access groups progressively across the range of groups. Engaging in farm work for example reduced the relative risk of completing secondary school to 14 percent of that of a non-working child and of completing primary school and receiving no further education to 20 percent.

A number of occupations of the household head were found to have significant and sizable effects on the level of access to basic education achieved by children in GLSS 5. Public sector formal employment was associated with the largest effect and children whose household head was in this occupational group had four times the relative risk of being in Zone 2 as opposed to Zone 1 when compared to children whose household head was not working. They had a relative risk 9 times greater of being in Zone 4, 13 times greater of being in Zone 5 and in the case of completing JSS, 21 times greater. Private formal employment, export farming and non-farm self-employment of the household head were found to increase the relative risk of a child being in one of the higher access groups relative to Zone 1 by between 2 and 6 times, although the pattern of relative risk increasing with the level of access was less clearly discernible. Household size and composition variables were not found to have significant effects with the exception that a higher proportion of children aged under 7 in the household was found to decrease the relative risk of a child completing JSS.

Regional dummy variables were found to have significant effects on access and exclusion (relative to the Upper West) with the exception of the Northern region dummy. Children in the other regions were found to have a relative risk of being in Zone 2 compared to Zone 1 between twice (Greater Accra) and 10 (Central) times higher than children in the Upper West. For Zone 4 the relative risk was between 3 (Greater Accra) and 13 (Central) times greater and for zone 5 between 3 (Upper East) and 15.5 (Central) times greater. With regard to completing JSS, the relative risk was between 4 (Eastern) and 25 (Central) times greater. Urban as opposed to rural residence was found to have no significant effect on a child's relative risk of being in Zone 2 compared to Zone 1, but increased the relative risk of being in Zone 4 or 5 and of completing JSS by between 1.5 and 2 times.

3.4.4 Alternative models

All three regression modelling exercises were conducted separately for the sub-sample of children for whom cost and travelling-time data was available at cluster level. Mean school expenditure at cluster level was not found to have a significant effect on ever-attendance, nor on current-attendance in GLSS 3 or 4. A negative and significant but small effect of school expenditure was found in GLSS 5 on current attendance. Travel time affected ever attendance negatively in GLSS 4 and 5 and current attendance in GLSS 3 and 5 although effects were larger for ever attendance. For GLSS 5, an additional hour's travelling was found to reduce the probability of ever attending by four percent. In these alternative models, the effect of urban residence was reduced considerably. In the multinomial model, an additional hour's travel time reduced the relative risk a child being in the higher access zones relative to Zone 1 progressively to between a half and one third. When child labour, household welfare and the household head's occupational category were removed from the regression model to explore possible co-determination, there were few changes to the significance of co-efficients or their order of magnitude. Coefficients on the survey round dummies in the probit regressions increased, as did those for urban location and region. In the multinomial regression, the effects of urban location and region increased as did the effect of the number of small children and of the household size.

3.5 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 was found to have been excluded entirely. 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 the case of gender equity in initial access, a key objective of FCUBE, the target may be considered relatively close at hand. In absolute terms, population growth has meant that attendance and completion at all levels in basic education have increased enormously. The proportion of children who had ever been to school improved during the 1990s, even after controlling for important changes in socio-economic and demographic indicators, suggesting an effect of expansion in supply of schooling consistent with considerable investment by the Ghana Government. Nonetheless, in the case of rates of current attendance and completion, there has been no discernible improvement at all. Indeed, data suggest that it may be taking longer on average to complete each phase of basic education than it did in 1991 and despite growth in overall prosperity, drop-out rates have not fallen. In a period also marked by rapid growth in total enrolments, Bhalotra and Zamora (2008) report a similar finding with regard to completion rates in India.

Part of the explanation may lie in the fact that gains in terms of initial educational access were most keenly felt in relatively disadvantaged areas and among less privileged groups. The ever-attendance variable represents attendance which could amount to as little as a single day and which relies perhaps rather more on the possibility of accessing a school than on the long-term preference for education or on income to offset its costs, which may be required for more sustained attendance. Findings from multinomial regression appear to support the suggestion that the elimination of initial barriers to entry may have done little to lessen the substantial barriers to progress, so that disadvantaged groups face a somewhat 'uphill struggle'. Regional disparities in terms of the completion of JSS were enormous in 2005/6, even with the inclusion of controls, suggesting substantial differences in secondary schooling provision by region. Even at primary level, completion remains very much conditioned by region. Pupils who reach completion of primary school and/or JSS are more likely to come from better off households and households whose heads are in formal employment are more

likely to have children who make good progress through the system. These effects were found to increase with the level of educational access. With regard to current attendance, by 2005/6 children's work may possibly be considered the most important correlate of non-attendance, although children were in general considerably less likely to be involved in work outside the household. The position of those who are in work appears to have worsened but further work is required to establish to what extent children are working because they do not attend school or are not attending school because they are working, especially given the lack of consistent effects of household welfare or socio-economic group on current attendance.

More than a quarter of children in Ghana fail to complete primary school and up to a half fail to complete JSS and these forms of exclusion have been a consistent feature of education in Ghana since 1991. Nonetheless, despite the implementation of FCUBE, parents are spending considerably more on their children's education and are less likely to be economically poor. There has, however, been a decline in the occupational class most associated with high levels of educational access as formal employment opportunities have struggled to keep pace with rapid population growth. Access to basic education, in line with the CREATE model and with the findings presented in this monograph may be understood in terms of barriers to initial entry, push/pull out factors and in terms of progress factors. In Ghana, barriers to initial entry include poverty in terms of low levels of welfare, regional and urban/rural locations which are likely to be partly indicative of educational supply. Drop-out overall may have more to do with children's work and the presence of young children in the household, but does not seem to be strongly and consistently determined by region, urban location or household welfare. Nonetheless, when drop-out is examined in more detail by the level of educational access reached, a different picture emerges for the 2005/6 data. Educational progress beyond the most basic stages is very strongly influenced by region and urban location and by household welfare and socio-economic group, with enormous advantages being afforded to children in the most privileged groups, particularly where the likelihood of completion of JSS is concerned.

4. Conclusion

The introduction in 2004 of the 'capitation grant' was intended to remove the remaining direct cost barriers with regard to initial entry into basic education and has strengthened the delivery of genuinely free elementary schooling in Ghana. This, among other policy levers, may conceivably bring the goal of universal *initial* access into sight by 2015. Yet it is clear that significant challenges lie ahead in ensuring that meaningful and timely progress is made once entry is secured, given what appears to be a steep trajectory for the relatively disadvantaged. The benefits associated with higher levels of education in Ghana are substantial, as the analyses in Part One of this monograph demonstrate. Moreover, the evidence suggests that the welfare gap between households whose heads gained access to a full basic education and those who did not may be widening. While the vast majority of children do gain access to basic education in Ghana, those who remain excluded form an increasingly disadvantaged group and for many of them, work replaces school attendance. The removal of cost barriers alone is likely to amount to an inadequate incentive for this group whose opportunity costs of schooling, given their low levels of household welfare, are comparatively high. A much larger group of Ghanaian children, amounting to up to half of the total, receives an incomplete basic education which, it may be suggested, is insufficient for the cognitive development which provides the foundations both for improved economic prospects and for wider human flourishing in the twenty-first century. Addressing the factors which both push and pull children out of basic education may be considered the primary concern with regard to access and exclusion overall. The evidence presented here points towards issues of supply, particularly concerning secondary schooling, but also points towards issues of demand, centred on poverty and children's work including the need to care for younger children, as well as highlighting the role of socio-economic (occupational) groupings which may be associated with differences in educational preferences.

References

Abuka, C. A., Atingi-Ego, M., Opolot, J. & Okello, P. (2007) Determinants of Poverty Vulnerability in Uganda. Institute of International Integration Studies Discussion Paper Series No. 203.

Adjasi, C. K. D. & Osei, K. A. (2007) Poverty Profile and Correlates of Poverty in Ghana. *International Journal of Social Economics,* 34 (7), 449-471.

Appleton, S. & Balihuta, A. (1996) Education and Agricultural Productivity: Evidence from Uganda. *Journal of International Development,* 8 (3), 415-444.

Baschieri, A. & Falkingham, J. (2006) Staying in school: assessing the role of access, availability and cost. S3RI Applications and Policy Working Paper, University of Southampton.

Becker, G. S. (1964) *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, Chicago: University of Chicago Press.

Bennell, P. (1996) Rates of return to education: Does the conventional pattern prevail in sub-Saharan Africa? *World Development,* 24 (1), 183-199.

Bentham, J. (1789) *An Introduction to the Principles of Morals and Legislation,* London: Methuen

Bhalotra, S. & Heady, C. (2003) Child Farm Labor: The Wealth Paradox. *The World Bank Economic Review,* 17 (2), 197-227.

Bhalotra, S. & Zamora, B. (2008) Primary Education in India: Prospects of meeting the MDG Target. Helsinki, UNU/WIDER Research Paper 2006/80.

Bhalotra, S. R. & Tzannatos, Z. (2003) Child Labor: What Have We Learnt? Social Protection Discussion Paper Series 317. Human Development Network. World Bank

Bigsten, A., Isaksson, A., Soderbom, M., Collier, P., Zeufack, A., Dercon, S., Fafchamps, M., Gunning, J. W., Teal, F. & Appleton, S. (2000) Rates of Return on Physical and Human Capital in Africa's Manufacturing Sector. *Economic Development and Cultural Change,* 48 (4), 801-827.

Boakye-Yiadom, L. (2004) The Evolution of Welfare in Ghana: A Rural-Urban Perspective. *International Conference on Ghana's Economy at the Half-Century.* Accra.

Canagarajah, S. & Coulombe, H. (1997) *Child Labor and Schooling in Ghana,* World Bank, Human Development Technical Family, Africa Region.

Canagarajah, S. & Pörtner, C. (2003) Evolution of Poverty and Welfare in Ghana in the 1990s: Achievements and Challenges. Africa Region Working Paper Series 61. World Bank.

Checchi, D. (2001) Education, Inequality and Income Inequality. Distributional Analysis Research Programme, the Toyota Centre, Suntory and Toyota International Centres for Economics and Related Disciplines, London School of Economics.

Coulombe, H. (2005) Ghana Census-Based Poverty Map: District and Sub-District. Accra, GSS.

Dreze, J. & Kingdon, G. G. (2001) School Participation in Rural India. *Review of Development Economics*, 5 (1), 1-24.

Fentiman, A., Hall, A. & Bundy, D. (1999) School Enrolment Patterns in Rural Ghana: A Comparative Study of the Impact of Location, Gender, Age and Health on Children's Access to Basic Schooling. *Comparative Education,* 35 (3), 331-349.

Filmer, D. (2007) If you build it, will they come? School availability and school enrolment in 21 poor countries. *Journal of Development Studies*, 43 (5), 901-928.

Filmer, D. & Pritchett, L. (1999) The Effect of Household Wealth on Educational Attainment: Evidence from 35 Countries. *Population and Development Review,* 25 (1), 85-120.

Foster, J., Greer, J. & Thorbecke, E. (1984) A Class of Decomposable Poverty Measures. *Econometrica,* 52 (3), 761-766.

Foster, P. (1965) *Education and Social Change in Ghana*, London: Routledge.

Friedman, M. (1957) *A Theory of the Consumption Function*, Princeton University Press.

Glewwe, P. (1991) *Schooling, Skills, and the Returns to Government Investment in Education: An Exploration Using Data from Ghana*, World Bank.

Glewwe, P. & Ilias, N. (1996) The Determinants of School Attainment in Sub-Saharan Africa: A Case Study of Ghana. *Journal of International Development,* 8 (3), 395-413.

Glewwe, P. & Jacoby, H. (1994) Student achievement and schooling choice in low-income countries. *Journal of Human Resources,* 29 (3), 843.

GoG (1997) *Vision 2020: The First Medium-Term Development Plan (1997-2000)*, Accra: Ghana Publishing Corporation, Assembly Press.

GSS (1988) Ghana Living Standards Survey: Preliminary Results 1988. Accra.

GSS (1999) Ghana Living Standards Survey 4: Data User's Guide. Accra, Ghana Statistical Service.

GSS (2000) Poverty Trends in the 1990s. Accra, GSS.

GSS (2007) Pattern and Trends of Poverty in Ghana 1991-2006. Accra, Ghana Statistical Service.

Jamison, D. T. & Lau, L. J. (1982) *Farmer Education and Farm Efficiency*, John Hopkins University Press Baltimore.

Jolliffe, D. (2004) The Impact of Education in Rural Ghana: Examining Household Labor Allocation and Returns on and off the Farm. *Journal of Development Economics,* 73 (1), 287-314.

Kingdon, G. & Soderbom, M. (2007) Education, Skills, and Labor Market Outcomes: Evidence from Ghana. World Bank Human Development Network.

Kingdon, G. & Theopold, N. (2006) Do Returns to Education Matter to Schooling Participation? Global Poverty Research Group Working Paper 52.

Knight, J., Shi, L. & Quheng, D. (2008) Education and the Poverty Trap in Rural China. The Centre for the Study of African Economies Working Paper 281.

Knight, J. B., Sabot, R. H. & Hovey, D. C. (1992) Is the Rate of Return on Primary Schooling Really 26 Per Cent? *Journal of African Economies,* 1 (2), 192-205.

Kyereme, S. S. & Thorbecke, E. (1991) Factors Affecting Food Poverty in Ghana. *Journal of Development Studies,* 28 (1), 39-52.

Langsten, R. & Hassan, T. (2007) Basic Educational Attainment in Egypt. *SGIV Seminar.* Institute of Social Studies The Hague.

Lavy, V. (1996) School Supply Constraints and Children's Educational Outcomes in Rural Ghana. *Journal of Development Economics,* 51 (2), 291-314.

Lewin, K. M. (2007) Improving Access, Equity and Transitions in Education: Creating a Research Agenda. Falmer: CREATE Pathways to Access Research Monograph 1.

Lockheed, M. E., Jamison, T. & Lau, L. J. (1980) Farmer Education and Farm Efficiency: A Survey. *Economic Development and Cultural Change,* 29 (1), 37.

Patrinos, H. A. & Psacharopoulos, G. (2004) Returns to Investment in Education: A Further Update. *Education Economics,* 12 (2), 111-134.

Pritchett, L. (2001) Where Has All the Education Gone? *World Bank Economic Review,* 15 (3), 367-391.

Psacharopoulos, G. (1994) 'Returns to Investment in Education: A Global Update'. *World Development,* 22 (9), 1325-1343.

Ravallion, M. & Wodon, Q. (2000) Does Child Labour Displace Schooling? Evidence on Behavioural Responses to an Enrollment Subsidy. *The Economic Journal,* 110 (462), 158-175.

Rolleston, C. & Oketch, M. (2008) Educational expansion in Ghana: Economic assumptions and expectations. *International Journal of Educational Development,* 28 (3), 320-339.

Sackey, H. A. (2007) The Determinants of School Attendance and Attainment in Ghana: A Gender Perspective. AERC Research Paper 173. Nairobi, African Economic Research Consortium.

Schultz, T. W. (1961) Investment in Human Capital. *American Economic Review,* 51 (1), 1-17.

Siddiqi, F. & Patrinos, H. A. (1995) Child Labor: Issues, Causes and Interventions Human Capital Developmental and Operations Policy Working Paper 56 World Bank.

Söderbom, M. & Teal, F. (2003) Openness and Human Capital as Sources of Productivity Growth: An Empirical Investigation. The Centre for the Study of African Economies Working Paper Series 188.

Teal, F. (2001) *Education, Incomes, Poverty and Inequality in Ghana in the 1990s*, Centre for the Study of African Economies, University of Oxford.

UNESCO (2005) Children Out of School: Measuring Exclusion from Primary Education. UNESCO Institute for Statistics.

White, H. (2004) *Books, Buildings, and Learning Outcomes: An Impact Evaluation of World Bank Support to Basic Education in Ghana*, World Bank Publications.

Appendix

Table 2: Descriptive statistics (household welfare equation)

	GLSS3		*GLSS4*		*GLSS5*	
	mean	se	mean	se	mean	se
Household						
Log of household welfare	13.917	0.02	14.107	0.04	14.241	0.03
No education	0.415	0.01	0.362	0.02	0.309	0.01
Some education (been to school)	0.202	0.01	0.166	0.01	0.216	0.01
Middle school quals	0.284	0.01	0.319	0.01	0.322	0.01
Vocational/commercial	0.013	0.00	0.012	0.00	0.017	0.00
O level	0.039	0.00	0.044	0.00	0.025	0.00
A level / SSS	0.009	0.00	0.022	0.00	0.036	0.00
Teacher training	0.018	0.00	0.024	0.00	0.016	0.00
Technical/professional	0.012	0.00	0.038	0.00	0.041	0.00
Degree	0.007	0.00	0.007	0.00	0.016	0.00
Other qual	0.003	0.00	0.006	0.00	0.003	0.00
Log household size	0.990	0.02	1.015	0.02	0.886	0.01
% girls aged 7-14	0.090	0.00	0.098	0.00	0.077	0.00
% boys aged 7-14	0.094	0.00	0.097	0.00	0.079	0.00
% male adults	0.438	0.01	0.447	0.01	0.338	0.00
% under 7	0.191	0.00	0.169	0.00	0.151	0.00
% over 59	0.099	0.00	0.105	0.01	0.107	0.00
Land owned (acres)	358.862	56.43	396.431	75.10	431.022	54.91
Sex – Head of HH	0.678	0.01	0.681	0.01	0.705	0.01
Age – Head of HH	44.298	0.29	44.950	0.38	44.988	0.25
Age squared/1000	21.97	28.64	22.47	36.98	22.69	25.11
Contextual						
Urban	0.349	0.03	0.366	0.03	0.428	0.02
Western	0.107	0.02	0.111	0.02	0.104	0.01
Central	0.113	0.02	0.101	0.02	0.099	0.01
Greater Accra	0.140	0.02	0.140	0.02	0.166	0.02
Eastern	0.146	0.02	0.101	0.02	0.076	0.01
Volta	0.091	0.01	0.123	0.02	0.145	0.02
Ashanti	0.162	0.02	0.180	0.03	0.174	0.02
Brong Ahafo	0.100	0.02	0.097	0.02	0.090	0.01
Western	0.075	0.02	0.086	0.02	0.087	0.01
Upper West	0.024	0.01	0.023	0.01	0.036	0.01
Upper East	0.042	0.01	0.039	0.01	0.022	0.00
GLSS 3	1.000	0.00	0.000	0.00	0.000	0.00
GLSS 4	0.000	0.00	1.000	0.00	0.000	0.00
GLSS 5	0.000	0.00	0.000	0.00	1.000	0.00
Observations	4514	4514	5986	5986	8682	8682

standard errors robust to data clustering

Source: Computed from GLSS 3-5

Table 3: Results of regression of household welfare on educational qualifications of the household head (partial correlations)

	GLSS3		*GLSS4*		*GLSS5*	
	coef	tstat	coef	tstat	coef	tstat
Some education (been to school)	0.126	3.75***	0.271	5.62***	0.409	11.64***
Middle school quals	0.361	10.92***	0.443	7.63***	0.641	15.79***
Vocational/commercial	0.554	6.18***	0.633	6.61***	1.053	12.54***
O level	0.667	10.45***	0.755	10.04***	0.872	14.12***
A level / SSS	1.089	13.06***	0.942	10.85***	1.080	17.70***
Teacher training	0.307	4.68***	0.516	5.91***	1.024	14.87***
Technical/professional	0.613	4.72***	0.869	9.75***	1.119	19.33***
Degree	1.187	7.29***	1.041	10.44***	1.551	17.52***
Other qual	0.369	1.90*	-0.041	-0.22	1.267	8.87***
Constant	13.725	486.47***	13.807	301.18***	13.778	379.67***
Observations	4516	4516	5989	5989	8682	8682
R-squared	0.10	0.10	0.13	0.13	0.20	0.20

Dependent variable: log of household welfare (per capita equivalent)
t statistics robust to data clustering; *, ** and *** denote significance levels at the 10, 5 and 1 percent levels respectively

Table 4: Results of regression of household welfare equation with controls

	Pooled OLS		*Pooled FE*		*GLSS3 FE*		*GLSS4 FE*		*GLSS5 FE*	
	coef	tstat	coef	tstat	coef	tstat	coef	tstat	Coef	tstat
Household										
Some education (been to school)	0.099	6.20***	0.063	5.35***	0.010	0.49	0.093	3.92***	0.073	4.27***
Middle school quals	0.236	13.72***	0.176	15.51***	0.164	7.78***	0.169	7.95***	0.191	11.08***
Vocational/comm. Quals	0.394	9.61***	0.320	9.04***	0.248	3.71***	0.256	3.99***	0.395	7.54***
O level	0.403	13.11***	0.290	12.41***	0.251	5.81***	0.313	8.31***	0.282	6.88***
A level / SSS	0.476	13.62***	0.343	13.01***	0.560	7.00***	0.274	5.40***	0.365	11.08***
Teacher training	0.495	14.84***	0.405	14.60***	0.217	4.41***	0.359	8.03***	0.574	12.64***
Technical/profess	0.624	17.65***	0.477	18.41***	0.345	4.74***	0.483	9.64***	0.509	15.80***
Degree	1.023	17.61***	0.777	15.89***	0.646	5.30***	0.552	6.47***	0.895	14.47***
Other qual	0.458	3.88***	0.352	3.72***	0.178	1.00	0.104	0.92	0.746	5.34***
% girls aged 7-14	-0.155	-4.15***	-0.148	-4.89***	-0.194	-3.42***	-0.197	-3.76***	-0.091	-2.01**
Log Household size	-0.482	-39.15***	-0.488	-53.65***	-0.507	-29.00***	-0.447	-26.98***	-0.498	-36.48***
% boys aged 7-14	-0.292	-7.61***	-0.251	-7.75***	-0.289	-5.07***	-0.325	-6.17***	-0.186	-3.66***
% over 59	-0.147	-4.63***	-0.103	-3.87***	-0.121	-2.40**	-0.112	-2.23**	-0.084	-2.14**
% male adults	-0.176	-7.41***	-0.202	-10.09***	-0.234	-6.11***	-0.243	-6.78***	-0.170	-5.48***
% under 7	-0.328	-10.61***	-0.270	-10.49***	-0.308	-6.77***	-0.301	-6.37***	-0.224	-5.76***
Land owned (acres)	0.000	2.72***	0.000	2.39**	0.000	0.50	0.000	2.12**	0.000	2.13**
Sex – Head of HH	0.029	1.74*	0.065	5.06***	0.121	4.45***	0.090	3.93***	0.026	1.35
Age – Head of HH	0.004	2.11**	0.007	4.40***	0.004	1.33	0.003	0.88	0.010	4.67***
Age squared/1000	-0.004	-2.27**	-0.007	-4.38***	-0.004	-1.29	-0.003	-0.97	-0.010	-4.59***
Contextual										
Western	0.610	10.89***								
Central	0.558	10.16***								
Greater Accra	0.611	10.88***								
Eastern	0.471	8.08***								
Volta	0.557	10.28***								
Ashanti	0.688	12.99***								
Brong Ahafo	0.471	8.42***								
Northern	0.259	3.68***								
Upper East	-0.020	-0.24								
GLSS 4	0.153	5.64***								
GLSS 5	0.151	6.26***								
Constant	13.712	208.26***	14.438	387.58***	14.382	197.97***	14.545	199.07***	14.409	270.84***
Observations	19181	19181	19181	19181	4514	4514	5986	5986	8681	8681
Number of clust			1245	1245	365	365	300	300	580	580
R-squared	0.52	0.52	0.36	0.36	0.39	0.39	0.33	0.33	0.38	0.38

Dependent variable: log of household welfare (per capita equivalent)
t statistics robust to data clustering; *, ** and *** denote significance levels at the 10, 5 and 1 percent levels respectively

Table 8: Proportions of children aged 5-17 who had 'dropped-out' of basic education by region and survey round

	GLSS 3	GLSS 4	GLSS 5
Western	8	5	6
Central	6	6	7
Greater Accra	5	6	6
Eastern	6	5	6
Volta	5	7	7
Ashanti	10	7	7
Brong Ahafo	7	5	5
Northern	2	4	3
Upper West	2	1	4
Upper East	1	6	3
Total	**6**	**6**	**6**

Source: Computed from GLSS 3-5

Table 9: Proportions of children who had completed primary school by age, region and survey round

	Age 13			Age 17			Total age 11-17		
	GLSS 3	GLSS 4	GLSS 5	GLSS 3	GLSS 4	GLSS 5	GLSS 3	GLSS 4	GLSS 5
Western	0.41	0.48	0.26	0.65	0.84	0.80	0.48	0.48	0.39
Central	0.36	0.38	0.30	0.75	0.79	0.75	0.44	0.41	0.44
Greater Accra	0.37	0.60	0.46	0.85	0.96	0.84	0.50	0.58	0.57
Eastern	0.41	0.29	0.28	0.83	0.81	0.79	0.47	0.40	0.33
Volta	0.42	0.44	0.33	0.76	0.85	0.87	0.42	0.48	0.44
Ashanti	0.42	0.51	0.35	0.85	0.85	0.87	0.52	0.52	0.48
Brong Ahafo	0.35	0.39	0.26	0.89	0.86	0.66	0.44	0.48	0.32
Northern	0.08	0.24	0.10	0.27	0.40	0.31	0.12	0.24	0.16
Upper West	0.26	0.49	0.10	0.57	0.77	0.43	0.24	0.35	0.18
Upper East	0.16	0.15	0.15	0.18	0.39	0.46	0.10	0.19	0.21
Total	**0.35**	**0.42**	**0.28**	**0.74**	**0.80**	**0.73**	**0.42**	**0.44**	**0.39**

Source: Computed from GLSS 3-5

Table 10: Proportions of children who had completed JSS by age, region and survey round

	Age 15			Age 20			Total age 14-21		
	GLSS 3	GLSS 4	GLSS 5	GLSS 3	GLSS 4	GLSS 5	GLSS 3	GLSS 4	GLSS 5
Western	0.17	0.22	0.08	0.53	0.63	0.57	0.34	0.41	0.35
Central	0.22	0.17	0.09	0.41	0.45	0.58	0.31	0.32	0.36
Greater Accra	0.15	0.20	0.29	0.79	0.75	0.70	0.48	0.57	0.55
Eastern	0.30	0.13	0.04	0.54	0.67	0.50	0.48	0.38	0.27
Volta	0.08	0.25	0.15	0.37	0.49	0.56	0.29	0.42	0.39
Ashanti	0.18	0.21	0.12	0.54	0.74	0.66	0.43	0.47	0.41
Brong Ahafo	0.13	0.15	0.06	0.63	0.74	0.53	0.38	0.37	0.28
Northern	0.00	0.04	0.02	0.11	0.34	0.27	0.08	0.19	0.12
Upper West	0.05	0.00	0.04	0.17	0.17	0.23	0.16	0.16	0.12
Upper East	0.00	0.02	0.01	0.08	0.33	0.24	0.03	0.24	0.13
Total	**0.14**	**0.17**	**0.11**	**0.49**	**0.58**	**0.53**	**0.35**	**0.39**	**0.34**

Source: Computed from GLSS 3-5

Table 11: Descriptive Statistics (age 5 to 19)

	pooled		GLSS 3		GLSS 4		GLSS 5	
	mean	se	mean	se	mean	se	mean	se
Ever attended school	0.839	0.007	0.770	0.014	0.866	0.013	0.863	0.011
Child								
Age in years	11.333	0.032	11.079	0.055	11.275	0.055	11.544	0.052
Age squared/1000	145.884	0.753	140.061	1.274	144.174	1.312	151.043	1.228
Sex	0.514	0.003	0.524	0.006	0.512	0.007	0.510	0.005
Spouse	0.006	0.001	0.007	0.001	0.005	0.001	0.006	0.001
Son/daughter	0.771	0.005	0.786	0.008	0.768	0.010	0.765	0.008
Grandchild	0.110	0.004	0.098	0.006	0.119	0.008	0.110	0.006
Other relative	0.091	0.003	0.095	0.005	0.096	0.005	0.085	0.004
Servant	0.004	0.000	0.005	0.001	0.004	0.001	0.003	0.000
Other non-relative	0.015	0.001	0.006	0.001	0.007	0.001	0.028	0.002
No work	0.793	0.008	0.692	0.015	0.815	0.014	0.842	0.010
Waged work	0.006	0.001	0.008	0.002	0.006	0.001	0.006	0.001
Self-employment	0.012	0.001	0.022	0.003	0.012	0.002	0.005	0.001
Farm work	0.161	0.007	0.260	0.016	0.115	0.012	0.131	0.010
Unpaid work	0.028	0.003	0.018	0.003	0.053	0.008	0.016	0.002
Household								
Log Household size	1.536	0.008	1.555	0.014	1.525	0.015	1.532	0.014
% girls aged 7-14	0.149	0.002	0.147	0.003	0.158	0.003	0.143	0.002
% under 7	0.186	0.002	0.210	0.004	0.176	0.004	0.177	0.003
% over 59	0.048	0.001	0.046	0.002	0.050	0.003	0.048	0.002
Sex – Head of HH	0.715	0.007	0.701	0.014	0.691	0.015	0.744	0.010
Age – Head of HH	47.696	0.178	47.479	0.313	47.413	0.372	48.060	0.245
Age squared/1000	24.381	0.187	24.221	0.328	24.082	0.387	24.719	0.259
Public formal	0.100	0.005	0.137	0.010	0.112	0.010	0.066	0.006
Private formal	0.045	0.003	0.037	0.005	0.043	0.006	0.052	0.005
Private informal	0.037	0.002	0.026	0.003	0.024	0.004	0.056	0.005
Export farming	0.074	0.006	0.066	0.009	0.071	0.011	0.082	0.011
Food farming	0.433	0.012	0.436	0.020	0.392	0.025	0.464	0.018
Non-farm self empl	0.294	0.009	0.282	0.015	0.340	0.021	0.266	0.012
Not working	0.016	0.002	0.015	0.003	0.018	0.004	0.014	0.002
Log HH welfare	13.766	0.020	13.617	0.025	13.817	0.040	13.823	0.034
Context								
Rural	0.666	0.016	0.666	0.029	0.666	0.034	0.667	0.022
Urban	0.334	0.016	0.334	0.029	0.334	0.034	0.333	0.022
Western	0.106	0.010	0.097	0.016	0.107	0.021	0.110	0.016
Central	0.095	0.009	0.104	0.017	0.093	0.018	0.091	0.014
Greater Accra	0.105	0.010	0.116	0.019	0.113	0.023	0.092	0.013
Eastern	0.107	0.010	0.133	0.018	0.123	0.023	0.079	0.012
Volta	0.118	0.011	0.089	0.015	0.124	0.022	0.133	0.018
Ashanti	0.170	0.012	0.160	0.020	0.169	0.026	0.179	0.018
Brong Ahafo	0.103	0.011	0.124	0.020	0.091	0.026	0.099	0.014
Northern	0.108	0.013	0.091	0.020	0.099	0.025	0.127	0.020
Upper West	0.040	0.007	0.032	0.012	0.032	0.018	0.051	0.009
Upper East	0.046	0.007	0.054	0.014	0.049	0.015	0.039	0.007
GLSS 3	0.269	0.014						
GLSS 4	0.321	0.018						
GLSS 5	0.410	0.017						
Observations	31922	31922	8300	8300	10142	10142	13480	13480

standard errors robust to data clustering

Source: Computed from GLSS 3-5

Table 12: Children's work and school attendance GLSS 3-5

	Mean level of ever-attendance by work category						*Mean level of current-attendance by work category*					
	GLSS 3		GLSS 4		GLSS 5		GLSS 3		GLSS 4		GLSS 5	
	mean	se	mean	se	mean	se	mean	se	mean	se	mean	se
None	0.78	0.01	0.89	0.01	0.91	0.01	0.92	0.01	0.92	0.00	0.92	0.00
Waged	0.75	0.08	0.74	0.09	0.68	0.06	0.36	0.09	0.26	0.10	0.06	0.04
Self-emp	0.72	0.03	0.79	0.05	0.77	0.06	0.57	0.06	0.33	0.08	0.21	0.06
Farm	0.75	0.02	0.74	0.04	0.62	0.04	0.82	0.01	0.69	0.03	0.71	0.03
unpaid	0.77	0.05	0.84	0.04	0.79	0.04	0.75	0.05	0.79	0.03	0.28	0.05

standard errors robust to data clustering

Source: Computed from GLSS 3-5

Table 13 Results of probit regression: Dependent variable ever attendance at school (age 5 to 19)

	pooled		GLSS3		GLSS4		GLSS5	
	mfx	zstat	mfx	zstat	mfx	zstat	mfx	zstat
Child								
Age in years	0.062	18.17***	0.136	12.93***	0.055	8.19***	0.051	9.97***
Age squared/1000	-0.002	-15.96***	-0.005	-11.31***	-0.002	-6.57***	-0.002	-8.72***
Sex	0.043	9.51***	0.083	7.19***	0.034	4.27***	0.019	3.52***
Spouse	-0.331	-6.54***	-0.259	-1.67*	-0.018	-0.13	-0.147	-1.65*
Grandchild	0.006	0.64	0.032	1.49	-0.013	-0.78	0.004	0.33
Other relative	-0.088	-7.77***	-0.119	-5.09***	-0.095	-4.39***	-0.073	-4.18***
Servant	-0.420	-6.68***	-0.476	-5.48***	-0.536	-4.05***	-0.597	-4.40***
Other non-relative	-0.133	-4.54***	-0.249	-2.47**	-0.302	-3.93***	-0.072	-2.42**
Waged work	-0.296	-5.41***	-0.193	-2.24**	-0.352	-2.32**	-0.526	-4.66***
Self-employment	-0.178	-5.10***	-0.122	-2.27**	-0.242	-2.99***	-0.241	-2.01**
Farm work	-0.126	-8.27***	-0.064	-3.15***	-0.118	-4.25***	-0.198	-6.58***
Unpaid work	-0.156	-5.22***	-0.187	-2.88***	-0.094	-2.29**	-0.268	-4.96***
Household								
Log Household size	0.002	0.28	0.048	2.49**	-0.012	-0.74	0.000	0.04
% girls aged 7-14	0.014	0.70	0.073	1.54	-0.026	-0.73	-0.006	-0.23
% under 7	-0.065	-3.48***	-0.068	-1.52	-0.095	-2.71***	-0.046	-2.01**
% over 59	0.026	0.85	0.037	0.44	-0.028	-0.55	0.064	1.45
Sex – Head of HH	-0.016	-2.42**	-0.030	-2.07**	-0.000	-0.03	-0.018	-2.01**
Age – Head of HH	-0.004	-2.92***	-0.005	-1.80*	-0.008	-3.27***	-0.001	-0.67
Age squared/1000	0.002	1.97**	0.002	0.74	0.007	3.07***	0.000	0.04
Public formal	0.070	5.92***	0.117	3.60***	0.067	3.36***	0.057	4.31***
Private formal	0.049	3.50***	0.107	3.29***	0.017	0.54	0.036	2.08**
Private informal	0.009	0.41	0.052	1.10	0.003	0.08	0.023	0.96
Export farming	0.032	1.89*	0.043	0.93	0.015	0.48	0.030	1.34
Food farming	-0.009	-0.45	0.010	0.20	-0.022	-0.69	0.006	0.20
Non-farm self-empl	0.024	1.33	0.067	1.57	-0.005	-0.17	0.032	1.24
Log HH welfare	0.047	6.98***	0.095	6.69***	0.020	1.80*	0.049	5.42***
Context								
GLSS 4	0.052	5.71***						
GLSS 5	0.069	7.60***						
Urban location	0.027	2.64***	0.013	0.50	0.044	3.13***	0.024	1.99**
Western	0.098	12.62***	0.173	6.81***	0.089	7.37***	0.064	7.20***
Central	0.096	12.75***	0.153	4.88***	0.082	7.07***	0.073	10.22***
Greater Accra	0.076	6.52***	0.163	5.10***	0.062	3.10***	0.039	2.42**
Eastern	0.084	8.50***	0.189	7.17***	0.069	4.37***	0.039	2.89***
Volta	0.105	13.51***	0.177	7.39***	0.095	8.39***	0.068	7.47***
Ashanti	0.118	13.95***	0.202	7.35***	0.094	7.02***	0.078	8.06***
Brong Ahafo	0.102	13.84***	0.201	8.97***	0.082	6.69***	0.061	6.48***
Northern	-0.019	-0.79	0.009	0.14	-0.017	-0.42	-0.017	-0.79
Upper East	0.012	0.61	-0.047	-0.62	-0.017	-0.39	0.050	6.00***
Observations	31922	31922	7567	7567	9162	9162	12035	12035
pseudo R squared	0.258	0.258	0.260	0.260	0.215	0.215	0.314	0.314
log likelihood	-10449	-10449	-3037	-3037	-2840	-2840	-3285	-3285

*, ** and *** denote the 10, 5 and 1 % significance levels respectively
z values robust to data clustering

Table 14: Results of probit regression: Dependent variable current attendance at school (age 5 to 19)

	pooled		GLSS3		GLSS4		GLSS5	
	mfx	zstat	mfx	zstat	mfx	zstat	mfx	zstat
Child								
Age in years	0.038	12.57***	0.030	5.18***	0.024	5.73***	0.031	7.46***
Age squared/1000	-0.002	-18.03***	-0.002	-7.47***	-0.001	-7.82***	-0.002	-9.70***
Sex	0.028	7.95***	0.036	5.83***	0.013	2.66***	0.011	3.09***
Spouse	-0.215	-3.78***	-0.507	-2.21**	-0.026	-0.54	-0.016	-0.49
Grandchild	0.001	0.08	0.001	0.13	0.008	1.13	-0.012	-1.32
Other relative	-0.026	-3.77***	-0.029	-2.31**	-0.011	-1.42	-0.033	-2.84***
Servant	-0.209	-3.57***	-0.040	-0.79	-0.460	-3.57***	-0.111	-1.31
Other non-relative	-0.017	-1.21	-0.145	-2.20**	0.006	0.35	-0.003	-0.28
Waged work	-0.356	-5.26***	-0.175	-2.07**	-0.114	-1.15	-0.425	-2.05**
Self-employment	-0.185	-5.39***	-0.048	-1.51	-0.206	-3.03***	-0.335	-3.04***
Farm work	-0.081	-7.86***	-0.017	-1.88*	-0.097	-4.26***	-0.090	-4.48***
Unpaid work	-0.122	-6.02***	-0.009	-0.43	-0.053	-2.80***	-0.312	-4.91***
Household								
Log Household size	0.019	3.11***	0.011	0.98	0.001	0.12	0.012	1.94*
% girls aged 7-14	0.008	0.61	0.013	0.59	-0.011	-0.63	-0.000	-0.01
% under 7	-0.060	-4.46***	-0.057	-2.61***	-0.053	-2.65***	-0.031	-2.15**
% over 59	-0.034	-1.52	-0.044	-1.00	0.001	0.03	-0.050	-1.93*
Sex – Head of HH	0.014	2.93***	0.005	0.56	0.021	3.27***	0.004	0.77
Age – Head of HH	-0.001	-1.54	-0.003	-2.06**	0.001	0.62	-0.001	-0.49
Age squared/1000	0.001	1.36	0.003	1.98**	-0.001	-1.05	0.001	0.58
Public formal	0.024	2.25**	0.034	2.72***	0.020	1.58	-0.006	-0.26
Private formal	0.018	1.52	0.035	3.56***	-0.006	-0.24	-0.015	-0.58
Private informal	-0.003	-0.18	0.029	2.30**	-0.001	-0.05	-0.043	-1.17
Export farming	0.008	0.58	0.020	1.28	-0.001	-0.04	-0.010	-0.40
Food farming	0.011	0.84	0.033	1.76*	-0.003	-0.16	-0.014	-0.64
Non-farm self-empl	0.011	0.87	0.028	1.67*	0.005	0.28	-0.012	-0.55
Log HH welfare	0.015	3.93***	0.011	1.70*	0.008	1.36	0.007	1.45
Context								
GLSS 4	-0.007	-1.03						
GLSS 5	-0.003	-0.47						
Urban location	-0.007	-1.17	-0.013	-1.08	0.000	0.07	0.000	0.00
Western	-0.056	-2.14**	-0.022	-0.82	-0.106	-1.91*	-0.012	-0.73
Central	-0.048	-1.91*	-0.003	-0.15	-0.129	-2.26**	-0.020	-0.94
Greater Accra	-0.055	-2.15**	0.020	1.55	-0.196	-2.52**	-0.017	-0.88
Eastern	-0.029	-1.34	0.008	0.56	-0.090	-1.86*	-0.004	-0.23
Volta	-0.047	-1.99**	0.006	0.36	-0.179	-2.81***	-0.001	-0.05
Ashanti	-0.063	-2.69***	-0.009	-0.53	-0.154	-2.73***	-0.016	-1.01
Brong Ahafo	-0.033	-1.49	0.001	0.03	-0.109	-2.02**	-0.002	-0.12
Northern	-0.019	-0.79	0.029	2.43**	-0.162	-1.90*	0.001	0.03
Upper East	-0.016	-0.54	0.025	1.91*	-0.214	-2.20**	0.018	1.88*
Observations	26417	26417	5803	5803	7975	7975	10019	10019
pseudo R squared	0.346	0.346	0.219	0.219	0.221	0.221	0.249	0.249
log likelihood	-6188	-6188	-1240	-1240	-1468	-1468	-1796	-1796

*, ** and *** denote the 10, 5 and 1 % significance levels respectively
z values robust to data clustering

Table 15: Results of multinomial logistic regression: Dependent variable - Access outcome (Age 5 to 19)

	Zone 2 Primary Drop-Out		*Zone 4 Primary Completer (only)*		*Zone 5 Lower Secondary Drop-Out*		*Lower Secondary Completers*	
	rrr	z stat	rrr	z stat	rrr	z stat	rrr	z stat
Child								
Sex	1.571	5.03***	1.603	3.73***	1.502	3.49***	1.195	1.32
Spouse	0.244	-3.29***	0.240	-2.77***	0.078	-4.33***	0.037	-5.35***
Grandchild	0.933	-0.37	0.877	-0.52	0.954	-0.19	0.811	-0.78
Other relative	0.432	-5.32***	0.278	-5.83***	0.254	-6.34***	0.187	-6.69***
Servant	0.075	-3.42***	0.009	-3.70***	0.007	-4.61***	0.008	-4.67***
Other non-relative	0.501	-2.37**	0.384	-2.80***	0.273	-3.84***	0.179	-4.14***
Waged work	0.102	-5.39***	0.039	-5.81***	0.004	-6.77***	0.018	-7.28***
Self-employment	0.200	-3.05***	0.127	-3.22***	0.031	-5.69***	0.029	-5.37***
Farm work	0.189	-8.73***	0.141	-9.19***	0.113	-8.93***	0.128	-8.63***
Unpaid work	0.160	-6.57***	0.055	-6.05***	0.059	-7.31***	0.075	-7.07***
Household								
Log Household size	0.939	-0.38	1.121	0.52	0.952	-0.24	1.089	0.36
% girls aged 7-14	1.266	0.57	1.600	0.96	1.250	0.43	0.494	-1.19
% under 7	0.855	-0.41	0.559	-1.17	0.645	-0.85	0.187	-2.79***
% over 59	2.732	1.54	4.522	1.75*	2.251	0.97	6.440	2.16**
Sex – Head of HH	0.792	-1.42	0.754	-1.57	0.862	-0.76	0.893	-0.56
Age – Head of HH	0.947	-1.95*	0.949	-1.52	0.926	-2.12**	0.933	-1.78*
Age squared/1000	1.441	1.37	1.367	0.96	1.813	1.78*	1.595	1.28
Public formal	5.446	2.81***	8.521	2.92***	13.139	4.12***	20.507	4.12***
Private formal	3.241	2.29**	7.044	2.85***	7.997	3.58***	5.917	2.63***
Private informal	1.940	1.20	1.529	0.61	2.098	1.21	1.390	0.48
Export farming	4.262	2.56**	4.455	1.99**	4.665	2.40**	2.982	1.46
Food farming	1.863	1.21	1.997	1.02	1.962	1.19	1.452	0.56
Non-farm self empl	2.841	1.98**	3.783	1.97**	4.067	2.47**	3.406	1.87*
Log HH welfare	1.822	4.72***	2.553	5.91***	3.055	6.92***	4.117	7.96***
Context								
Urban location	1.153	0.66	1.499	1.67*	1.556	1.79*	2.480	3.30***
Western	3.887	4.30***	3.182	2.70***	5.035	3.75***	9.202	4.73***
Central	10.396	6.05***	13.009	5.46***	16.612	6.07***	25.352	6.36***
Greater Accra	2.040	1.63	3.211	2.36**	4.341	2.87***	10.883	4.42***
Eastern	2.926	2.78***	3.031	2.21**	3.715	2.55**	4.064	2.52**
Volta	6.954	6.22***	8.917	5.28***	12.272	6.17***	22.832	6.75***
Ashanti	5.454	5.72***	6.523	4.67***	11.479	6.02***	21.809	6.93***
Brong Ahafo	4.330	4.22***	4.057	3.28***	4.892	3.71***	6.005	3.93***
Northern	0.913	-0.35	0.639	-1.13	0.815	-0.57	0.713	-0.76
Upper East	2.961	3.67***	3.033	2.67***	4.284	3.42***	4.812	3.57***
Observations	11329	11329	11329	11329	11329	11329	11329	11329
pseudo R squared	0.388							
log likelihood	-8715							

relative risk ratios (rrr) reported. Base outcome is 'never attended school' (CREATE Zone 1)
*, ** and *** denote the 10, 5 and 1 % significance levels respectively
z values robust to data clustering
controls included for child age and its quadratic.

Consortium for Research on
Educational Access, Transitions & Equity
Funded by DFID

Report summary:

The period since 1991 has seen a general improvement both in terms of household welfare and schooling participation in Ghana. This monograph explores the patterns among descriptive indicators and uses regression analysis to examine possible causal relationships with special reference to the role of education in determining welfare and its reciprocal, the role of welfare and other aspects of economic privilege in the determination of school attendance and progression. It reviews the literature on modelling of the household consumption function as well as on modelling schooling decisions based on the household production function.

Author notes:

Caine Rolleston is a doctoral student and research assistant in the Department of Education and International Development at the Institute of Education, University of London. He has master's degrees from the universities of Oxford and London and his current research lies in the areas of access to and economic benefits from education in sub-Saharan Africa.

Address for Correspondence:
CREATE, Centre for International Education
Sussex School of Education, University of Sussex
Brighton BN1 9QQ, UK.
Website: http://www.create-rpc.org
Email: create@sussex.ac.uk