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Education and Livelihood in Ghana: Evidence from Instrumental Variable Analysis

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Abstract

The research verified if schooling makes any difference in the consumption expenditure and poverty status of individuals in Ghana. Using the recent round of the Ghana Living Standards Survey data, we quantified the difference that schooling makes in the livelihood of individuals through the method of instrumental variables (IV). We found that individuals who have completed some level of schooling experience a significant increase in their consumption expenditure relative to those who have not been to school at all. Again, educated individuals who are poor had a significantly lower consumption expenditure compared to educated individuals who are non-poor. Also, individuals with some level of schooling had a lower probability to be poor compared to those without any schooling. We suggest massive investment in educational infrastructure and a revision of the schooling curriculum to equip individuals with workable skills that can enable them to undertake livelihood activities to improve their welfare.

Keywords: Ghana, Consumption expenditure, Schooling, Livelihood, Poverty, Instrumental variables.
JEL Classification: C12; E21; I26.

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Contents

Contribution of this paper to the literature
We established the difference that schooling makes in the consumption expenditure of individuals in Ghana and how this influences their livelihoods. We also analyzed the interplay of education and poverty on the consumption expenditure of individuals in Ghana to provide a new perspective on the nexus of education and livelihood.

1. Introduction

Every individual requires some resources to sustain life (Adjei, 2010) and these livelihood assets are what people dwell on to make a living (Oduro, Mohren, Pena-Claros, Kyereh, & Arts, 2015). Different individuals go through their livelihood activities in different places; some undertake their activities in their homes while others go outside of their homes (Mahama & Maharjan, 2018). Livelihood issues are of great importance in combating poverty; hence the government of Ghana has initiated the Livelihood Empowerment Against Poverty (LEAP) program as one of the key policy directives to address the vulnerability in the country (Mahama & Maharjan, 2018). Education contributes to the enhancement of assets and a good foundation in education for that matter enhances one's efforts of building human capital to earn a decent living (Tangney, Baumeister, & Boone, 2004). Again, education is potent in enabling peoples' capabilities to be enhanced to achieve sustainable livelihoods. Also, Sen (1990) emphasizes that education serves both as a means to a better life and also an end in itself which makes it important for all individuals.

However, despite the important role education plays in livelihood, there have been concerns about how education is being accessed and delivered (Tangney et al., 2004). According to United Nation International Children's Emergency Fund (United Nations Children's Fund (UNICEF), 2016) approximately 124 million adolescents and children lack the opportunity to attend and complete school. Approximately 59 million primary students and 65 million adolescents in lower secondary levels are unable to complete school with more than 50% of this number living in Sub-Saharan Africa.

According to Corcoran et al. (2020) no matter the efforts people put into learning, if the teaching and learning environment is not favorable, then the quality of education is a problem. Even though the education system has experienced reforms and reviews over the years, their cumulative effects have not yielded the desired goals as significant issues still exist (Pajibo & Tamanja, 2017). Corcoran et al. (2020) noted that Ghana has inadequate schools, a low teacher-to-pupil ratio, and high illiteracy rates, especially in rural parts of the country. For example, the centers of Ghana's Early Childhood Education (ECE) are lacking in terms of major learning and teaching materials per the same report. Another challenge has been the huge opportunity cost for some parents to allow their children to attend school because their children serve as a significant source of labor (Debrah, 2013). This makes it difficult to convince most parents to enroll their children in school.

The abundance of highly educated people undoubtedly is a prerequisite for socio-economic development. The effect of education on certain indicators has therefore received enormous attention across the globe. Mention can be made of Coelli and Green (2012) which analyzed the effect of high school education on the welfare of young Canadians while Little, Aboud, and Lenachuru (2009) studied how education influences the livelihood of farmers in Kenya. In Ghana, Sackey (2005) looked at how education affect the labor force participation and the fertility of women whereas Peters, Baker, Dieckmann, Leon, and Collins (2010) examined the effect of education on the health-protecting behaviors of people. Based on these studies and discussions, it is obvious that the direct link between education and livelihood in Ghana has not been sufficiently highlighted in the literature. Precisely, the effect of education has been examined on certain aspects of livelihood but not on a livelihood measure like the consumption expenditure of individuals in Ghana. Consumption forms a critical aspect of the individual's livelihood and underscores the need to examine the direct effect of education on it. This will provide more insight into how the lives of Ghanaians can be enhanced by improving the access and quality of education.

The contribution of this study to literature is three-fold: First, we find out if Ghanaians with some level of schooling significantly differ from those who have never been to school in terms of their consumption expenditure. To do this, we estimate the magnitude of the difference in consumption expenditure between individuals who have had some level of schooling and those who have not been to school at all. Second, we estimate the effect of education on the consumption expenditure of poor individuals in Ghana. This in particular allowed us to analyze the interplay of education and poverty on the consumption expenditure of individuals in Ghana. Third, we estimate the effect of education on the poverty status of individuals in Ghana. This objective reveals further insight into the role of education in influencing the poverty status of Ghanaians.

The remainder of this paper is organized as follows. Section two reviews the literature in addition to an overview of the educational system in Ghana. The next section outlines the methodology adopted by the study whiles section four presents empirical results and its discussions. The paper is concluded in section five by presenting a summary of findings, conclusions, and some policy recommendations.

2. Literature Review

2.1. Theoretical Review

Endogenous growth models with emphasis on human capital are the theoretical basis for this study. Endogenous growth models that stressed knowledge accumulation became necessary after classical growth theories failed to explain what determines the vast increase in income over time and the wide disparities between income levels of poor and rich countries. Essentially, endogenous models of growth focused on explaining what determines technical progress (Romer, 2012). For instance, Aghion and Howitt (2008) mentioned formal education as the first and foremost channel of knowledge accumulation. These models emphasized education because it is important for the development of human capital. The reason is that education has a progressive effect as individuals with some level of education can obtain an extra level of education which improves their human capital and makes them more productive. The Lucas model for instance noted that an individual with human capital h(t) is as productive as two individuals with half each of h(t) (Crockett, Duffy, & Izhakian, 2019). Also, education has an externality effect as individuals from highly educated families are able to attain more education than those from

families that are less educated. This argument is extended to include the fact that individuals from highly educated neighborhoods are more likely to reach higher levels of education compared to those from other neighborhoods (Heckman & Karapakula, 2019).

The increase in human capital and productivity of the individual enhances their capacity to secure a meaningful source of livelihood. It follows that the more years of schooling attained by an individual, the higher will be their consumption which enhances their livelihood (Tran, Tran, & Nguyen, 2020). Based on this, education is considered a gateway for individuals all over the world to obtain a sustainable source of income either through formal employment or self-employment. Although the ascending rate of unemployment especially in developing countries may cause individuals not to secure a meaningful source of livelihood after several years of education, it is difficult to deny the wholistic improvement education brings to a person. Education remains a catalyst for economic growth which further enhances the livelihood of individuals. Education has been described as a defining factor for the difference between rich and poor countries as evidence shows that developed countries have more educated individuals than developing ones (Lim, 2018).

2.2. Empirical Review

The review of literature is done along two lines. We first consider studies that examined the effect of education on other indicators in jurisdictions other than Ghana. The second part focused on studies that investigated education and livelihood in Ghana. Coelli and Green (2012) found Canadians who graduate from a high school reduce their receipt of welfare by 50% and this effect is much more noticeable in more deprived neighborhoods. Tran et al. (2020) confirmed the positive effect of education on the consumption and negative effect on poverty in Vietnam. A crucial aspect of their study showed that the positive effect of education is higher for relatively better-off households which suggests a form of inequality. Little et al. (2009) also noted the positive effect of education on the livelihood of pastoralists in Kenya as it helps them reduce the risk of famine and increase their employability.

Sackey (2005) found positive effects of education on labor force participation and a negative effect on the fertility of women. Peters et al. (2010) also found evidence that education enhances the health-protecting behaviors of people in Ghana. Another study is Porter et al. (2011) which noted that inadequate transport infrastructure affects the livelihood of young Ghanaians particularly by reducing their attendance and performance in school. Essentially, the paper suggests that improvement in the transport infrastructure will enhance the education of young people in Ghana. Cameron and Ananga (2015) also showed that saving groups improve the livelihood of rural households by helping them to pay for the education of their children. It further noted that households generate income from the loans that they source from the saving program. More recently, Mabe, Konja, Addo, and Awuni (2022) examined how the location and gender aspects of the LEAP program affect the education of children in Ghana. Their results indicate that social protection projects like the LEAP improve education for children of beneficiary households but this impact is higher for urban areas compared to rural areas.

The general conclusion from the review of empirical studies is that education improves the livelihood of individuals through channels such as increased labor force participation, increased productivity, and incomes. It is also clear that an improvement in the livelihood of individuals improves the quality of education for their children. However, the direct effect of education on the consumption expenditure of individuals in Ghana is yet to be studied. Since livelihood improvement ends up with increased consumption, it is important to examine the direct effect of education on consumption expenditure in Ghana.

2.3 Overview of the Ghanaian Educational System

Education is widely accepted as one of the important means by which any country can improve the lives of its people. Like most countries in Sub-Saharan Africa (SSA), Ghana is making a lot of efforts to improve education for its people. Some of these initiatives include working towards the attainment of universal primary education for every child. Ghana commenced Free Compulsory Basic Education (FCBE) in the middle of the 1990s to give every Ghanaian child a free basic education. This initiative did not yield the expected results as there were still several Ghanaians who did not have the privilege of basic education and most of them were from poor rural households (Akyeampong, 2009). Akyeampong (2009) further noted that one main problem that militated against the success of FCUBE was that the program did not provide much incentive for some children to give up whatever it is they were doing for school. Apart from the fact that there were still costs incurred by parents, poor households were unable to allow their children to attend school and forgo their child labor. Essentially, the program did little to eliminate the cost associated with primary education, especially for poor households in rural areas.

Before this, Ghana had already experienced a mammoth number of its teachers who had left for Nigeria due to the poor economic conditions between the late 1970s and the middle of the 1980s. This situation, coupled with insufficient and deteriorating infrastructure negatively affected the quality of education leading to a decline in primary enrollment in the late 1980s (World Bank, 2004). The educational sector received a major boost with the introduction of the Structural Adjustment Program (SAP) and a huge investment worth about US$ 260 million between 1986 and to early 2000s (Akyeampong, 2009). To further boost education by improving free compulsory education, the government of Ghana in collaboration with its partners introduced the school feeding program which was to provide one healthy meal for children in public basic schools every day of school (Akyeampong, 2009). . The program which encouraged the production and consumption of local foods encouraged more children to attend school because they would not have to worry about food anymore. According to Adu-Gyamfi, Donkoh, and Addo (2016), one phenomenon that has characterized the educational system in Ghana is the pendulum of four years and three years duration of senior secondary education that accompany various changes in political power. This inconsistency in secondary education does not lead to the effective transfer of knowledge to the students and may lead to poor academic performance.

The most recent initiative by the government of Ghana to improve education in the country is the Free Senior High School program. This policy was introduced in fulfillment of article 25, section 1b of the 1992 constitution of Ghana which states that; "secondary education in its different forms including technical and vocational education, shall be made generally available and accessible to all by every appropriate means, and in particular, by the progressive introduction of free education". It is also in line with one of the goals of Sustainable Development

Goals of the United Nations (SDG-UN) to provide free, equitable, and quality primary and secondary education to all boys and girls by the year 2030 (United Nations Development Group (UNDP), 2016). This program has increased the number of students in second-cycle institutions and it's widely regarded as a step in the right direction as far as providing accessible and quality education for all is concerned.

There are still problems despite these initiatives and progress made as a country concerning education. Problems include the huge infrastructural deficit, high pupil-to-teacher ratio, and the inability of most students to attain tertiary education. The student-to-teacher ratio of primary schools in Ghana is 27.30 which is relatively high compared to countries like Mauritius (17.94) and Cuba (8.83) (Majgaard & Mingat, 2012). The inadequate infrastructure within the educational system is evident as most school children especially in the rural areas have to learn in deplorable structures which inhibit quality teaching and learning. In some rural communities, teachers have no option but to teach their students under trees and no one needs further explanations as to how that will affect students. The phenomenon of low tertiary completion is not surprising because of the many challenges that affect basic education in the country. The issue is uncommon in several countries in SSA as only 5% of students who begin primary school can complete tertiary education in the region (Majgaard & Mingat, 2012). The government of Ghana needs to do more especially in rural areas and at the basic level if the country has any hopes of using education to transform its economy and improve the lives of its people.

3. Methodology

3.1. Data and Description of Variables

The study employed cross-sectional data from the most recent round of the Ghana Living Standard Survey (GLSS). This round of GLSS was conducted in 2016/2017 and provides a wide range of information on 59,864 Ghanaians. GLSS is the most widely used dataset as far as cross-sectional information on Ghanaian households is concerned. The study, therefore, found it prudent to employ it since the aim was to estimate how education influences the livelihood of Ghanaians. Specifically, GLSS provides data on education and several other factors that influence the livelihood of households such as income, gender, location, size of household, and poverty status.

The study used consumption expenditure as a measure of livelihood. Chambers and Conway (1992) defined livelihood as comprising the assets, capabilities, and activities that one requires for a living. Essentially, individuals employ the resources at their disposal to earn a living and it is, therefore, prudent to measure their livelihood by their consumption expenditure. The main aim of livelihood strategies is to provide the necessities of life such as food, clothing, and shelter (Gecho, Ayele, Lemma, & Alemu, 2014). The majority of individuals in developing countries like Ghana spend almost all their income in fulfillment of these basic needs and justify the use of total real consumption expenditure as a measure for their livelihood.

Education is measured as a binary variable of 0 and 1 respectively for individuals who have not attended school at all and those who have completed a given level of schooling. This allowed the study to find out how individuals with some level of schooling significantly differ from those who have not been to school at all. The years of schooling of the individual have been used by studies such as Pons and Gonzalo (2002) to estimate the effect of schooling but this study is unable to do the same due to limited information on the years of schooling as well on the course years completed. Apart from education which is the main explanatory variable, the study controls for individual characteristics such as household size, poverty status, location, gender, and total gross income. Location tells whether the individual resides in an urban or rural area whereas poverty status indicates whether an individual is non-poor or poor (GSS, 2017).

Table 1 depicts significant differences in individual characteristics based on their poverty status. The income and consumption of poor individuals were significantly lower than those who are better off. For instance, much better-off individuals consume about 3 times more than poor individuals highlighting the vulnerability of poor individuals in Ghana. Poor individuals also tend to have a relatively larger household size and are much younger. This implies that poverty is prevalent among young adults in Ghana, especially in the face of rising unemployment. The difference in course years completed by poor and non-poor individuals is small and it further shows the average course years completed by Ghanaians is very small. Essentially, this gives a snapshot of the state of education in Ghana and the need for more efforts to improve it.

Table 1. Individual characteristics based on their poverty status.

Variables	Non-poor		Poor		Whole Sample	
	Mean	SD	Mean	SD	Mean	SD
Consumption (GHS)	12,866.77	11,186.96	4,652.05	3,047.79	10,766.32	10,409.83
Income (GHS)	33,186.5	174,681.8	8,197.1	26,606.1	26,799.1	151,693.4
Household size	3.6	2.5	5.9	3.2	4.2	2.8
Course years completed	2.4	1.2	2.2	1.3	2.3	1.3
Age in years	45.2	15.7	20.7	18.5	24.9	20.3
Gender (Female)	1.33	0.47	1.55	0.49	1.52	0.49
Location (Rural)	1.46	0.49	1.67	0.47	1.63	0.48
Observations	10,427		49,437		59,864	

Note: SD represents the Standard Deviation.

Table 2 describes the total real consumption expenditure of individuals based on their educational status. It also presents the two-sample t-test for the relationship between the consumption expenditure of individuals and their educational status. Educated individuals were shown to consume more than those who are uneducated. Essentially, individuals who have completed some level of schooling consume GHS 2,165.14 more than those who have never been to school. Results of the two-sample t-test confirm that this difference in their consumption expenditure is significant at the 5% level of significance. This difference does not establish any causal effect between educated and uneducated individuals but points to the fact that education or schooling is an avenue for individuals to improve their livelihood through an increase in their consumption expenditure.

Table 2. Cross-tabulation of individual's consumption by their educational status.

Educational Status	Obs.	Mean (GHS)	Std. Err.	Std. Dev.	[95% conf. Interval]	
Uneducated	3,357	9120.074	124.57	7217.514	8875.834	9364.314
Educated	10,652	11285.14	108.32	11179.53	11072.81	11497.47
Combined	14,009	10766.32	87.95	10409.83	10593.93	10938.72
Diff.		-2165.066	205.2358		-2567.356	-1762.777
Two-sample t test	H_0: diff.=0 H_1: diff.! =0		t=-10.549 Df. = 14007		Pr. (|T|>|t|) =0.000	

3.2. Instrumental Variable Estimation of the Effect of Education on Livelihood

Following Pons and Gonzalo (2002), the IV model for the effect of education on the livelihood of individuals is given as;

$$C_i = a + X_i\alpha + S_i\beta + \varepsilon_i \quad (1)$$

$$S_i = q + Z_i\rho + v_i \quad (2)$$

Equation 1 shows the total real consumption expenditure of individuals (C_i) is explained by a vector of exogenous variables (X_i) and (S_i) which indicates if the individual has completed any form of schooling or not. (S_i) is 1 if the individual has completed some level of education and 0 if he/she has not been to school at all. Equation 2 presents the schooling equation in a reduced form in which Z_i is a vector of exogenous variables that influences the schooling decision so that X_i is included in Z_i. a and q are intercepts of the two equations. Indeed, the decision to attend school and complete a given course of study is not exogenous and therefore requires the use of relevant instruments. The reason is that estimating Equation 1 by OLS in the presence of correlation between ε and v leads to a biased estimate of β.

The second objective was to find the effect of education on the consumption expenditure of poor individuals in Ghana considering the relevance of poverty as far as livelihood issues are concerned. This requires the interaction of the schooling variable and the variable for poverty. The interacted variable will then be included in Equation 1 as;

$$C_i = a + X_i\alpha + S_i\beta + (S_i * PS_i)\theta + e_i \quad (3)$$

Equation 3 expresses the consumption expenditure of poor individuals as a function of a vector of exogenous variables (X_i) and (S_i) which indicates if the individual has completed any form of schooling or not plus the interaction of the schooling variable and the variable for poverty. θ represents the effect of the interacted variable for schooling (S_i) and poverty status (PS_i) of individuals in Ghana. The endogeneity of schooling implies the interacted variable is also endogenous and the instrumental variable method was employed to find out how education impacts the consumption of poor Ghanaians. e_i is the error term, and the definition of other variables remained the same.

To further delve into the effect of education in enhancing the livelihood of Ghanaians, the third objective was to estimate the effect of schooling on the poverty status of individuals. This was done in an instrumental variable probit (IV probit) framework as the dependent variable was binary. Following Haji and Legesse (2017) the study specifies the poverty status of the individuals as a function of their schooling and other significant variables as;

$$\Pr(PS_i \neq 0|X_i) = \Phi(X_i\beta) \quad (4)$$

Equation 4 expresses the poverty likelihood of individuals as a function of their schooling and other significant variables. PS_i is poverty status of the individual which is the dependent variable, Φ is the cumulative standard normal and X_i is a vector of explanatory variables which includes the instrumented variable for schooling (S_i). The poverty status of the individual is a binary variable with a value of 1 representing poor and 0 for non-poor. The probit model, therefore, assumes how different the effect of education on the poor is from the non-poor. In this case, how likely is the poverty status of educated individuals to differ from those who are uneducated (Wooldridge, 2019).

Information on the family background has been used as an instrument for schooling by several studies. Pons and Gonzalo (2002) for instance, used the education of parents and their occupation as part of instruments to estimate the effect of schooling on wages. This study follows in that direction and employs the educational level of the father and mother as instruments for the education of the individual. Pons and Gonzalo (2002) are one of many studies that have asserted the significance of parents' education to the educational achievement of the individual. Individuals whose parents have a higher level of education tend to have significantly longer years of schooling. The reverse is true for individuals whose parents have a low level of education significantly and have shorter years of schooling.

3.3. Hausman's Test for Endogeneity

Self-reported values associated with survey data make variables endogenous (Wooldridge, 2019). Again, the decision to attend school and complete a given level of study is also influenced by several factors. Suspecting the possibility of endogeneity of the schooling variable is not enough. There is the need to ascertain if the variable is endogenous. Verification of the schooling variable will inform the use of appropriate instruments through the method of instrumental variable estimation to obtain consistent and valid estimates (Wooldridge, 2019).

According to Davidson and MacKinnon (1993), an augmented regression needs to be run after performing a first auxiliary regression which specifies the schooling variable as a function of the instruments. This specification is given as;

$$S_i = k + \gamma S_f + \delta S_m + u_i \quad (5)$$

Equation 5 represents the represents the auxiliary regression and S_f and S_m represents the educational level of the individual's father and mother respectively. k is the intercept, u_i is the stochastic error term, and the definition of S_i remained unchanged. Equation 4 is estimated and its residuals are predicted and stored as S_i^*. S_i^* is hence included as a regressor in the consumption function in Equation 1 as;

$$C_i = a + X_i\alpha + S_i\beta + \phi S_i^* + \omega_i \quad (6)$$

Equation 6 represents the augmented regression that contains the predicted residuals from Equation 5. ϕ which is the co-efficient of the predicted residuals for Equation 4 is therefore tested. The definition of other variables remains unchanged and ω_i is the stochastic error term for Equation 5. Rejecting the null hypothesis of exogeneity means the coefficient of S_i^* is significantly different from zero. This means the variable correlates with the error term and hence employing the ordinary least square method will yield inconsistent results. This test is also done for the interacted variable for the third objective.

4. Results

4.1. What Difference Does Schooling Make in the Consumption Expenditure of Individuals in Ghana?

Table 3 presents how the consumption of individuals with education differs from those without any formal education. It also contains results for various tests, particularly for the exogeneity of education. Hausman's test results imply the rejection of the null hypothesis which suggests that the education of the individual is exogenous. This means education is endogenous and justifies the use of instrumental variable estimation techniques to find out how the consumption of educated individuals significantly differs from those who have not had any education.

Table 3. Effect of education on consumption of individuals in Ghana.

Consumption expenditure	**OLS**	**Reduced Form**	**IV**
Schooling	1.37***	1.22***	33.32***
	(0.171)	(0.176)	(5.954)
Income	0.009***	0.011***	0.0102***
	(0.004)	(0.0005)	(0.001)
Household size	1.46***	1.52***	1.47***
	(0.028)	(0.029)	(0.055)
Age in years	0.004	0.014***	-0.067***
	(0.0046)	(0.0048)	(0.015)
Poverty status (Poor)	-9.781***	-9.349***	-10.21***
	(0.19)	(0.199)	(0.387)
Gender (Female)	-0.972***	-1.012***	2.164***
	(0.162)	(0.165)	(0.659)
Location (Rural)	-4.107***	-3.627***	-1.44**
	(0.159)	(0.165)	(0.564)
Intercept	8.326***	6.726***	-15.146***
	(0.276)	(0.306)	(4.371)
Observations	14,009	13,142	13,142
R^2	0.325	0.332	.
Test results			
Hausman t-test on exogeneity	n/a	n/a	(87.39) ***
F-test statistic	F (2, 28286) 59.62***	F (9, 13132) 727.12***	Wald chi (7) 1825.29***
Sargan's identification test	n/a	n/a	(20.65) ***

Notes: Robust std. errors in parenthesis. *** represents 5 percentage significance levels.

Results from the OLS and Reduced form equations show that the effect of education on the consumption of individuals is undercast due to the presence of endogeneity. The IV results which correct for the problem of endogeneity show educated individuals consume 33.32 cedis more than those with no education. This confirms the theory of Becker (1993) and empirical studies like (Tran et al., 2020) which asserted the significance of education in enhancing the livelihood of individuals through an expansion in their consumption. Indeed, estimating the effect of education in the presence of endogeneity leads to bias as the effect was undercast by about 32 cedis.

Results from Table 3 also show that income significantly influences the consumption of individuals in Ghana. A one cedi rise in the individual's income increases the consumption of the individual by less than one cedi. This finding confirms the fundamental psychological law that states that a change in income increases consumption but not as much as the change in income. This implies consumption of individuals is less sensitive to changes in their income (Sloman & Wride, 2009). Again, an additional increase in the size of an individual's household increases his/her consumption by 1.47 cedis. Age of the individual was found to significantly reduce the consumption of the individual whiles poor individuals experience a fall of 10.21 cedis in their consumption relative to those who are better-off. Females were found to consume 2.164 cedis more than their male counterparts while individuals that reside in rural areas consume 1.44 cedis less than their counterparts in the urban areas, holding all other factors constant.

4.2. Effect of Schooling on the Consumption Expenditure of Poor Individuals in Ghana

It is hard to talk about livelihood, especially in developing countries like Ghana without mentioning poverty. The poverty rate of Ghana as of 2016 was 56.30% which is significant, especially in influencing the consumption expenditure of individuals (GSS, 2017). The focus of this section is to find out how poverty influences the consumption expenditure of educated individuals in Ghana. Alternatively, how will education influence the consumption expenditure of poor individuals? Because education was endogenous, interacting it with the poverty status of individuals makes the interacted variable also endogenous. Hausman's test for endogeneity of the interacted variable presented in Table 4 confirmed the presence of endogeneity and justifies the need to employ instrumental variable estimation to estimate the effect of education on poor individuals.

Table 4 indicates that poverty hurts the consumption of individuals even if they are educated. Educated individuals who are poor consume 39.65 cedis less than educated individuals who are non-poor. This negative effect substantiates the severity of poverty in Ghana and the damage it does to the livelihood of individuals even if they have attained some level of schooling (World Bank, 2019).

Table 4. Effect of education on the consumption expenditure of poor individuals in Ghana.

Consumption expenditure	OLS	Reduced Form	IV
Schooling	2.132***	1.89***	38.92***
	(0.198)	(0.202)	(6.16)
Schooling*Poverty	-2.938***	-2.822***	-39.65***
	(0.388)	(0.441)	(6.155)
Income	0.0091***	0.011***	0.0098***
	(0.004)	(0.0012)	(0.001)
Household size	1.46***	1.52***	1.57***
	(0.028)	(0.029)	(0.056)
Age in years	0.0063	0.016***	-0.028***
	(0.0046)	(0.0048)	(0.010)
Poverty status (Poor)	-7.596***	-7.24***	-19.54***
	(0.346)	(0.366)	(4.537)
Gender (Female)	-0.921***	-0.964***	2.45***
	(0.162)	(0.165)	(0.642)
Location (Rural)	-4.05**	-3.587***	-1.095**
	(0.159)	(0.165)	(0.565)
Intercept	7.575***	6.081***	-21.79***
	(0.293)	(0.320)	(4.912)
Observations	14,009	13,142	13,142
R^2	0.328	0.335	.
Test results			
Hausman t-test on exogeneity	n/a	n/a	(119.86) ***
F-test statistic/Wald chi2	F (8, 14000) 852.6***	F (10, 13131) 661.4***	Wald chi (8) 1820.29***
Sargan's identification test	n/a	n/a	(11.40) ***

Notes: Robust std. errors in parenthesis. *, ** & *** represents 10, 5 & 1 percentage significance levels.

Individuals with some years of schooling were also found to consume more than those who have not been to school at all. The significant difference in their consumption even increased from 33.32 cedis to 38.92 cedis which goes to affirm the role schooling plays in improving the livelihood of individuals. In the counterfactual sense, individuals who have never been to school would have consumed 38.92 cedis more if they have had some level of schooling. Such an increase would have improved their livelihood.

The effect of control variables remained the same. Consumption expenditure remained less sensitive to changes in income, household size had a positive effect on consumption expenditure of individuals and poor individuals consume 19.54 cedis less relative to non-poor ones. Females were shown to consume more than their male counterparts whiles individuals who dwell in rural areas were found to consume less than those in urban areas.

4.3. Effect of Schooling on the Poverty Status of Ghanaians

After establishing that poverty reduces consumption expenditure even for educated individuals, we went further to estimate the effect of schooling on the poverty status of individuals. The aim is to find out how education influences the poverty status of individuals in Ghana.

Results of the Wald test presented in Table 5 show that the null hypothesis of exogeneity of the schooling is rejected at the 5% significance level. This implies that the schooling variable is endogenous and justifies the use of an instrumental variable to estimate the effect of schooling on poverty in Ghana.

Table 5. Effect of schooling on the poverty status of individuals in Ghana.

Poverty status	Coef.	Marginal Effects
Schooling	-2.356***	0.0025
	(0.0439)	(0.0143)
Household size	0.204	0.083***
	(0.2977)	(0.0026)
Gender (Female)	-0.259***	-0.0103***
	(0.0403)	(0.0028)
Age in years	0.0061***	0.000243***
	(0.00107)	(0.000075)
Location (Rural)	-0.112***	0.0083***
	(0.0408)	(0.0033)
Consumption expenditure	-0.151	-0.0625***
	(0.225)	(0.00036)
Constant	1.594***	n/a
	(0.1044)	
Other Statistics		
Wald chi2 (7)	28746.58***	
Observation	13,902	
Corr. (education, poverty)	0.995	
Wald test of exogeneity	4.38**	

Notes: Robust std. errors in parenthesis. ** & *** represents 10, 5 percentage significance levels.

According to Table 5, individuals with some years of schooling are less likely to be poor compared to those who have not been to school at all. Put differently, schooling reduces the likelihood of individuals being poor as it enhances their abilities to make a meaningful living.

The marginal effect of household size on poverty status showed that individuals with a higher household size are 8.3% more likely to be poor. The simple explanation is that the income per head of a household reduces as its size increases and reduces the relative provision each member receives, holding all other factors constant. An

increase in household size also increases the dependency burden which increases the vulnerability of that household to poverty, assuming all other factors are fixed. Compared to their male counterpart, females were shown to be less likely to be poor. Their marginal effect confirms that females are 1.03% less likely to be poor compared to males in Ghana. Table 5 also revealed that Individuals in rural areas of Ghana were less likely to be poor relative to those in urban areas. Its marginal effect was however contradictory as rural dwellers are 0.83% more likely to be poor. The results further showed that individuals with a higher consumption expenditure are 6.25% less likely to be poor. This means individuals with a higher level of consumption expenditure have the means to do so and are hence able to have a sustainable living which makes them less likely to be poor.

5. Conclusion

The purpose of this study was to verify if schooling makes any difference as far as the consumption expenditure and poverty status of individuals in Ghana are concerned. In doing so, we quantified the magnitude of this difference through the method of instrumental variables (IV). The use of IV became important since schooling was found to be endogenous which means the use of OLS will yield invalid and inconsistent estimates. The study also evaluated the effect of schooling on the consumption of poor individuals since poverty is considered paramount in livelihood issues, especially in developing countries. The influence of education on the poverty status of individuals was also investigated.

Using the education of individuals' parents as instruments, we found a significant difference in the consumption expenditure of educated and uneducated individuals in Ghana. Essentially, individuals who have completed some level of schooling experience a significant increase in their consumption expenditure relative to those who have not been to school at all. As evidence of endogeneity, the results of OLS underestimated the difference in consumption expenditure between these groups of individuals.

Again, educated individuals who are poor had a significantly lower consumption expenditure compared to educated individuals who are non-poor. The fall in consumption for the educated but poor significantly exceeds that of uneducated individuals. This evidence suggests the gravity of poverty on the livelihood of individuals even if they have had some level of schooling. It also suggests that putting individuals in schools is not enough but efforts must be made to adequately resource them to undertake livelihood activities.

Also, individuals with some level of schooling had a lower probability of poverty compared to those without any schooling. Essentially, schooling to some extent empowers the individual with some skills and knowledge set that makes them less likely to be poor. Finally, this paper recommends serious attention and investments in the Ghanaian educational system especially at the lower level to increase enrollment. The schooling curriculum must be revised to equip individuals with some workable set of skills that can enable them to undertake livelihood activities to improve their welfare. This will help individuals to undertake start-up businesses and reduce the high rate of unemployment in the country.

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