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2

3 **Child Poverty, Status of Rural Women and Education in Sub Saharan Africa**

4 **Abstract**

5 Africa's disadvantaged children are rural, malnourished, out of school, child brides or child labourers  
6 and have illiterate mothers who were denied access to productive resources. Our objective is to analyse  
7 factors affecting child poverty. Endogenous variables are under five mortality rate, primary school  
8 enrolment and child underweight. Endogeneity led to the use of Three Stages Least Squares simultaneous  
9 equations and fixed effects methods. The estimated elasticities indicate that female employment in  
10 agriculture has the greatest effect on under five mortality rates, while crop production index has the  
11 greatest effect on primary school enrolment and child underweight. Elasticity ranking shows that what is  
12 at issue is not the effect of education on reducing child poverty or the effect of child poverty on reducing  
13 education, but the improvement of women's status particularly in agricultural sector. Policies for long  
14 lasting solutions should highlight institutional quality as a prerequisite in child poverty reduction, it  
15 presents children and women with equal opportunities to access basic needs and productive resources.

16 **Keywords:** Sub Saharan Africa; Child poverty; Rural women; Under-five mortality rate; Primary school  
17 enrolment; Child underweight; Institutions; Simultaneous equations model.

18 **1 Introduction**

19 There is no uniform approach for defining, identifying or measuring child poverty. The notion of poverty  
20 to some implies lack of income, while to some in addition to lack of income, poverty means the lack of  
21 the basic needs of life. Sen (1999:87) sees poverty "*as the deprivation of basic capabilities rather than  
22 merely as lowness of income, which is the standard criterion of identification of poverty*". Our definition  
23 of child poverty echoes Sen's definition of poverty as a deprivation of capabilities, we have also  
24 considered child rights principles and the concepts of deprivation approach in identifying and measuring  
25 child poverty. We thus define children living in poverty as those children who are deprived of interrelated

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27 environmental in nature and are generally known to be very vital for child development.

28 Child malnutrition is declining both in percentages and in numbers at global level, for instance stunting  
29 fell from 32.5% in 2000 to 21.9% in 2018, in numbers it fell from 198.2millions to 149millions. Whereas  
30 in Sub Saharan Africa (Africa) stunting fell from 42.8% in 2000 to 33.6% in 2018, but rose in numbers

31 from 49.7 to 58.4millions (UNICEF/WHO/World Bank Group 2019). The rate of decline in stunting has  
32 not kept pace with population increases, resulting in a high number of stunted children overall.

33 This report among others indicate that Sub Saharan Africa (Africa) is the only region known to have  
34 rising child malnutrition, which accounts for a large percentage of child deaths. Hunger, poverty and  
35 disease are interlinked with each contributing to the presence and persistence of the other two (UNICEF  
36 2013). The World Health Organisation (WHO 2019) reports that globally, significant progress has been  
37 made in reducing levels of mortality among children under five years of age (U5MR). Although Africa's  
38 U5MR has declined, child mortality rates are reported to be the highest across the globe. U5MR is highest  
39 in rural areas, since an average child living in a rural area is isolated from basic health services and  
40 adequate sanitation (Doherty 2008; UNICEF 2009). Early child deaths are preventable with interventions  
41 including immunization, adequate nutrition, safe water and food. In Africa, 29% male and 35% female  
42 children, adolescents, youths of primary and secondary age are out of school. Progress towards gender  
43 equality in primary education has been of mixed results (UNESCO 2018).

44 Why focus on child poverty? Firstly, over 50% of Africa's population are children under 18 years of age  
45 (UN World Population Prospects 2015). Secondly, the incidence of poverty among children is higher  
46 than the incidence of poverty amongst the population as a whole in Africa (Batana et. al 2013). Finally,  
47 poverty causes lifelong damage to children's minds and bodies, leading them into adulthood poverty and  
48 it thereby perpetuates a vicious cycle of poverty through generational transmission (Vorster and Kruger  
49 2007). Why status of rural women? The wellbeing of children cannot be divorced from that of their  
50 mother. A mother suffers the consequences of her children's poverty while at the same time transmits  
51 her poverty to them. Most of Africa's population is rural and thus there is a high concentration of poverty  
52 in rural areas (Alkire et.al 2014).

53 The objective of this paper is to analyse the factors affecting child poverty by finding answers to the  
54 following research questions (i) Does lack of access to education cause child poverty or does child  
55 poverty cause lack of access to education? Or both and to what extent? (ii) To what extent can the low  
56 status of rural women be considered as a contributing factor to child poverty?

57 The present study is of great importance to Africa, to the policymakers and to the organisations working  
58 towards child poverty alleviation. The point to be focused on is not just poverty in general, but child  
59 poverty with highlights on primary school enrolment, out-of-school children (OOSC), child underweight,

60 rural women and institutions. A combination of the analysis of child education and health, with rural  
61 women's lack of access to productive resources and the role of institutions is most likely to improve on  
62 findings of previous studies on child poverty.

63 Maternal nutrition is intimately intertwined with infant health and survival right from the foetal stage  
64 through infancy. The kind of prenatal care a mother receives, the birthing care as well as the neonatal  
65 care for both the baby and mother mostly depends on the financial status of the mother and yet the link  
66 between mother's poverty and child poverty has not been given the due importance in the precedent  
67 studies. Previous studies on child poverty (UNICEF 2007; Gunes 2013; Fuchs et al. 2009) have  
68 advocated for mothers' education and health as key factors in reducing child poverty with minimal  
69 attention given to their availability and accessibility. Only good functioning of respective institutions  
70 determines the availability and accessibility of education and health.

71 We add to the precedent findings by emphasising that it is not enough to highlight economic policies in  
72 favour of mothers' education and health. To ensure their success there is need for them to be backed up  
73 by social norms which are expected to be receptive to gender equality in employment opportunities and  
74 wages, in accessing credit, in accessing productive inputs and information. It is not sufficient to enact  
75 laws and policies; their enforcement is also of utmost importance, and political institutions have to see  
76 to it that these laws are enforced to effect the positive changes. Thus, this study goes a step further than  
77 the previous studies by incorporating the key role of good quality institutions in explaining child poverty.

78 There is need to expand the literature on child poverty and make up for the missing parts. The  
79 consequences of low birth weight children such as underdeveloped cognitive ability are mostly  
80 irreversible and negatively affects child's health leading to poor performance at school and may carry on  
81 into adulthood and in the process affect his/her income earning prospects consequently creating vicious  
82 cycle of transgenerational poverty. This study revisits child poverty by giving education its rightful  
83 position as a solution to most of the other child deprivation indicators. It takes up this point further  
84 through econometric analysis to show that it is not just education but that the multidimensional nature of  
85 child poverty calls for the analysis of factors that interact with education in child poverty issues.

86 Section 2 of this paper is literature review which examines factors affecting child poverty using  
87 multidimensional deprivation approaches such as Bristol approach, Young Live Project and Children's  
88 Perspective approach. Women's status and the role of institutions in child poverty issues are examined.

89 Section 3 discusses data, model and presents results from the estimations of simultaneous equations using  
90 3SLS and fixed effects panel data methods. Section 4 is the conclusion on the major findings and their  
91 implications.

## 92 **2 Literature review of factors affecting child poverty**

93 Children's needs are multifaceted and therefore require multidimensional measures and since child  
94 poverty has to do with deprivation of basic capabilities, this study uses selected readings that focus on  
95 child poverty (child deprivation) with insights of basic capabilities. Based on Brown and Madge (1982)  
96 and Townsend (1987), deprivation is defined as a state of being disadvantaged relative to the local  
97 community, or the wider society or nation to which an individual, family or group belong. According to  
98 Gordon et al. (2003) deprivation indices are broader measures, for this reason they are more inclusive  
99 and reflect different aspects of living standards including personal, physical and mental conditions, local  
100 and environmental facilities, and social activities and customs. Deprivation approach is one of the  
101 measures that is specific to children's needs. Under deprivation approach we are reviewing three  
102 approaches: Bristol approach, Young Lives Project and Child's perspective approach.

103

104 Bristol measures of child poverty are based on child rights, it analyses child poverty by measuring  
105 deprivation indicators such as education, health, food, information, safe drinking water, sanitation and  
106 shelter (Gordon et al., 2003). A child is said to live in absolute poverty if he/she is deprived of two or  
107 more deprivations. The Bristol group with the help of data from household survey conducted an empirical  
108 study on how children fare with respect to the seven deprivation indicators in all developing countries.  
109 Their findings report that 56% of children in low and middle income countries suffered from one or more  
110 forms of deprivation. South Asia and Africa had deprivation rates of more than 80%. Rural children in  
111 these two regions suffered deprivation rates of more than 90% (Gordon et al. 2003). The report indicates  
112 that poor shelter and sanitation take the lead in deprivations experienced by children.

113

114 The Young Lives project focuses on filling in the gap of lack of information on the changes in children's  
115 well-being overtime. It does this by putting under observation about 12,000 children and their families  
116 for over 15 years in Ethiopia, Peru, Vietnam and India (Camfield et al. 2008). The project aims to  
117 examine all aspects of children's lives. Empirical regressions on the chosen children are done every three  
118 years, results of the first attempt revealed that in all the four countries, children experienced high levels

119 of deprivation from basic needs such as clean water, quality education, electricity and proper shelter  
120 (UNDP 2004:5, REF. UNICEF 2006). Young Lives project covers areas that are crucial to children's  
121 wellbeing that have not featured in the Bristol study such as childcare, child work and childrearing. The  
122 study is in a position to determine any changes in the causes and consequences of child poverty since it  
123 follows a set of children for a specified period.

124

125 Child's perspective deprivation approach is founded on children's views on living in poverty gathered  
126 from them during interviews. Witter and Bukokhe (2004), carried out interviews on children's  
127 perceptions of poverty, participation and local governance in Uganda. The findings from children's  
128 response indicates that children stressed the fact that, it is crucial to deal with child poverty issues  
129 separately from general poverty. Children's World Congress on Child Labor (CWCL) hosted in  
130 Florence Italy in May 2004 invited around 200 children mostly between the age group 14-17 years from  
131 different regions, countries and organisations as main speakers. Most of the child delegates were former  
132 child labourers and activists, implying that they understood better than adults children's wishes on how  
133 a child's life should be. The mission of child delegates was to express their opinions and to identify their  
134 capabilities. Their responses to the three most relevant capabilities in a child's life ranked education first  
135 with 75% scores, followed by health with 36% scores, leisure with 25% scores, social relations takes the  
136 fourth position, information the fifth and shelter the sixth (Biggeri et al. (2005).

137

138 Bristol approach and Young Lives Project analyse child poverty by measuring deprivation indicators that  
139 cover children's multifaceted needs, but these studies have not included status of rural women as well as  
140 roles of institutions a determinant factor in children's and women's access to basic needs and productive  
141 resources. Women's lack of access to productive resources due to social cultural norms that discriminate  
142 against women not only exacerbates their low status but also affects the wellbeing of their children.  
143 Smith et al. (2003) defines women's status as "*women's power relative to men*". Women with low status  
144 are generally known to have both less access to and control over productive resources, tighter time  
145 constraints, poorer mental and physical health and lower self-esteem. How does rural women's low status  
146 contribute to child poverty? Women play three significant roles in the lives of children: (i) as mothers  
147 (ii) as main carers of children and (iii) the traditional domestic division of Labor leaves the management  
148 of poverty as women's responsibility (Lister 2005). In Africa women produce a large percentage of the  
149 continent's food, including both subsistence and market food, on small land holdings with very limited

150 access to productive resources, land inclusive (SOFA Team and Doss 2011). Duties of rural women  
151 connotes that they play a major role in both child wellbeing and agricultural productivity.

152 Mo Ibrahim Foundation (2016) defines governance as the provision of the political, social and economic  
153 goods that any citizen has the right to expect from his or her state and that any state has the responsibility  
154 to deliver to its citizens. The definition of governance in terms of child poverty implies that institutional  
155 actors and agencies have distinct roles, responsibilities and capacities that govern both policies of  
156 resource allocation as well as provision of basic needs and services. Institutional fulfilment of their  
157 commitments to child rights facilitates the achievement of the multifaceted needs of children.

158 Institutions depend on economic growth as a source of sufficient revenue to execute budget allocation  
159 which enables public expenditure to be directed towards priority sectors that enhance child wellbeing  
160 (Dzator and Chen, 2015; Easterlin and Angelescu, 2007). Studies have in the past questioned if there was  
161 any systematic relationship between economic growth and the income share of the bottom quintile. These  
162 studies concluded that the share tended to decline in the early stages of development, but increased in the  
163 long-run (Lopez, 2004; Kraay, 2004). Akobeng (2016) points out that increasing economic growth does  
164 not automatically translate into child poverty reduction.

165 Poor people can only benefit from economic growth if institutions frame pro-poor growth policies which  
166 in the process reduce inequality levels. Diao et al. (2010) found that poverty growth elasticity is  
167 consistently larger when growth is driven by agricultural growth than non-agricultural growth.  
168 Alongside economic growth, government strategies have to turn to social protection programs directed  
169 to areas which positively impacts children's capabilities. Public expenditure has been limited in most  
170 African countries because of poor budgetary procedures and corruption (Delavallade, 2006; Wilhelm et  
171 al. 2005).

### 172 **3. Data, model, results**

#### 173 *3.1 Data*

174 In measuring factors affecting child poverty we have incorporated deprivation indicators from both  
175 Bristol School and Young Lives deprivation approaches, we have extended on these approaches by  
176 including low status of women and institutional quality. The econometric analysis on child poverty  
177 equations have been estimated with a sample of 30 countries (between 1990-2010) out of the 46 sub  
178 Saharan African countries, the criteria of the choice of countries has entirely been based on the

179 availability of data of our interest. A sample of 30 countries which although constrained by the  
 180 availability of data, is broadly representative.

181

182 Variable names' abbreviations, unit of measurements and descriptive statistics are presented in Table 1.

183 **Table 1 Descriptive statistics of factors affecting child poverty in Sub Saharan Africa.**

Variable	Units of measurement	Mean	Standard deviation	Minimum	Maximum	Abbreviation
Under five mortality rate	% proportion of live births	13.48	5.1	1.51	30.79	U5MR
Gender parity index	%	84.45	16.04	40.93	124.21	GPI
Out of school children	%	31.37	18.51	1.17	81.00	OOSC
Female employment in agri.	% propotion of FE employment Agri.	60.75	23.03	4.14	96.65	FAG
Mobile phone subscribers	%	33.34	32.49	0.00	100.00	MPH
Rural sanitation	% of rural population	25.00	21.24	0.00	88.00	RS
Primary school enrolment	%	68.84	18.34	22.28	98.83	PSE
Ibrahim Index African Governance	%	50.66	12.23	24.24	81.57	IAG
Female primary Sch. Teacher	% of total teachers	38.69	19.02	5.89	81.85	FPST
Orphans 0-17yrs currently living	%	1.87	3.76	0.01	25.00	ORP
Ratio female to male labor force participation rate	Pop. Ages +15 in %	80.14	18.39	10.23	108.08	RFM
Underweight children	%	23.70	8.62	3.30	49.60	CU
Crop production index	%	9.01	2.18	0.60	18.05	CPI
Wood fuel	%	11.27	15.61	0.01	76.60	WF
Child labor	%	15.66	16.96	0.59	93.82	CL
Health expenditure per capita	% of GDP	5.51	2.95	2.09	11.8	HE
Ethno linguistic fractionalisation	% total population	64.84	24.39	4.00	90.00	ELF
Girls out of school	%	4.53	8.15	2.09	54.88	GOS
Persistence to the last grade primary	Total % of cohort	55.03	18.95	16.16	98.45	PLG
Married women can open bank account	Dummy	0.73	0.44	0.00	1.00	MWBA
Paved Roads	% of total roads	22.01	22.37	1.00	100.00	PRD
Female enrol sec. vocational	%	38.35	11.04	8.65	86.22	FSV
Agricultural value added	% of GDP	4.52	12.66	-33.07	59.75	AGV
Regional dummy Eastern Africa	Dummy	0.30	0.46	0.00	1.00	EA
Regional dummy Southern Africa	Dummy	0.09	0.30	0.00	1.00	SA

Regional dummy Western Africa	Dummy	0.40	0.49	0.00	1.00	WA
Child marriage	% of total	21.16	2.33	17.60	28.00	CM

184

185

186 The major source of the data is the World Bank’s African Development Indicators 2012. Other sources  
 187 have been United Nations Educational Scientific and Cultural Organisations database (UNESCO) 2011,  
 188 Economic Commission for Africa (ECA) 2011, United Nations Children's Fund (UNICEF) 2011,  
 189 Demographic Health Surveys (DHS). These organisations have used household survey methods to collect  
 190 the data, World Bank compiles international datasets, which are generally based on data generated by  
 191 national statistical systems.

192 *3.2 Model*

193 Econometrically, we employ Simultaneous Three Stage Least Squares (3SLS) and fixed effects model  
 194 with the help of panel data methods to run the econometric regressions of the three equations  
 195 simultaneously. Data on child poverty in Africa are scarce and this has given rise to unbalanced panel  
 196 data. Why simultaneous equations? Reverse causality creates endogeneity in the measurement of child  
 197 poverty using U5MR as a dependent variable and independent variables of primary school enrolment  
 198 rates and child underweight. High primary enrolment rates are assumed to reduce child poverty because  
 199 of the benefits of education. While high percentages of OOSC are assumed to increase child poverty  
 200 because of lack of education. However, there is the probability of reverse causality. High levels of  
 201 poverty may cause children from poor families not to be enrolled in school because of a lack of funds to  
 202 meet schooling costs, thereby leading to low primary school enrolment rates and increasing numbers of  
 203 OOSC.

204

205 Children from poor families tend to suffer from malnutrition (child underweight) because of their lack  
 206 of access to adequate nutritious food, thus child poverty contributes to child underweight. While child  
 207 underweight contributes to child poverty because malnourished children generally have poor health that  
 208 affects school attendance, concentration while at school which leads to poor performance and in the long  
 209 run, affects earning potential in adult life. Simultaneous causality bias takes place when causality runs  
 210 both from X (primary school enrolment) to (U5MR) Y and from Y to X. The coefficients of primary  
 211 school enrolment and child underweight are the endogenous variables suspected to be correlated to the



212 error term. We have solved the endogeneity issue by running simultaneous equations model consisting  
 213 of three equations U5MR, primary school enrolment (PSE) and child underweight (CU) with the help of  
 214 the 3SLS.

215

216 U5MR is the probability expressed as a rate per 1,000 live births, a new born baby will die before  
 217 reaching age five, if subject to current age specific mortality rates. Under-five mortality rates have been  
 218 converted into percentages. U5MR is chosen by UNICEF as its single most important indicator of the  
 219 state of a nation's children and human development. U5MR as an accurate measure of children's  
 220 wellbeing is used by UNICEF to rank the nations of the world not in ascending order of their per capita  
 221 GNP, but in descending order of their U5MR (UNICEF 2002 and 2008).

222 The econometric model is described by a simultaneous system of three equations which is given below

$$223 \text{ (a) } U5MR_t = \alpha_0 + \alpha_1 * PSE_t + \alpha_2 * CU_{t-1} + \alpha_3 * GPI_t + \alpha_4 * FAG_t + \alpha_5 * AGV_t + \alpha_6 * HE_t + \alpha_7 * \\ 224 RS_t + \alpha_8 * ELF_t + \alpha_9 * GOS_t + \alpha_{10} * WA_t + \varepsilon_{1t} \quad (1.1a)$$

$$225 \text{ (b) } PSE_t = \beta_0 + \beta_1 * U5MR_t + \beta_2 * CU_t + \beta_3 * GPI_t + \beta_4 * CPI_t + \beta_5 * PRD_t + \beta_6 * PLG_t + \beta_7 * CL_t + \\ 226 \beta_8 * GOS_t + \beta_9 * IIAG_t + \beta_{10} * ORP_t + \beta_{11} * FPST_t + \beta_{12} * MPH_t + \beta_{13} * SA_t + \beta_{14} * WA_t + \varepsilon_{2t} \\ 227 \quad (1.1b)$$

$$228 \text{ (c) } CU_t = \gamma_0 + \gamma_1 * CU_{t-1} + \gamma_2 * U5MR_t + \gamma_3 * PSE_t + \gamma_4 * GPI_t + \gamma_5 * CPI_t + \gamma_6 * CPI_{t-1} + \gamma_7 * \\ 229 FSV_t + \gamma_8 * WF_t + \gamma_9 * MA_t + \gamma_{10} * OOSC_t + \gamma_{11} * MWBA_t + \gamma_{12} * IIAG_t + ELF_t \gamma_{13} * \\ 230 + MPH_t + \gamma_{14} * SA_t + \gamma_{15} * WA_t + \varepsilon_{3t} \quad (1.1c)$$

231 Where:  $\alpha_0$  to  $\alpha_{10}$  correspond to the estimated coefficients of the U5MR equation

232  $\beta_0$  to  $\beta_{14}$  correspond to the estimated coefficients of PSE (primary school enrolment) equation

233  $\gamma_0$  to  $\gamma_{15}$  correspond to the estimated coefficients of CU (child underweight)

234  $\varepsilon_{1t}$ ,  $\varepsilon_{2t}$  and  $\varepsilon_{3t}$  are error terms corresponding to each one of the equations

235 Reverse causality creates endogeneity in the measurement of child poverty using U5MR as a dependent  
 236 variable in equation (1.1a) and as an independent variable in equations (1.1b) and (1.1c) Similar problems

237 are created by using variables PSE and CU as endogenous variables in equations (1.1b) and (1.1c) and  
238 as exogenous in equations (1.1a) and (1.1b), respectively.

239 The explanatory variables for under-five mortality rate (child poverty) are- PSE, CU\_1 (child  
240 underweight with 1 year lag), GPI (gender parity index), FAG (female employment in agriculture), AGV  
241 (agriculture value added), HE (health expenditure), RS (rural sanitation), ELF (ethnolinguistic  
242 fractionalization), GOS (girls out of school) and WA (West Africa).

243 The explanatory variables for primary school enrolment are- U5MR, CU, GPI, GOS, CPI (crop  
244 production index), PRD (paved roads), PLG (persistence to the last grade), CL (child labour), IIAG  
245 (Ibrahim's Index, African Governance), ORP (orphans), FPST (female primary school teacher), MPH  
246 (mobile phone subscribers), SA (South Africa) and WA (West Africa).

247 The explanatory variables for child health are- CU\_1, U5MR, PSE, GPI, CPI, CPI\_1 (crop production index  
248 with 1 year lag), FSV (female secondary vocational enrolment), WF (wood fuel), MA (age at first  
249 marriage), OOSC (out of school children), MWBA (married women can open a bank account), IIAG,  
250 ELF, MPH, WA and SA.

### 251 *3.3 Results*

#### 252 **Table 2- Estimates of factors affecting child poverty- here**

253 The econometric model of Eq (1a)-Eq (1c) is estimated using 3SLS estimation techniques and the results  
254 are presented in Table 2. The estimated coefficients have the expected signs and most of them are  
255 statistically significant. In equation 1, the benefits of education in reducing child poverty (under-five  
256 mortality rate) are evident through the estimate of primary school enrolment which has a negative and  
257 statistically significant (1% level) effect on under five mortality rate. Furthermore, the estimated  
258 elasticity indicates that 1% increase in primary school enrolment will decrease under-five mortality rate  
259 by 0.46%. Gender parity index is used as a proxy for the status of rural women. In the present context  
260 the low status of women connotes not having equal access to education as compared to men. Regression  
261 results reveal that gender parity index is positive (0.09) and statistically significant at the 1% level of  
262 significance. Furthermore, the estimated elasticity indicates that 1% decrease in the number of girls  
263 enrolled in primary school as compared to the number of boys will increase child poverty by 0.56%. The  
264 benefits of girls' education in terms of reducing child poverty are for instance educated women are known

265 to have good health practices such as controlling fertility rates, good nutrition and good hygiene practices  
 266 that boosts children's wellbeing and performance at school which translates into better future prospects  
 267 in adult-life thereby minimising intergenerational child poverty.

268

269 **Table 2 ESTIMATES OF FACTORS AFFECTING CHILD POVERTY**

<b>EQUATION 1: DEPENDENT VARIABLE-UNDER FIVE MORTALITY RATE 1990-2010</b>					
VARIABLE	COEFFICIENT	STD ERROR	T-STAT	P-VALUE	ELASTICITY
Constant	76.0533***	13.4750	5.64	0.0000	
Primary school enrolment (PSE)	-0.0896***	0.0164	-5.44	0.0000	-0.46
Child underweight 1 (CU 1)	0.7604***	0.0433	17.56	0.0000	1.35
Gender parity index (GPI)	0.0948***	0.0214	4.42	0.0000	0.56
Female employment in agriculture (FAG)	-0.5489***	0.1265	-4.34	0.0000	-2.48
Agricultural value added (AGV)	-0.0004***	0.0001	-3.83	0.0001	
Health expenditure per capita (HE)	-0.1306***	0.0369	-3.53	0.0004	-0.05
Rural sanitation (RS)	-0.2146***	0.0596	-3.60	0.0003	-0.39
Ethnolinguistic fractionalization (ELF)	-0.4178***	0.0648	-6.44	0.0000	-2.02
Girls out of school (GOS)	0.0310	0.0191	1.62	0.1054	0.10
Country dummy-West Africa (WA)	-0.0680**	0.0300	-2.27	0.0234	
Number of observations	630	Durbin - Watson test		2.325	
<b>EQUATION 2: DEPENDENT VARIABLE- PRIMARY SCHOOL ENROLMENT</b>					
Constant	183.653**	87.9421	2.09	0.0368	
Under five mortality rate (U5MR)	-2.6917***	0.3710	-7.25	0.0000	-0.53
Child underweight (CU)	-6.4803**	3.3039	-1.96	0.0498	-2.23
Gender parity index (GPI)	0.3678***	0.1067	3.45	0.0006	0.45
Crop production index 1 (CPI 1)	1.9541***	0.3034	6.44	0.0000	2.49
Roads, paved (PRD)	0.2822***	0.0461	6.12	0.0000	0.09
Persistence to last grade of primary (PLG)	0.3550***	0.0746	4.76	0.0000	0.29
Ratio of female to male labor F.P. rate (RFM)	-1.0215***	0.2022	-5.05	0.0000	-1.19
Children in employment (CL)	-0.0003***	0.6912	-4.31	0.0000	
Girls out of school (GOS)	-0.2161***	0.0729	-2.96	0.0030	-0.14
Ibrahim's Index of African Governance (IIAG)	-1.1841**	0.5397	-2.19	0.0282	-0.87
Orphans (ORP)	-0.0016*	0.8487	-1.84	0.0660	
Female teacher primary school (FPST)	0.1793*	0.1029	1.74	0.0814	0.11
Mobile phone subscribers (MPH)	1.0197*	0.5271	1.93	0.0530	0.52
Country dummy-Southern Africa (SA)	-0.3326***	0.0816	-4.07	0.0000	
Country dummy-West Africa (WA)	-0.3582***	0.1230	-2.91	0.0030	
Number of observations	630	Durbin Watson test		2.149	
<b>EQUATION 3: DEPENDENT VARIABLE CHILD UNDERWEIGHT</b>					
Constant	24.8681***	3.7269	6.67	0.0000	
Child underweight 1 (CU 1)	0.4841***	0.0691	7.01	0.0000	0.48
Under five mortality rate (U5MR)	0.0332***	0.0119	2.79	0.0053	0.02
Primary school enrolment (PSE)	-0.0840***	0.0277	-3.02	0.0025	-0.23
Gender parity index (GPI)	0.0059***	0.0016	3.68	0.0002	0.04
Crop production index (CPI)	0.3309***	0.0611	5.41	0.0000	1.25
Crop production index 1 (CPI 1)	-0.4375***	0.0668	-6.54	0.0000	-1.63

Enrolment in sec. vocational, female (FSV)	-0.7144***	0.1880	-3.80	0.0001	-1.15
Wood fuel (WF)	0.6085***	0.1668	3.65	0.0003	0.29
Child marriage (CM)	0.0039***	0.0013	2.83	0.0047	0.04
Out of school children (OOSC)	0.0829***	0.0285	2.91	0.0036	0.11
Married women open bank acc. (MWBA)	-0.0021**	0.0009	-2.27	0.0233	
Ibrahim's Index of African Governance (IIAG)	-0.0207**	0.0109	-2.06	0.0394	-0.04
Ethnolinguistic fractionalization (ELF)	-0.0109**	0.0051	-2.13	0.0334	-0.03
Mobile phone subscribers (MPH)	0.0186*	0.0098	1.09	0.0576	0.03
Regional dummies, West Africa (WA)	-0.0046**	0.0019	-2.37	0.0177	
Regional dummies, Southern Africa (SA)	-0.0024	0.0016	-1.56	0.1191	
Number of observations	630	Durbin Watson test		2.037	

270 The numbers in parentheses below the estimated coefficients are absolute values of the "t" ratios. Three asterisks, two asterisks and one  
271 asterisk besides. The estimated coefficients denote statistical significance at 0.01, 0.05 and 0.10 levels respectively valued at two-sided test.  
272 All the variables are in percentages, with the exception of regional dummies and married women with access to bank account which is a  
273 dummy variable.  
274

275 The findings of this study on the impact of primary school enrolment on child poverty are similar to those  
276 of Barro and Lee (2010) who found that African countries do not invest heavily in primary school  
277 education and therefore have few average years of primary schooling which consequently leads to high  
278 losses in GDP per capita. While Burnett et al. (2013) found that the foregone income due to lack of  
279 completing primary school, loses of wage premium to primary education and direct costs as a percentage  
280 of GDP per capita weigh heavily on African economies. UNESCO (2012) reports that education makes  
281 people more skilled and employable at the same time provides an escape route from poverty, an  
282 additional year of education adds about 10% increase to a person's income on average. Psacharopoulos  
283 and Patrinos (2002) found that social and private returns from primary education are much higher, than  
284 those from secondary education particularly in low income countries as compared to high income  
285 countries.

286 However, our findings are contrary to those of Faux and Ntembe (2013) who investigated the impact of  
287 primary education attainment on poverty in Cameroon, and found that primary education had no impact  
288 on poverty reduction, but added that as education level rises, it negatively affects poverty. Appleton  
289 (2000) review on 9 African studies concluded that the estimated effects of education were typically  
290 insignificant. He found that a mean increase in self-employment income associated with an extra year of  
291 education is 7% at primary level and 12% at the secondary level.

292 Results from equation 1 in Table 2 show that female employment in agriculture has a statistically  
293 significant negative (-0.55) effect on child poverty. Furthermore, the estimated elasticity shows that 1%  
294 increase in the number of female employed in agriculture will decrease child poverty by 2.48%.

295 In equation 1, child underweight has a positive and statistically significant effect on under five mortality  
296 rates (0.76). The estimated elasticity indicates that 1% increase in child underweight will increase under  
297 five mortality rates by 1.35%. Klasen (2007) suggests that 60% of childhood deaths are directly or  
298 indirectly attributed to moderate or severe under-nutrition. Most micro-level empirical evidence suggests  
299 some negative effects of moderate under-nutrition and clearly identifies high morbidity and mortality  
300 risks to severe under-nutrition.

301 Ethnolinguistic fractionalisation (ELF) is a proxy for the quality of institutions in equation 1, nations  
302 with high percentages of linguistic diversity are prone to ethnic conflicts that negatively affects the  
303 quality of institutions. The estimate ELF is negative (-0.42) and statistically significant at the 1% level  
304 of significance. Moreover, the estimated elasticity indicates that 1% decrease in ethnic diversity (ELF)  
305 would reduce child poverty by 2.02%

306 Equation 1 attempted to answer the question that are children poor because they cannot access education,  
307 Equation 2 attempts to answer the reversed question that do children lack access to education because  
308 they are poor? This question suggests that the causality between child poverty and lack of education is  
309 bi-directional. In the light of this understanding, equation 2 uses primary school enrolment as a dependent  
310 variable, while under five mortality rate is used as an explanatory variable to gauge its negative impact  
311 on education and at the same time to demonstrate that since causes of child poverty are interrelated,  
312 factors that positively affect child poverty negatively impact children's education and vice versa. The  
313 measurement of education using primary school enrolment is not exhaustive given that it does not  
314 account for factors affecting quality of education including teachers' absenteeism, large size of  
315 classrooms, and lack of access to textbooks. However, as pointed out in section 3.2 data on child poverty  
316 in Africa are scarce, therefore we are limited by the available data sets- this comment was made by  
317 Reviewer 3.

318 It should be noted that in equation 1 primary school enrolment is negative (-0.08) and statistically  
319 significant, at the 1% level. The estimated elasticity indicates that 1% increase in primary school  
320 enrolment reduces under-five mortality rate by 0.46%. Whereas in equation 2 the estimate of under five  
321 mortality rate is negative (-2.69) and statistically significant, at the 1% level. The estimated elasticity  
322 indicates that 1% increase in under-five mortality rate reduces primary school enrolment by 0.53%.

323 The results in equation 2 reveal that child underweight is negative (-6.48) and statistically significant at  
324 0.05 level. A child who is underweight is most likely to be either absent from school due to poor health

325 or if he/she attends school may end up performing poorly probably because he/she suffers from  
326 underdeveloped cognitive skills. The estimated elasticity indicates that 1% increase in underweight  
327 children will decrease primary school enrolment by 2.23%, these results suggest that of all the  
328 determinants of primary school enrolment, great attention should be given to children's nutritional status  
329 because it shows the highest effect on primary school enrolment.

330 Child malnourishment is attributed to several factors such as child's health, mother's health and  
331 education status, family income, availability of food supply and the accessibility of food which largely  
332 depends on its affordability. Children from poor families who barely have subsistence income, tend to  
333 suffer from malnutrition because their families are unable to make food purchases. Therefore it is  
334 assumed in equation 2 that an increase in crop production may reduce food prices, and in the process  
335 enable poor families to access food. Crop production index is a proxy for food supply, the estimated  
336 coefficient of crop production index is positive (1.95) and statistically significant at the 1% level. A  
337 mother with the possibility to access food has more probability to maintain good health and give birth to  
338 healthy children, who can be enrolled in school and be retained in school. The estimated elasticity shows  
339 that 1% increase in crop production index will increase primary school enrolment by 2.49%.

340 In equation 2, results show that the estimate ratio of female to male labour force participation is negative  
341 (-1.02) and is statistically significant at the 1% level. In circumstances where low household income  
342 constrains parents to limit the number of children they send to school, sociocultural factors tend to favour  
343 sons over daughters, thus lack of income acts as a strong case against girls being sent to school.  
344 Subsequently, girls denied education grow up into illiterate adults which adds up to the already existing  
345 barriers in the labour market. With the widening of the gap between the ratio of female to male labour  
346 force participation rate, the estimated elasticity indicates that a 1% decrease in the ratio of female to male  
347 participation in the labour market will reduce primary school enrolment by 1.19%.

348 Rural Sub Saharan Africa is largely characterised by poverty, the effects of poverty are not only felt in  
349 families but also in schools, therefore the burden of developing schools particularly in poverty stricken  
350 areas is mostly borne by the African governments. In equation 2 the estimated coefficient of Ibrahim's  
351 Index of African Governance is negative (-1.18) and statistically significant at the 5% level. If the low  
352 proportion of education funds allocated to rural schools and poverty stricken areas in general diminishes,  
353 the estimated elasticity shows that 1% decrease in Ibrahim's Index of African governance will decrease

354 primary school enrolment by 0.87%. The negative effect of African governance could be partly because  
355 there is a tendency to spend more in the tertiary sector as compared to the primary sector.

356 In equation 3 the dependent variable is child underweight, women's status in this equation are represented  
357 by gender parity index and female enrolment in secondary vocational. The effect of female enrolment in  
358 secondary vocational on child underweight is negative (-0.71) and statistically significant at the 1% level.  
359 Smith et al. (2003) found that women's status and children's nutritional status are linked. The study noted  
360 that if men and women enjoyed equal status, child malnutrition in Sub Saharan Africa would decrease  
361 by nearly 3 percentage points—a reduction of 1.7 million malnourished children under three. Mahgoub,  
362 S.E.O. et al. (2006) study on factors affecting prevalence of malnutrition among children under three  
363 years of age in Botswana found that the higher the level of mother's education the lower the level of  
364 child underweight.

365 Child poverty limits the ability of children to access and obtain sufficient nutritious food, thereby their  
366 poverty state exacerbates their undernutrition status. In equation 3, the effect of under five mortality rate  
367 is positive (0.03) and statistically significant at the 1% level. The estimated elasticity indicates that 1%  
368 increase in child poverty, increases underweight children by 0.02%.

369 Primary school enrolment can reduce child underweight indirectly through the pathway of the benefits  
370 of education. In equation 3, the effect of primary school enrolment on child underweight is negative (-  
371 0.08) and statistically significant at 1% level. The estimated elasticity indicates that 1% increase in  
372 primary school enrolment will decrease child underweight by 0.23%.

373 Primary school enrolment can directly reduce child underweight through school feeding programs which  
374 enables poor children to access nutritious food which they would otherwise never have accessed if they  
375 were not enrolled in school. Out of school children are largely characterised by malnutrition, school  
376 feeding programs may act as an incentive for children to enrol and remain in school. In equation 3, the  
377 effect of out of school children on child underweight is positive (0.08) and statistically significant at the  
378 1% level. Furthermore the estimated elasticity shows that 1% increase in out of school children will  
379 increase child underweight by 0.11%.

380 Furthermore the effect of Ibrahim index of African governance on child underweight is negative (-0.02),  
381 and statistically significant at the 5% level. Conversely Ibrahim index of African governance had a  
382 negative effect on primary school enrolment in equation 2. This turn of events does not necessarily imply

383 that resources channelled to health sector positively promotes children's wellbeing. The case as with the  
384 public expenditure on education applies to healthcare as well resources are mostly channelled to tertiary  
385 healthcare which largely benefits rich people at the expense of primary healthcare which mostly benefits  
386 poor people. The negative impact of Ibrahim index of African governance on child underweight could  
387 be probably because of child vaccines such as DPT\_3 which are easily accessible by poor families and  
388 greatly prevent children from certain diseases that could have otherwise tampered with their health status  
389 and in the process increased the percentage of underweight children. It is notable that the explanatory  
390 variable in equation 3 with the greatest potency on child underweight is crop production index, child  
391 underweight decreases by 1.63% for 1% increase in crop production index.

#### 392 **4 Conclusion**

393 Attempts to answer the question: "are children poor because they cannot access education or do children  
394 lack access to education because they are poor" using econometric model suggests that the causality  
395 between child poverty and lack of access to education is bi-directional. Although education plays a  
396 crucial role in the pathway out of poverty, the order of elasticity ranking shows that female employment  
397 in agriculture, ethnolinguistic fractionalization (quality of institutions) and child underweight are more  
398 potent in explaining child poverty than primary school enrolment (education). As much as child poverty  
399 (under five mortality rates) affects children's access to education, elasticity ranking indicates that the  
400 impact of child poverty on primary school enrolment is not as potent as that of crop production index,  
401 child underweight, ratio of female to male labor force participation rate and Ibrahim Index African  
402 Governance. However, all these factors are mostly influenced by child poverty, suggesting that the  
403 indirect impact of child poverty on primary school enrolment is stronger than the direct impact. For  
404 instance, child underweight is generally associated with children from poor families. The results suggest  
405 that the effect of child poverty on education is negative and is statistically significant in explaining lack  
406 of access to education.

407 Crop production index (CPI) elasticity of child underweight takes the first position an increase in CPI  
408 corresponds to a decrease in child underweight. Low status of women (gender parity index) and education  
409 (primary school enrolment) are significant in explaining child underweight. Our findings indicate that  
410 both access to education and women's access to productive resources are crucial factors in explaining  
411 child poverty.



412 Based on the results of econometric analysis, the answer to the second research question (To what extent  
413 can the low status of rural women be considered as a contributing factor to child poverty?) is that the low  
414 status of women affects child poverty to a large extent. Rural women's access to productive resources  
415 takes pre-eminence by laying a sound foundation for education boosting factors to create a virtuous cycle  
416 of growth. Our findings suggest that child poverty (under five mortality rates) can be reduced largely  
417 through improved status of women in agriculture, while increased crop production leads to increases in  
418 primary school enrolment and reductions in underweight children. The elasticity of under five mortality  
419 rates with respect to women in agriculture and the elasticity of primary school enrolment with respect to  
420 crop production taking the lead in elasticity ranking implies that strategies to reduce child poverty and to  
421 increase education should focus on creating an enabling environment for women in agriculture which in  
422 the process will increase agricultural output which positively affects education. Elasticity ranking shows  
423 that what is at issue is not the impact of education on reducing child poverty or the impact of child poverty  
424 on reducing education but the improvement of women's status particularly in the agricultural sector.

425 The contributions of the study can be explained in the following way for instance we expand on the  
426 previous research by adding the need to improve on the quality of institutions particularly those  
427 concerned with budget allocation, to shift high investments away from tertiary sectors to primary sectors  
428 which tend to serve the needs of a large proportion of poor children and their families.

429 Previous studies on child poverty have mostly focused on the conventional multidimensional child  
430 deprivation indicators such as food, water, education, sanitation, shelter, information and health in  
431 general. We have added to the conventional multidimensional indicators child specific indicators – out  
432 of school children, child marriage, orphans and children in employment; and general indicators including  
433 women's status and institutional quality in describing children's plight.

434 We have contributed to the precedent studies on child poverty by bringing on board agricultural  
435 productivity. A combination of results and theory suggests that agricultural production which is a labour  
436 intensive sector is the password for child poverty reduction particularly in rural Africa. Africa's poor  
437 being mainly rural and their livelihood being mainly subsistence farming, agriculture is their lifeline.  
438 Increased agricultural productivity acts both as a source of increased food availability and incomes of  
439 the farmers. It enables farmers to increase their household consumption expenditure which consequently  
440 improves children's nutritional status and subsequently augments school enrolment rates thereby  
441 reducing out of school children and subsequently in the long run reduces child poverty and adult poverty.

442

443 In sum this study has given a new interpretation of child poverty by applying the established theory of  
444 child deprivations in a new setting to add on the existing studies of child poverty. We have done this by  
445 showing the effect of women's limited access to productive resources such as education and labor market  
446 on under five mortality rates, primary school enrolment and child underweight. We have stretched the  
447 body of knowledge of child poverty, particularly in Africa where the numbers of out of school children  
448 are on the rise and social cultural institutions still override the constitution of equality and there is  
449 declining percentages of women in agriculture.

450

451 **NOTE:**

452 **(1) FUNDING- this study did not receive any form of grants.**

453 **(2) CONFLICT OF INTEREST- We as the authors of this paper declare that we have no**  
454 **conflicts of interest.**

455 **(3) The manuscript entitled “Child Poverty, Status of Rural Women and Education in Sub**  
456 **Saharan Africa” is based on an academic dissertation submitted at the link**  
457 **<https://helda.helsinki.fi/bitstream/handle/10138/219416/FACTORSA.pdf>**

458

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