Understanding Household Education Expenditure in Sudan: Do Poor and Rural Households Spend Less on Education?

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Abstract

This paper examines the factors that influence households' expenditure on education in Sudan, using the National Baseline Household Survey (NBHS) data (2009) for national, urban and rural levels. The results of Tobit model indicate that household income, head education, head age, household size, number of school-age children and residing in urban areas are the most significant factors affecting education expenditure. Interestingly, the results show that the income elasticity of education in urban sample model is greater than that of rural model, implying that households residing in urban areas are likely to spend more on education. In addition, the effect of household income is found to be positive and significant in the highest income quintile. Overall, the results revealed that households with higher income, whose heads are educated and reside in urban areas tends to spend more on education compared to poor and rural households. These results signify the lack of inter-generational educational and income mobility in Sudan, implying that children from poor households are caught permanently in low income and educational levels, and are not able to "catch up" their peers in high income families.

Keywords: Education Expenditure, Tobit models, Sudan
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1. Introduction

Education has been considered as a key factor for supporting economic growth and development and alleviating poverty in developing countries. According to human capital theory, education allows individuals to gain better skills and knowledge needed to access jobs, hence enhances productivity and economic growth; which in turn help in eradicating extreme poverty and hunger (Bryant, 1990; Becker, 2009 Mincer, 1970 and Schultz, 1961). Therefore, the issue of education expenditure by both governments and households has gained a sizable attention from researchers and international development organizations.

In Sudan, the education system has been affected by many economic transformations that the country undergone in the last three decades. Specifically, the adoption of liberalization and free market policies in early 1990s have resulted in reducing public spending on education. Since then, the size of private investment in education has expanded remarkably. Accordingly, households' expenditure on education has gone up although basic education such as, primary and secondary education, is still delivered through public sector. Moreover, the reduction of government expenditure on education has contributed greatly in lessening the quality of public education; hence a large segment of population is pushed into private education. This leads to a significant increase in household education expenditure, particularly in urban areas and among high income households.

Against this backdrop, many questions can be raised in accordance with the aims of this study, including: What are the key determinants of the households' education expenditure in Sudan? Does the poor and rural household spend less than urban and rich household? To what extent could the factors that affecting education expenditure vary across rural and urban areas as well as among different categories of income groups?

Regarding the importance and policy relevance, the empirical investigation to be undertaken by this study is useful for several reasons. First, investigating household education expenditure is crucial to provide evidence, which can be used to formulate relevant policies targeting planning and reforming education system in Sudan. Second, understanding the factors that affecting educational spending in Sudan may help policymakers and key stakeholders (i.e. national and international NGOs) to design effective strategies that ensure better access to education so as to create more jobs and reduce poverty. Finally, by identifying the factors affecting education expenditure among different areas (i.e. urban and rural) and income quintiles, the study would place strong foundation in designing effective education programs for disadvantaged groups of population.

The remainder of this paper is organized as follows. The next section outlines some stylized facts about education system and its finance in Sudan. Section three discusses the theoretical and empirical literature on the determinants of household educational spending. While section four outlines data and research methodology, section five presents the empirical results and discussions. Section six ends with a conclusion and possible ways forward.

2. Education in Sudan: An Overview

Gaining its independence in January 1956 from British colony, Sudan inherited an education system designed to provide civil servants and professionals to serve the colonial administration. The distribution of education facilities such as, teachers and enrollment was biased in favor of the needs of the British administration and Western curriculum. Thus, the

education services were clustered in urban cities, although about 70 percent of population resides in rural areas. However, at that time the education was fully sponsored by government and the public expenditure on education was about 20 percent (Nour, 2012). Most of education during the colonial era was focused on the basic education (i.e. primary, intermediate and secondary), while tertiary education was limited to the University of Khartoum. In addition, a few number of students of wealthier parents received secondary and university education abroad.

After the independence, the education system in Sudan has received considerable attention from national governments. The national education policies concentrated on the target of achieving universal and compulsory education with aim of equitable distribution of facilities among urban and rural areas. Therefore, the education system has experienced a significant change in terms of years of schooling and distribution of schools. For instance, the Nimeiri regime (1969) considered the education system as inadequate for the needs of social and economic development, hence reorganized the education system in the 1970s as a result (Elmagboul, 2014). The basic education system was changed from 4-4-4 to 6-3-3 (6 primary years compulsory, 3 year for intermediate and 3 for secondary). The technical and vocational education also has gained more attention during Nimeiri government. Moreover, during the era of 1970s the tertiary education has expanded by establishment two new universities (i.e. University of Juba and University of Gaziera) in addition to oldest one: the University of Khartoum.

During the 1980s, Sudan underwent a remarkable expansion in basic education with the opening of hundreds of primary and secondary schools, despite economic and political instability. The technical and vocational education also increased remarkably. All these efforts led to a significant increase in the rate of enrollment from 1980.

In early the 1990s, the education system in Sudan witnessed a great transformation. First, it was further reorganized into eight years of primary education followed by three years secondary schooling. In addition, Arabic language was adopted as instruction language in all public universities. Moreover, the tertiary education expanded and more than thirty universities were established. The number of private schools grew rapidly following economic policies lifting government subsidies to service sectors, including education.

Regarding financing education in Sudan, the country inherited a tax-based education system from the British colony, in which the state provides free educational services for the entire population. Thus, successive national governments adopted free education and this continued until the adoption of free market policies in the decade of the early 1990s. However, after the implementation of the Structural Adjustment Program (SAP), the government began its sudden withdrawal from the provision of educational services. The austerity measures adopted in 1992 resulted in a great reduction in public spending on education. To fill the gap in financing education resulting from these policies, the government provided licenses to private schools. In line with this system, parents were requested to pay some fees for public schools in order to utilize education.

To understand the contribution of government in education, Table 1 below presents the public spending on education in Sudan and a sample of Sub-Saharan African countries. The table shows that public spending on education in Sudan is accounted for a small proportion from the country's GDP compared to other countries in the sample.

Table 1: Public Education Expenditure (% of GDP) in Sudan and a sample of SSA countries

Country	1990-1999	2000-2009	2010-2014
Angola	2.6	2.7	3.5
Botswana	6.3	9.7	9.6
Cameroon	3.1	3.0	3.1
Cote d'Ivoire	4.8	4.1	4.7
Ethiopia	2.6	4.6	4.5
Ghana	4.1	6.0	6.9
Kenya	6.0	6.3	5.5
South Africa	5.8	5.0	6.0
Sudan	**1.0**	**1.8**	**2.1**
Uganda	2.5	3.6	2.5

Source: World Bank, World Bank Indicator (2016)

Table shows that Sudan has the smallest public education spending ratio to its GDP compared to other SSA countries in our sample. Specifically, the government expenditure on education (% of GDP) remained rotating around 1 percent during 1990-1999. During 2000-2009, it increased to the rate of 1.8 percent, indicating the expansion in education expenditure, which may be due to oil revenue at such a period. Moreover, during the last period (2010-2014) the spending on average progressed to 2.1 percent. However, in all periods, the public spending on education in Sudan lags far behind the levels of public expenditure in SSA countries.

Regarding the contribution of government education spending to the total public spending, Table 2 below presents data on public spending on education as a percentage of total government expenditures for Sudan and a sample of SSA.

Table 2: Public Education Expenditure (% of Total Government Expenditure) in Sudan and a sample of SSA countries

Public Education expenditure (% of Total Government Spending)			
Country	**1990-1999**	**2000-2009**	**2010-2014**
Angola	6.1	6.9	8.7
Botswana	20.0	24.3	21.0
Cameroon	11.6	18.7	15.7
Cote d'Ivoire	19.0	21.9	20.7
Ethiopia	14.0	20.6	26.7
Ghana	15.0	22.3	27.9
Kenya	24.0	25.0	20.6
South Africa	20.0	19.4	19.2
Sudan	9.1	8.9	11.0
Uganda	10.0	14.8	11.5

Source: World Bank, World Bank Indicator (2016)

Table 2 indicates that Sudan has the second lowest percentage of public education spending (percentage of total government spending) after Angola. For instance, during the period (1990- 1999), Kenya holds the highest rate of public spending on education, which is about a threefold of that of Sudan. The low rate of public educational spending as a percentage of GDP and total government expenditure implies low public investment in education in Sudan. This also indicates that public education spending falls below the standardized international

adequacy criterion, which was earlier adopted in the 1960s and related to the supply side and implies the allocation of either 8 percent of GDP on education or 20 percent of total government or public spending on education (Nour, 2013). The reduction in government spending on education resulted in a significant deterioration in efficiency indicators like education attainment and enrollment.

Regarding the demand for education, Table 3 presents the gross enrolment ratio for the three educational levels, primary, secondary and tertiary, respectively[28].

Table 3: Gross Enrolment Ratio by Educational Level in Sudan and a Sample of SSA Countries (%)

	Primary level			**Secondary Level**			**Tertiary Level**		
	1990-1999	2000-2009	2010-2014	1990-1999	2000-2009	2010-2014	1990-1999	2000-2009	2010-2014
Angola	18.4	115.4	85.7	11.6	18.9	28.8	0.6	2.3	8.4
Botswana	15.2	17.0	16.9	55.0	77.5	83.3	5.3	10.6	21.4
Cameroon	10.5	16.6	29.1	25.9	30.0	51.6	3.6	6.1	11.5
Cote d'Ivoire	1.7	2.9	5.3	24.3	25.6	40.1	4.6	9.1	8.5
Ethiopia	1.4	2.3	14.2	11.5	24.2	35.7	0.8	2.6	7.4
Ghana	83.7	75.0	113.7	37.5	47.3	60.9	1.2	6.9	13.5
Kenya	36.9	48.1	67.4	38.5	48.1	67.6		3.1	
South Africa	26.1	42.1	75.8	79.6	88.9	92.9	13.1	16.3	19.3
Sudan	16.2	23.6	34.3	33.2	36.2	39.3	6.3	11.0	15.4
Uganda	9.1	11.4	12.4	10.4	21.0	80.8	1.5	3.5	4.2

Source: World Bank, World Bank Indicator (2016)

The table shows that the enrolment ratio for primary education in Sudan was close to some African countries that belonging to poor income group like Angola. However, the primary enrolment ratio falls below some of SSA counties like Kenya and Ghana. Regarding the secondary enrolment ratio, Sudan also has a lower rate compared to some SSA countries like Botswana, Ghana and Kenya. The low enrolment ratio in primary and secondary education in Sudan may be attributed to poverty and economic instability. During the period under consideration, the tertiary enrolment ratio in Sudan has the second highest ratio during all periods after South Africa. This high tertiary enrolment ratio may be due to expansion in tertiary education over the last three decades.

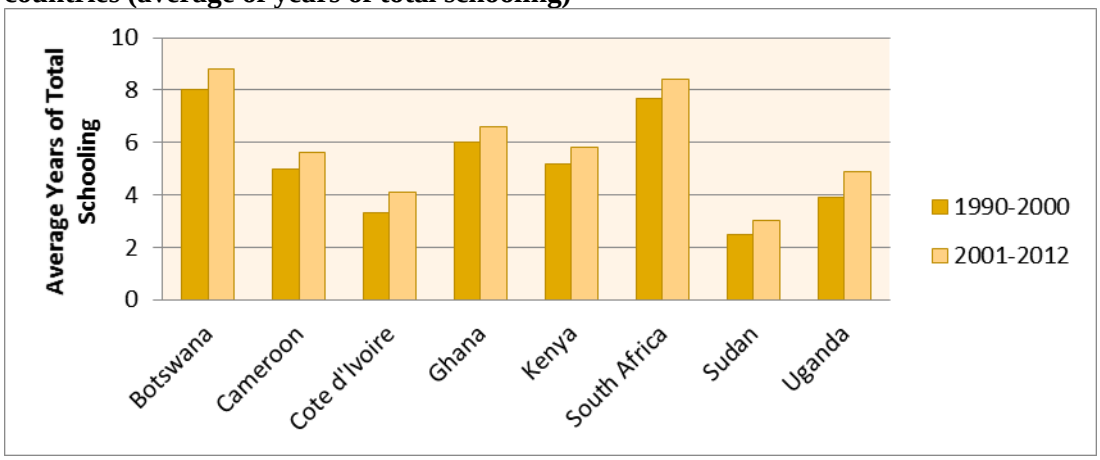
Regarding the educational attainment, Figure 1 below shows the average years of total schooling in Sudan and a sample of SSA countries[29]. As indicted from the Figure, Sudan has the lowest rate of educational attainment among other SSA countries in comparison. The low level of educational attainment confirms the relatively low level of school enrollment. This also supports the high rate of illiteracy in Sudan, which is about 26 percents in 2013 (World Bank, 2013). However, there are many factors that may be held responsible for low educational attainment, including the high cost of education, poverty and unemployment. In general, the low rate of educational attainment and enrollment indicates low commitment to

[28] Gross primary or secondary school enrolment ratio - The number of children enrolled in a level (primary or secondary), regardless of age, divided by the population of the age group that officially corresponds to the same level (World Bank, 2016).

[29] Educational attainment refers to the highest level of schooling that a person has reached. Here we use average years of total schooling as calculated by Baroo and Lee (2010).

the standardized international adequacy and equity criterions in the demand side as measured by the lack of adequacy in enrollment rate in primary, secondary and tertiary education and literacy rate of population (Nour, 2013).

Figure 1: Education Attainment of population aged 15 and older in Sudan and a sample of SSA countries (average of years of total schooling)



Source: World Bank, World Bank Indicator (2016)

3. Literature Review

Given the importance of education in economic growth and development, the determinants of household educational expenditure have gained a considerable attention from both researchers and policy makers in last decades. However, most of the exiting literature has focused on the macroeconomic perspective and government expenditure on education. On the other hand, the issue of household' expenditure on education has gained a few attention particularly in developing countries. In this section we briefly review some empirical studies on this issue.

The empirical literature indicates that household education expenditure is influenced by many variables, including household characteristics, parents' education level and household income, among them. However, the main consensus among most of empirical studies is that household income is the most significant factor affecting education expenditures (e.g. Hashimoto and Heath, 1995; Panchamukhi, 1965); and Kothari, 1966 and Tilak, 2002).

Huston (1995) analyzed the impact of income and household characteristics on education expenditure in US. Using a sample from the 1990-1991' Consumer Expenditure Survey, he found that head age, education level, income, region, race, and family size are the most significant factors affecting household education expenditure.

Kanellopoulos and Psacharopoulos (1997) investigated the factors that affect private expenditure on education in Greece, using household Expenditure Survey of 1988. They found that household size and number of children under six years of age have negative effect on private spending on education, while the head's years of education and income have a positive impact on education expenditure. In the same vein, Psacharopoulos and Papakonstantinou (2005) examined the household expenditure on university education in Greece, using a sample of 3000 university freshmen. They argued that private education is

highly inelastic, indicating its importance in Grecian household budget. They also found that private out of pocket spending to prepare for the entrance exams and study at college exceeds that of public spending. In addition, they found that poorer families spend a higher share of their income on education of their children. Moreover, using data from household surveys for 1990 and 1992, Psacharopoulos et al. (1997) examine the extent of private expenditure on education in Bolivia and calculate an income elasticity of 0.23. They conclude that education expenditure is not a luxury good for Bolivian families.

Tilak (2002) studied the household education expenditure in rural India using the national survey on Human Development in rural India (HDI) (1994). The paper also examines the household expenditure on education by different groups of population. He found that there is nothing like free education in India and household expenditure on education represents a considerable portion of household budget. In addition, households from lower socio-economic background and low income groups spend considerable amounts on acquiring education, including specifically elementary education, which is expected to be provided free to all by the State. His results also indicate that household income, educational level of the head of household and the household size are among the most significant factors affecting education expenditure. Interestingly, he found that education is income inelastic in India by compiling time series of household expenditure estimates over the period 1960-61 and 1984–85.

Glewwe and Jacoby (2004) examined the relationship between household resources and demand for education in Vietnam using household panel survey data covering the period 1993-1998. They found a positive relationship between household income and demand for education, even after controlling for locality-specific factors such as change in education returns, supply and quality of schools, and opportunity costs of schooling.

Tansel and Bircan (2006) studied the demand for private tutoring in Turkey, using household expenditure survey (1994). Adopting tobit model, the authors showed that private tutoring is neither a luxury nor a necessity item in a household's budget. They also found that parents' educational level, especially of mothers have positive and significant affect on private tutoring expenditures, which means inequity in the intergenerational distribution of education. Moreover, the results indicate that private tutoring expenditures increase at a decreasing rate with the age of the household head, hence implying lifecycle considerations. Their results also indicate that urban families spend more than rural household residents. Finally, household private tutoring expenditures are found to be declined with the number of children in the household.

Qian et al. (2011) examined parents' expenditure on their children's education, using household survey data from 32 selected cities across China in 2003. Their results show that household income has significant effects on both domestic and overseas educational expenditures. The results also indicate that households whose mothers have secondary school or college education and fathers who are working in professional occupations are likely to spend more on education. Moreover, their study found that households belonging to the highest income group, with a college-educated father, a mother who is a cadre or middle professional and living in coastal areas, are most probable to spend on children's education abroad.

Sulaiman et al (2012) examined the determinants of household expenditure on education in Malaysia. Using household survey data, they found that household characteristics such as parents' income and educational level, mother's work status, job category of head of household and parents' awareness of globalization in respect of their children's education are the most significant factors affecting education expenditure. Specifically, their results show that the elasticity of income is very high (approximately 1 percent) indicating the importance of household income in education expenditure.

Vu Quang (2012) investigated the factors that affecting household expenditure on children's education in Vietnam. Using the Vietnamese Household Living Standards Survey (VHLSS 2006) and adopting tobit model, he found that household income has a positive and significant effect on household education expenditure. Meaning, increase in the income of the household is always associated with an increase in educational expenditure. His result also revealed that households whose heads have a higher level of education or with professional jobs are more likely to spend more on education. Moreover, households with more primary-school-age or secondary school-age children are likely to spend more on education compared to households with pre-school-age or college-age children. Vu Quang shows that families with more resources and better human capital are those who are able to spend more income on their children's education.

Andreou (2012) investigated the determinants of household education expenditure in Cyprus, using expenditure surveys of 1996-1997, 2002-2003 and 2008-2009. He found that the level of education expenditure increases with income across years. In addition, his results pointed out that household income, number of children in household, region of residence and heads' age and education level are the most important factors affecting the level of household expenditure on education.

Recently, Acar et al (2016) using Turkish household budget surveys from 2003, 2007 and 2012, investigated the determinants of household education expenditures, adopting an Engel curve framework. In particular, they estimate Tobit regressions of real educational expenditures by income groups to examine if and to what extent the determinants of educational expenditures differ by income groups. Their results indicate that the estimated expenditure elasticity is low for the top- and the bottom-income quartiles while it is high for the middle-income quartiles. The results also show that for all income groups the expenditure elasticity of education increases over time, indicating that Turkish household allocates greater share of their budgets to education expenditures.

The above discussion has made clear that there is a dearth of empirical studies on household educational expenditure in Africa in general and Sudan in particular. Therefore, this study would contribute to the existing literature by examining the factors that affecting household health expenditure across national, urban and rural areas. Moreover, unlike the previous studies, this paper emphasizes the role of income and regional disparities in household educational expenditure.

4. Data and Methodology

4.1 Data and Variables

The data used in this study is sourced from the national baseline households survey (NBHS) conducted by the Central Bureau of Statistics in 2009. The survey contains data on all household' expenditures (e.g. food, education, health, utility, etc..) as well as demographic

and socio-economic characteristics of households and individuals. The survey comprises 48825 individuals of 7913 households and covering 15 states. However, information on education expenditure for each individual in household is not exist, thus, we use household as a unit of the analysis. The data include expenditure of the household in past 12 months (year). Following previous studies (e.g. Qian and Smyth, 2010 and Quang, 2012) we focus on households with dependent children of age is not older than 22, as most of households' members are graduated from university by that age. Accordingly, there was 7,257 valid households who hold such criteria[30]. Therefore, we ensure that there is no sample selection problem, because most of the households with children have positive education expenditure.

Based on the literature review discussed in the previous section, the dependent variable in our analysis is household education expenditure on education. The dependent variable is explained by a vector of explanatory variables, which include household income and socio-economic characteristics. The socio-economic characteristics include a set of variables that are hypothesized to influence household education expenditure such as, household size, education level of head of household, gender, age of the head of household, marital status and dummy variables indicating region of residence, and occupation. Regional and seasonal factors are also considered. The definition and descriptive statistics of the variables used in the analysis is presented in table 4.

4.2 Estimation Technique

To analyze the factors affecting household education expenditure, this paper uses tobit model, which is appropriate technique to estimate household expenditure with zero observations (Tobin, 1958). That is, because not all the households spend on education services, numerous zero observations will exist in the data and we are facing with the so-called censored sample problem (Barslund, 2007; Czarnitzki and Stadtmann, 2002; Dardis et al., 1994). The tobit model was originally developed by Tobin in 1958 to accommodate censoring in the dependent variable. This model also overcomes the bias associated with assuming a linear functional form in the presence of such censoring. The tobit model considers that all zeros are attributable to standard corner solutions. Negative values of the dependent variable are assumed to be exist but are considered to be unobservable and bunched at zero. Based on the Tobin's model, it is assumed that a latent variable that measures the consumer's propensity to spend money on education (y_h) is related to the vector of explanatory variables (X_h) and undetectable influences, as specified in the following:

$$y_h^* = \beta X_h + \varepsilon_h \qquad (1)$$

It is assumed that a household h spends (y_h^*) on education if the latent variable (y_h^*) is positive. In contrast to the observed expenditure of household h (y_h), the value of the unobservable value (y_h^*) can be negative. Negative values of the latent variable imply that household will not spend any money on education:

$$y_h = \begin{cases} y_h^* & if\ y_h^* > 0 \\ 0 & if\ y_h^* \leq 0 \end{cases}$$

[30] The study does not discriminate between private and public education expenditure because there is no information on the type of schooling and/or education expenditure in the NBHS' data.

The conventional estimators for these types of models are based on maximum likelihood estimation (MLE). The MLE produces consistent estimates of the parameters of the tobit model, under appropriate assumptions such as, homoscedasticity and normality of the error terms. The likelihood function consists of two parts: the product of the probabilities that households do not spend any money on education [$Pr\ (y_h = 0\ )$] and the product of the probabilities that households spend y_h^* on education [$Pr\ (y_h = y_h^*\ )$]:

$$L(\beta, \sigma_e) = \prod_{censored} Pr\ (y_h = 0) \prod_{uncensored} Pr\ (y_h = y_h^*\ ) \qquad (2)$$

Assuming standard normal distributed errors (ε_h), the likelihood function of censored model can be rewritten using a probability density function (ϕ) and cumulative distribution function (Φ) of the standard normal distribution as (Tobin, 1958):

$$L(\beta, \sigma_e) = \prod_{censored} \Phi\left(\frac{0 - X_h\beta}{\sigma_e}\right) \prod_{uncensored} \frac{1}{\sigma_e}\phi\left(\frac{X_h - X_h\beta}{\sigma_e}\right) \qquad (3)$$

Equation (3) will be estimated via the maximum likelihood (ML). The estimation is run for different samples, namely full, urban and rural household samples, as well as for different household income groups.

5. Empirical Results and Discussion

This section presents the empirical results and discussions. First, we present some descriptive statistics about the variables that used in the analysis and then report the econometric results.

5.1 Descriptive Statistics

Before analyzing the factors influencing household educational expenditure in Sudan, it is useful to present some descriptive statistics. Thus, table 4 below describes the definition and mean as well as the standard deviation of variables employed in the analysis.

As can be read from the table, the reported statistics indicate that the mean of total household income is SDG 6,846 per annum. This is somewhat consistent with the national statistics as reported by NBHS (2009). However, the higher standard deviation of the total income point to the prevalence of income inequality in Sudan. The mean of health expenditure is about SDG 472 per month, representing about 17 percent out of non-food expenditure. This suggests that a considerable portion of Sudanese households' income is spent on education. The standard deviation of household education expenditure is also high, indicating a great disparity among households in terms of educational expenditure.

The table also indicates that the average of gender variable is very high (about 90 percent), indicating the dominance of males in heading households. Regarding the mean and standard deviation of education variables, the table shows that most heads of households and spouses have low levels of educational attainment, confirming the widespread illiteracy in Sudan.

Table 4: Summary Statistics of Variables used in the Analysis

Variable	Definition	Mean	Std. Dev.
Education Expenditure	Household expenditure on education	472.501	4644.570
Income	Household total disposable income in SDG	6846.134	24416.660
Household's Head Characteristics			
Age	Age of head of household in years	45.811	14.810
Gender of head	Gender of the head of household (1 = male; 0 = female)	0.896	0.305
Education level of Household head			
Primary	Primary school, dummy	0.192	0.394
Secondary	Secondary school, dummy	0.078	0.268
University	University, dummy	0.042	0.201
Education level of Spouse			
Spouse Primary	Primary school, dummy	0.191	0.393
Spouse Secondary	Secondary school, dummy	0.070	0.255
Spouse University	University, dummy	0.032	0.176
Number of children in household			
Pre-school	The number of children aged 1 to 6 living in the household.	0.967	1.046
Primary school	The number of children aged 6 to 14 living in the household	1.500	1.512
Secondary school	The number of children aged 15 to 17 living in the household	0.404	0.628
University level	The number of children aged 18 to 22 living in the household	0.971	1.099
Profession of Household's Head			
Agriculture	A dummy variable where 1 =household's head being engage in agricultural activities, 0 otherwise.	0.072	0.258
Industry	A dummy variable where 1 =household's head being engage in industrial activities, 0 otherwise.	0.003	0.053
Service	A dummy variable where 1 =household's head being engage in industrial activities, 0 otherwise.	0.925	0.262
Household Type of Dwelling			
House	A dummy variable where 1 = being a resident in house, 0 otherwise.	0.995	0 .068
Apartment	A dummy variable where 1 = being a resident in apartment, 0 otherwise.	0.006	0.108
villa	A dummy variable where 1 = being a resident in villa, 0 otherwise.	0.005	0.126
Household Characteristics			
Household size	Number of household' members	6.173	2.806
Room	Number of rooms	3.265	1.869
Married head	A Dummy variable, (1= married; 0= unmarried)	0.895	0.306
Electricity	A Dummy variable, (1= electrified; 0= un-electrified)	0.391	0.488

Moreover, as can be read from the table, the mean of number of heads engaging in agriculture and industry is very small, while the mean for service activity is very high. This implies that a considerable portion of household income is generated from service activities, confirming the dominance of the service sector in Sudan's economy. Moreover, as can be fairly read from the table, the average household size is about six persons, which is consistent with the 2009 NBHS. Interestingly, the mean of dummy variable (married) is high, implying that most household heads are married. Finally, the mean of electricity is found to be relatively small, demonstrating the weakness of infrastructure in Sudan, particularly in rural areas.

5.2 Econometrics Results

A. Determinants of Household' Health Expenditure

First, the results of tobit estimation of equation (3) for the full, urban and rural sample are presented in Table 1 in Appendices. As can be observed from the table, most of the variables carry their expected signs and in line with the theory. The result reveals that the coefficient of household income is positive and significant in all estimated models. However, the results show some differences in income coefficients across models, indicating variations in terms of income impact on education between regions. For instance, the elasticity of income is higher in urban sample compared to rural sample. This result indicates that households residing in urban areas spend about 6 percent more on children's education than those living in rural areas. This result suggests that urban households devote a considerable portion of their budget to children's education. This can be explained by the fact that the extremely poor quality of education in the country, led most of urban households to switch their children to private institutions, which supply better educational services than their public counterparts. On a national level, an increase in household income by a 1 percent elevates its education spending by 8.4 percent. This strong association between household income and education expenditure indicates the absence of free provision of education in Sudan. Alternatively stated, due to the withdrawal of government from financing education, households are pressed to cover education spending relying on their own resources. Furthermore, quality deterioration of public schools pushes a considerable part of the population to private institutions.

Regarding the household head characteristics, the results show that age of head has positive and significant impact of education expenditure. This result confirms many previous empirical studies (e.g. Suliaman, 2012 and Andreos, 2012). Also, the coefficients of education level of head and spouse are found to be positive and significant in full, urban and rural sample models. This means that a household whose head received university degree or diploma is likely to spend the more on their children's education. This result indicates that educated heads and mothers are likely to spend more in education. This finding is in line with the previous studies of Acar (2016) and Vu Quang (2012).

The number of secondary school and university age children has positive and significant impact on education expenditure. This implies that household with children in high education institutions tend to spend more on education compared to those with more children in low education levels. In addition, household head who engage in the service activities tends to spend more in education compared to those participating in agricultural activities. This is because most of service activities are located in urban areas, where households have higher opportunity to spend more on education compared to rural households who engage in agricultural sector.

Moreover, the results show that the coefficients of household size, number of room and access to electricity have positive and significant impact on household education expenditure in Sudan. This can be justified by that fact that larger household with urbanized facilities tends to spend more in education. This finding is also confirms the positive and significant coefficient of urban dummy variable, which indicates that households residing in urban areas tend to spend more in education than those living in rural area.

In terms of geography, households residing in the Northern, eastern, central and Kurdofan regions are likely to spend less on their children's education than households residing in the capital city (Khartoum). This confirms the fact that households in Khartoum devote a large investment for their children's education. Expectedly, the coefficient of Darfur region is found to be negative but not significant. This finding can be justified by the fact that people of Darfur suffer from civil war and a large portion of Darfur population live in IDP camps and spend nothing in education, as most of education services provided by government and non-governmental organizations.

Overall, households with higher income and residing in urban areas tend to spend more on education of their children. This finding confirms our hypothesis that rural and poor household spend less in education in Sudan. In addition, households whose head and mother have higher education level are likely to invest more on education.

Regarding the factors affecting education expenditure by income quintile, Table 2 in Appendices reports the marginal effects for the tobit estimates. As can be read from the table, the coefficient of household income in the bottom four income quintiles are insignificant. On the other hand, the effect of household income in the highest (fifth) income quintile is found to be positive and statistically significant. This indicates that households belonging to high income quintile are likely to spend more on children education. This result confirms the previous results of full, urban and rural models. This also implies that children's education is an important investment for rich population. However, the result suggests that an increase in income of household that belonging to low income quintiles does not raise the education expenditure, as poor households devote a greater part of their budget to food and health expenses.

Similar to the results obtained from the full, urban and rural samples, the education level of household head is found to be very significant in influencing household expenditure, particularly for the highest income group. This finding supports the previous analysis that household with higher income and educated head tends to spend more on education than poor and less educated heads. In addition, the number of secondary and university-age children increases household education expenditure in both fourth and fifth quintile. In addition, households whose head is working in service sector and belonging to third and fourth income quintile spend more on education compared to other income quintiles. Moreover, the results shows that households reside in other regions than Khartoum spend less. Finally, the coefficient of Darfur is not significant, confirming the pervious analysis.

6. Conclusion and Policy Implications

This paper examines the factors influencing household educational expenditure, with emphasis on the role of household income. The study used the NBHS data (2009) for national, urban and rural levels and employed a tobit model. For further understanding of the

impact of income on children's education, the analysis is executed for different income groups.

The results of the tobit estimation reveal that household income, heads' educational level, heads' age, household size, number of school-age children and residing in urban areas are the most significant factors affecting educational expenditure in full, urban and rural samples of the surveyed households. Interestingly, the empirical results show some variations between the effects of household income on educational expenditure across urban and rural areas. Specifically, the income elasticity of education in the urban sample model is greater than that of the rural model, implying that household resides in urban areas tends to spend more on education than rural households. In addition, the effect of household income is found to be positive and significant in the highest income quintile, implying that rich households tend to spend more than poor households.

Overall, our results indicate that households with higher income, residing in urban areas tend to spend more on education in Sudan. In addition, household whose head and mother have higher education level are likely to spend more on education than the others. These results signify the weakness of inter-generational educational and income mobility in Sudan. This also suggests that children from poor household are caught permanently in low income and low education levels and are not able to "catch up" their peers of high income families. Accordingly, education policies in Sudan need to take into account the equality of opportunity in education to ensure that children from low education families have as much access to education as their richer counterparts; thus leading to higher intergenerational mobility in Sudan. Accordingly, liberalization of education that adopted in 1992 should be revised with cautions so as to achieve income and educational equality.

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Appendices

Table 1: Tobit Estimation Results for Household Education Expenditure in Sudan (Full, Urban and Rural Sample)

Variable	Full Sample	Urban	Rural
Income	0.084*** (0.000)	0.130*** (0.001)	0.067*** (0.003)
Household's Head Characteristics			
Age	0.007*** (0.000)	0.006** (0.043)	0.008*** (0.000)
Gender of head	-0.106 (0.177)	-0.138 (0.332)	-0.071 (0.445)
Married	-0.056 (0.471)	-0.090 (0.516)	-0.046 (0.625)
Education level of Household head			
Primary	0.153*** (0.002)	0.156* (0.062)	0.151** (0.011)
Secondary	0.337*** (0.000)	0.390*** (0.000)	0.238** (0.016)
University	0.654*** (0.000)	0.526*** (0.000)	0.864*** (0.000)
Education level of the Spouse			
Spouse Primary	0.136*** (0.006)	0.045 (0.578)	0.202*** (0.001)
Spouse Secondary	0.371*** (0.000)	0.311*** (0.004)	0.360*** (0.002)
Spouse University	0.439*** (0.000)	0.374*** (0.009)	0.408** (0.038)
Number of children in household			
Pre-school	-0.155*** (0.000)	-0.153*** (0.001)	-0.149*** (0.000)
Primary school	-0.006 (0.790)	-0.063* (0.075)	0.034 (0.190)
Secondary school	0.151*** (0.000)	0.118** (0.027)	0.177*** (0.000)
University level	0.181*** (0.000)	0.159*** (0.000)	0.196*** (0.000)
Profession of household's head (agriculture as reference)			
Service	0.338*** (0.001)	0.375 (0.498)	0.350*** (0.000)
Industry	-0.186 (0.745)	-0.412 (0.636)	0.107 (0.889)
Household type of dwelling (house as reference)			
Apartment	0.375** (0.024)	0.479** (0.015)	-0.157 (0.682)

villa	-0.152 (0.233)	-0.335 (0.249)	-0.078 (567)
Other Household characteristics			
Household size	0.079*** (0.000)	0.093*** (0.001)	0.065*** (0.002)
Room	0.037*** (0.001)	0.062*** (0.002)	0.021 (0.128)
Electricity	0.353*** (0.000)	0.425*** (0.000)	0.306*** (0.000)
Urban	0.273*** (0.000)		
Region (Khartoum as reference)			
Northern	-0.555*** (0.000)	-0.720*** (0.000)	-0.260 (0.109)
Eastern	-0.444*** (0.000)	-0.524*** (0.000)	-0.183 (0.274)
Central	-0.660*** (0.000)	-0.481*** (0.000)	-0.538*** (0.001)
Kordufan	-0.534*** (0.000)	-0.625*** (0.000)	-0.319* (0.053)
Darfur	-0.081 (308)	-0.103 (0.347)	0.110 (0.497)
Constant	0.962*** (0.000)	0.997*** (0.000)	0.827*** (0.000)
Observations	7257	2230	5027
Pseudo R2	0.113	0.093	0.092
LR chi2	1589.20 (0.000)	491.25 (0.000)	767.91 (0.000)
Log likelihood	-6198.213	-2378.344	-3784.186

Note: p-values in parentheses
***p<0.001,**p<0.01,*p<0.05

Table 2: Tobit Estimation Results for Household Education Expenditure by Income quintile

Variable	**1st quintile**	**2nd quintile**	**3rd quintile**	**4th quintile**	**5th quintile**
Income	0.030 (0.431)	-0.050 (0.224)	-0.026 (0.551)	0.007 (0.875)	0.152*** (0.001)
Household's head characteristics					
Age	0.004 (0.185)	0.005 (0.130)	0.007* (0.052)	0.004 (0.193)	0.008** (0.021)
Gender of head	0.209 (0.161)	-0.088 (0.569)	-0.230 (0.187)	-0.174 (0.322)	-0.064 (0.721)
Married	-0.140 (0.352)	-0.105 (0.502)	-0.382** (0.027)	0.070 (0.681)	0.006 (0.970)
Education level of household head (illiterate as reference)					
Primary	0.025 (0.846)	0.084 (0.420)	0.241** (0.015)	-0.046 (0.633)	0.343*** (0.001)
Secondary	-0.181 (0.476)	0.070 (0.705)	0.370** (0.013)	0.059 (0.679)	0.545*** (0.000)
University	1.107 (0.207)	1.381*** (0.005)	0.313 (0.277)	0.094 (0.623)	0.696*** (0.000)
Education level of the Spouse (illiterate as reference)					
Spouse Primary	0.244* (0.060)	0.026 (0.815)	-0.055 (0.579)	0.115 (0.235)	0.206** (0.043)
Spouse Secondary	0.904*** (0.009)	-0.101 (0.631)	0.202 (0.245)	0.330** (0.041)	0.378*** (0.003)
Spouse University	1.519*** (0.004)	0.821** (0.015)	-0.089 (0.812)	0.509** (0.017)	0.285* (0.094)
Number of children in household					
Pre-school	-0.157** (0.015)	-0.211*** (0.001)	-0.181*** (0.002)	-0.126** (0.015)	-0.153*** (0.003)
Primary school	0.109** (0.043)	-0.164*** (0.003)	0.002 (0.966)	0.007 (0.874)	-0.010 (0.799)
Secondary school	0.224*** (0.005)	0.037 (0.619)	0.158** (0.018)	0.228*** (0.000)	0.098 (0.115)
University level	0.136** (0.026)	0.006 (0.917)	0.144*** (0.008)	0.209*** (0.000)	0.209*** (0.000)
Profession of household's head (agriculture as reference)					
Service	0.201 (0.123)	0.250 (0.149)	0.455** (0.041)	0.808*** (0.006)	0.241 (0.485)
Industry	-0.991 (0.255)	-0.241 (0.801)	0.116 (0.915)	1.137 (0.320)	
Household Type of Dwelling (house as reference)					
Apartment	-0.416 (0.179)	-0.228 (0.503)			0.624*** (0.006)
Villa		-0.348	-0.149	-0.027	

		(0.283)	(0.316)	(0.921)	
Other Household Characteristics					
Household size	0.004 (0.925)	0.212*** (0.000)	0.107*** (0.009)	0.037 (0.279)	0.033 (0.266)
Room	0.062* (0.061)	0.005 (0.871)	-0.003 (0.916)	0.015 (0.531)	0.006 (0.774)
Electricity	0.092 (0.585)	0.228*** (0.002)	0.212** (0.018)	0.258*** (0.005)	0.542*** (0.000)
Region (Khartoum and reference)					
Northern	-1.096*** (0.005)	-0.809*** (0.000)	-0.459** (0.010)	-0.564*** (0.000)	-0.768*** (0.000)
Eastern	-0.971*** (0.009)	-0.645*** (0.001)	-0.349* (0.050)	-0.387** (0.021)	-0.614*** (0.000)
Central	-1.246*** (0.001)	-0.947*** (0.000)	-0.689*** (0.000)	-0.692*** (0.000)	-0.660*** (0.000)
Kordufan	-0.818** (0.028)	-0.625*** (0.001)	-0.521*** (0.005)	-0.599*** (0.001)	-0.714*** (0.000)
Darfur	-0.573 (0.113)	-0.299 (0.113)	0.074 (0.681)	-0.095 (0.562)	-0.090 (0.540)
Constant	1.577*** (0.001)	1.844*** (0.000)	2.080*** (0.000)	1.565*** (0.000)	1.173*** (0.001)
Observations	1419	1507	1671	1211	1440
Pseudo R2	0.110	0.087	0.079	0.066	0.103
LR chi2	155.61 (0.000)	182.7 (0.000)	214.17 (0.000)	205.94 (0.000)	402.61 (0.000)
Log likelihood	-625.912	-952.165	-1244.937	-1442.129	-1740.427

Note: p-values in parentheses
***p<0.001,**p<0.01,*p<0.05