Determinants of poverty in the Northern Region of Ghana

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Abstract

This paper investigates the correlates of poverty in the Northern Region of Ghana. The study used data from the sixth round of the Ghana Living Standard Survey (GLSS6) made up of 1702 households representing 10% of the data for the Region in the 26 districts. In order to identify the poor households, a poverty line of *GHS1,314*.00 was used and those households whose per capita consumption fell below it were considered as being poor otherwise non-poor. Ordinary least Squares (OLS) regression was used to estimate the correlates of poverty. Ordered probit regression was used to check the robustness of the model. The results revealed that household size, gender of head of household, marital status of head of household, educational level of head of household, walls, floor and roof of the dwelling are significant determinants of poverty. The model diagnostics indicate that the model fits the data well. The robustness check showed that the model is robust to other empirical models. It is recommended that any program or policy that is geared towards poverty reduction in the region should be district and household specific as the factors that affect poverty in the region are not unique across the region.

Keywords: Poverty, Households, Ordered Probit, Regression, Poverty Line, Per Capita Consumption

Background

Poverty reduction has become a global concern and in fact a security related issue for most nations. The Millennium Declaration of the United Nations (2000) placed the fight against poverty at the center of development policies. Ghana, like all other signatories to the declaration, committed herself to achieving measurable targets by 2015, including the target of fighting against poverty and reducing it by half by 2015. The current SDGs reemphasized on the need to fight against poverty as poverty is still experienced and felt by citizens of these nations. In Ghana, while some progress has been made in eradicating extreme poverty, continuous and very substantial efforts are still needed to fight poverty and accelerate progress in areas of education, health and gender equality among others. But the northern parts of Ghana, including Northern Region are still lagging behind in these indicators. These and other reasons called for the establishment of the Savannah Accelerated Development Authority (SADA) to help bridge the gap between the north and the south.

In 2007, Harold and Quentin studied the poverty trends in Ghana and concluded that Ghana was on track to reduce its poverty rate by half versus the level of 1990 well before the target date of 2015 for the Millennium Development Goals as the share of the population in poverty had dropped between the third and fourth rounds of Ghana Living Standard Surveys from 51.7% to 39.5% (Harold & Quentin, 2007). In 2006 the poverty level dropped further to 28.5% while extreme poverty also fell from 27% to 18% between 1999 and 2006 (http://www.indexmundi.com/ghanapop_below_poverty-line.html). This achievement was however not as widespread as one might have hoped. Indeed, the national pattern masked a sharp disparity in performance between geographic areas. Most of the poverty reduction was concentrated in Accra and the Rural Forest area, while poverty fell much more modestly or even rose elsewhere. In the Savannah area, of which Northern Region is, the share of the population in

poverty rose in urban areas and other measures of poverty which take into account the distance separating the poor from the poverty line rose as well in rural areas (Harold & Quentin, 2007). Further to this, in 2010, Darko carried out a study on reducing poverty through a social grants in Ghana and concluded that poverty levels in Ghana had risen from the 28.5% in 2006 to 38.5% in 2010.

All regions apart from Greater Accra and the Upper West regions, declined in poverty. However the statistics as presented does not mean that Ghana has eradicated poverty. The extent of deprivation in which scores of people live all over the country is at best deplorable. Poverty alleviation therefore still remains the most important challenge facing the country.

According to the Ghana Poverty Reduction Strategy I, the causes of poverty in Ghana include macroeconomic instability, inability to optimize benefits from the global economic system, low levels of consumption, limited use of technology, belief in superstition and myths, as well as powerlessness of the poor and women (Ghana Government/NDPC, 2003). As stated in Haruna and Anawart , 2012, the determinants or causes of poverty are generally known, the causes vary from country to country, from region to region, from district to district, from household to household and even from person to person and that it will be wrong to do draft and implement policies on poverty reduction merely based on the general causes of poverty. As a result for effective policy targeting, it is imperative to at least identify district specific determinants of poverty. Strategies aimed at poverty reduction need to identify factors that are strongly correlated with poverty and that are amenable to modification by policy (Alemayehu *et al.*, 2005).

According to the sixth round of Ghana Living Standard Survey (GLSS 6) about 50.4% of the people in the Northern Region is living in poverty. A lot of studies have been done on the determinants of poverty in Ghana but no specific study has been done on Northern Region. It then

becomes imperative to unearth the factors that impinge on wellbeing in the region to provide the needed critical evidence on the basis of which relevant and implementable policies can be crafted to eradicate poverty in the region. It is against this backdrop that this work aims at identifying the correlates (determinants) of poverty in the Northern Region of Ghana and to estimate the distribution function that can be used to estimate poverty statistics at the district levels to assist the region design specific pro-poor policies to contain poverty in the Region.

Definition of poverty

Poverty is a multidimensional phenomenon which has no single definition. One of the early researchers to single out the imperfection inherent in identifying poverty exclusively on the basis of the current income criterion was Townsend (as stated in Pratesi, 2016, pp25). Townsend proposed for poverty analysts to incorporate dwelling conditions, affluence, education, as well as professional and financial resources. In 1994, Repnik defined poverty as ; 1) the inability to satisfy basic needs of human life due to the lack of income, 2) lack of opportunity to generate income or property, 3) the lack of the means to change the situation.

The World Bank report (1990), defines poverty as the inability to attain a minimum standard of living and housing. According to Ravallion (1994) poverty is the lack of command over basic consumption needs and Sen (1983) defines poverty as the lack of certain capabilities such as being able to participate with dignity in society.

Ferge and Miller (1987) see poverty as a self-evident phenomenon of everyday reality which is difficult to grasp in a scientifically manageable way. According to them, poverty may be defined in absolute or relative terms. Defined in absolute terms, poverty means the inability of individuals or families to maintain, through lack of adequate resources, a socially minimal or acceptable level of living. In the relative sense, poverty is one aspect of social inequality. It means that part of the

population lacks the resources which assume full social membership in the given society, or at least which would assure living conditions customary in a given society.

From the above definitions one can see that poverty is a very complex multidimensional phenomenon having no single definition and method of measurement. However the most widely used definition by researchers is the situation where the income of households are below the poverty line. Chambers (2006) calls this definition the income-poverty and it is this definition that is being used by the World Bank for its poverty mapping projects.

Review of previous studies

In this section, pertinent literature is reviewed. Poverty being a multidimensional phenomena having no single definition can be measured/estimated by several employing so many methods or models. For instance Condouel et al (2002) and Fofack (2000) employed multiple linear regression analysis in their studies to determine the correlates of poverty while Bigmal et al (2000) and Ravallion (1996) applied models such as Probit, Logit and Tobit in their studies to identify the determinants of poverty. In 2000, Hentschel et al used the weighted least square regression to estimate correlates of poverty in Ecuador (as cited in Haruna and Anawart, 2012).

In determining the factors of poverty in Kenya Mwabu et al (2000) employed a household welfare function which was approximated by household expenditure per adult equivalent. In their estimation they ran two categories of regressions in which they used total and food expenditures as response variables. They estimated three (3) equations from each of the two (2) categories which differed by the type of response variable. The response variables they used were total household expenditure, total household expenditure gap and square of household expenditure with common explanatory variables. From their study they identified unobserved-region-specific factors, mean

age, household size, place of residence, level of schooling, livestock holding and sanitary conditions as the most important determinants of poverty. Even though the method is simple it does not yield probabilistic statements directly like probit or logit models.

Alemayehu et al (2005) carried out a study to identify factors associated with poverty in Kenya. They applied both Binomial and Polychotomous Logit models on household data collected in 1994. Their study revealed that poverty is strongly associated with level of education, household size, and engagement in agric activities. They observed that factors that are closely associated with poverty according to the Binomial model are also important in the ordered-logit model.

Donkoh (2010) employed the probit model to estimate the determinants of poverty in Ghana. He used data from the fourth round of Ghana Living Standard Survey (GLSS 4). His study revealed that male-headed households are likely to become poor than female-headed households. His determinants were not different from Alemayehu (2005). All factors had the expected signs in the analysis.

In 2008, Ayimpusah and Opoku-Afriyie, employed the Weighted Least Square Regression (WLSR) to identify the determinants of poverty in the Bolgatanga Municipality of the Upper East Region of Ghana. And in 2012, Haruna and Anawart, employed this method to estimate the socio-economic determinants of poverty in the Kwabre East District of the Ashanti Region of Ghana. Results from the study showed that the number of children in the household aged 6-12 and distance of household dwelling to the nearest source of portable water impact negatively on the welfare of households. It also revealed that female headed households are predisposed to poverty.

It can be seen from the previous studies that no specific study has been carried out in the Northern region to identify the factors or correlates of poverty. It is against this that this study seeks to

identify the correlates of poverty in Northern Region to assist craft policies that can lead to the eradication or reduction in poverty.

2.0 Methodology

The statistical method employed by the study is Ordinary Least Squares (OLS) estimation model in which the natural logarithm of the total per capita consumption of households is modelled against a set of exogenous variables. Such a level regression is of the form

$lny_i = x_i\beta + e_i$……………………………………(1)

Where lny_i is the natural log per capita consumption of household i, X_i are household characteristics (explanatory variables), e_i is the error term.

From the definition of poverty, it is a multifaceted phenomenon with several causes and it is important to include as much as possible the relevant characteristics fundamental to the household welfare.

.In order to check the robustness of the model, an ordered probit (Oprobit) model regression was estimated with the probability of a household being in poverty as the response variable and the same set of explanatory (exogenous) variables were used in the OLS regression.

The study also applied the method by Alemayehu (2005) in which they explained why some households are non-poor, poor and very poor. In this study, households whose consumption was below GHS1,314.00, $1.83 per day (Upper poverty line) were said to be poor, those below GHS792.05, $1.10 per day, (Lower poverty line) are said to be very poor and those above GHS1,314.00 are said to be non-poor

The poor and non-poor were identified first followed by calculating the probability of being very poor conditional on being identified as being poor.

We further assumed that the probability of being in a particular poverty category is determined by an underlying response variable that captures the true economic status of an individual. For a binary poverty status, let the underlying response variable be defined by the regression relationship as

$$y_i^* = \sum X_i^{/} \beta + \mu_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where $\beta^{/} = (\beta_1, \beta_2, \ldots \ldots \beta_k)$ and $X_i^{/} = (X_{i1}, X_{i2}, X_{i3}, \ldots, X_{ik})$,

y^* is a latent variable as a result it is not observable. μ_i is the stochastic error term

The observable is an event represented by a binary variable y defined as

$$y = \begin{cases} 1, if\ y^* > 0 \\ 0, otherwise \end{cases} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

From (2) and (3)

$$Prob(y_i = 1) = prob(u_i > -\sum X_i^{/} \beta)$$

$$= 1 - F(-\sum X_i^{/} \beta) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$

Where F is the cumulative distribution function for μ_i and

$$prob(y_i^* = 0\ given\ \beta X_i) = F(-\sum X_i^{/} \beta) \ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

In accordance with Alemayehu (2005), the value of the ys are the realization of the binomial variables with probability given by equation (4) which varies with the $X_i s$. Thus the likelihood function is given by

$$L = \prod_{y_i=0}[F(-\sum X_i^{/}\beta)]\prod_{y_i=1}[1 - F(-\sum X_i^{/}\beta)]\ldots\ldots\ldots\ldots\ldots(6)$$

The very poor versus poor and non-poor models can be handled by an ordered probit model as we make the ordering of the population sub-samples (Alemayehu, 2005)

Assuming categories 1, 2, and 3 with probabilities P_1, P_2, and P_3 respectively.an individual will fall into category 3 if $\mu < \beta X$ and in category 2 if $\beta X < \mu < \beta X + \alpha$; and in category 1 if $\mu \geq \beta X + \alpha$ where $\alpha > 0$ and u is the error term in the response model.

These relationships are then given by

$$P_3 = F(\beta X)$$

$$P_2 = F(\beta X + \alpha) - F(\beta X)$$

$$P_1 = 1 - F(\beta X + \alpha)$$

Where the distribution F is logistic in the ordered probit model which can be generalized for *m* categories (Maddala, 1983)

2.1 Data sources

The central element in this study is the availability of data. Secondary data from Ghana Statistical Service (GSS) was used for the study. The study used data from the sixth round of the Ghana Living Standard Survey (GLSS6) of Northern Region of Ghana.

2.2 Variable definition, expected sign and measurement

2.2.1 Dependent/Response Variable

The natural logarithm of the per capita consumption is used as the dependent variable even though there is debate going on as to whether to use consumption or income to measure household welfare.

The writers use consumption because, according to Ravallion (1992), consumption contains smaller measurement errors with income and also (as cited in Gounder, 2012) it is the actual consumption and non-consumption expenditure that determines the realized standard of living (Narsey, 2008, Silva, 2008), though Donkor (2010) is of the view that some respondents often overestimate the consumption expenditure and underestimate income.

Table 1: Table of variables, their expected signs, definition and measurements

Variable	Expected sign	Definition	Measurement
lny		natural log of per capita consumption	number
Hhsize	Negative	Household size	number
Hhsize2	Negative	Household size squared	number
Gender	Positive	Sex	Male=1, female=0
Age	Positive	age of head of household	numbers
Marst	Negative	Marital Status	Married=1, umarried=0
Edlev1	Positive	highest educational level	Basic level=1, otherwise=0
Edlev2	positive	highest educational level	secondary level=1, otherwise=0
Edlev3	Positive	highest educational level	tertiary level = 1, otherwise = 0
Roof	Negative	roof of dwelling	good =1, otherwise=0
Floor	Negative	floor of dwelling	good =1, otherwise=0
Wall	Negative	walls of dwelling	good =1, otherwise=0
Phone	Negative	head of household possess a phone	possess phone= 1, otherwise =0
Empst	Positive	Employment status of head of household	employed=1, otherwise=0
Age square	Positive	Square of age of head of household	number

Analytical Framework

In order to reflect the explanatory significance of the variables, multiple linear regression analysis was used to estimate the model. The validity of the model was verified by the a-priori expectation of the signs and magnitude of the coefficients of the variables and statistical criteria based on statistical theory, consisting of R-square, (R^2), F-statistic and t-test.

The consumption model (1) can be written specifically as

$$lnY_i = \alpha_0 + \alpha_1 hhsize + \alpha_2 hhsize2 + \alpha_3 sex + \alpha_4 Age + \alpha_5 marst + \alpha_6 edlev1 + \alpha_7 edlev2 + \alpha_8 edlev3 + \alpha_9 roof + \alpha_{10} floor + \alpha_{11} wall + \alpha_{12} phone + \alpha_{13} empst + \alpha_{14} Age2$$

Hypotheses

H_o: All coefficients are equal to zero i.e H_o: $\beta = 0$

H_a: All coefficients are not equal to zero i.e H_a:$\beta \neq 0$

3.0 Results and Discussion

Poverty as indicated earlier is caused by multifaceted number of issues including the household characteristics. Of the 1,702 households selected for this study, majority (88.5%) of those are headed by males with just about a tenth (11.5%) headed by females. This lower percentage of households headed by females can be attributed to the fact that females don't want to be accorded the headship position when a male is present in the house.

By household size, the study recorded a maximum of 25 people in a household with a mean household size of 5.6 persons. This mean is higher compared to the national average of 4.4 (PHC, 2010) while the ages of the heads of the households ranged between 15 and 98 years with a mean of 44 years.

1,426 of the heads of households representing 83.8% were married while the rest were not. Only 3.0% of female heading households are married. For highest educational level attained, 66.4% of the sampled heads of households never attended school while 33.6% attended school. Of those who attended school, 44.4% had basic education, 32.2% secondary and 23.4% tertiary.

For the quality of the dwellings, 58.8% had good roofs, 23.4% had good walls and only 1.7% had good floor with 0.3% possessing landline phones at the time data collection.

Having examine the socio-demographic x'tics it would be insightful to know the key determinants of poverty in the study area. Results from the analysis revealed a positive and significant effect of household size on household poverty (see Table 1). This means that larger households are more likely to be poor than smaller household sizes.

Table 2: OLS results of Determinants of Poverty

	Regional	Bole	Sawla-Tuna-Kalba	North Gonja	Central Gonja	East Gonja	Kpandai
VARIABLES	lnconsp	lnconsp	lnconsp	lnconsp	lnconsp	lnconsp	lnconsp
hhsize	0.166***	0.342**	0.157*	0.086	0.225***	0.442***	0.341***
	(0.020)	(0.150)	(0.085)	(0.138)	(0.082)	(0.116)	(0.121)
hhsize2	-0.005***	-0.015	-0.005	0.006	-0.007	-0.025***	-0.017**
	(0.001)	(0.009)	(0.004)	(0.010)	(0.005)	(0.008)	(0.008)
sex	-0.177**	0.280	-0.586	-0.631	-0.478**	-0.324	0.126
	(0.078)	(0.947)	(0.394)	(0.414)	(0.223)	(0.246)	(0.327)
age	0.003	-0.029	-0.006	-0.027	-0.027	0.050	-0.054
	(0.008)	(0.068)	(0.047)	(0.057)	(0.030)	(0.030)	(0.046)
age2	-0.000	0.000	-0.000	0.000	0.000	-0.000	0.001
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
marst	0.364***	-0.142	0.490	0.901*	0.395*	0.116	-0.276
	(0.071)	(0.544)	(0.346)	(0.436)	(0.226)	(0.247)	(0.345)
edlev1	0.976***	2.596*	0.823	0.585	0.427**	1.194**	1.129***
	(0.100)	(1.254)	(0.628)	(0.367)	(0.167)	(0.454)	(0.372)
edlev3	-0.631***	-2.606**	-0.357			-0.825*	-0.946**
	(0.099)	(1.185)	(0.635)			(0.456)	(0.381)
roof	0.339***	1.052**	0.925**	0.610**	-0.103	0.034	0.645**
	(0.044)	(0.399)	(0.448)	(0.238)	(0.160)	(0.214)	(0.264)
Wall	0.408***	-1.093	0.270		0.398*	0.183	0.407
	(0.052)	(0.994)	(0.380)		(0.228)	(0.167)	(0.262)
Floor	0.414***						
	(0.157)						
Phone	0.767**		0.421				

	(0.373)		(0.965)				
empst	0.101		0.872	0.011	0.019	0.143	
	(0.101)		(0.870)	(0.450)	(0.398)	(0.281)	
edlev2				0.761			
				(0.731)			
Constant	5.857***	4.933***	5.491***	6.214***	6.674***	4.002***	5.826***
	(0.194)	(1.225)	(1.260)	(1.619)	(0.613)	(0.687)	(1.051)
Observations	1,702	30	72	30	75	85	82
R-squared	0.289	0.627	0.332	0.740	0.420	0.412	0.374

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Nanumba South lnconsp	Nanumba North lnconsp	Zabzugu lnconsp	Yendi lnconsp	Tamale Metro lnconsp	Tolon lnconsp	Savelugu-Nanton lnconsp
hhsize	0.252**	0.194**	0.027	0.384***	0.139**	0.116	0.003
	(0.119)	(0.086)	(0.138)	(0.112)	(0.068)	(0.131)	(0.088)
hhsize2	-0.014	-0.009*	0.007	-0.017**	-0.003	-0.004	0.010
	(0.008)	(0.005)	(0.009)	(0.007)	(0.005)	(0.008)	(0.006)
sex	-0.678	0.310	-1.836*	-0.114	0.134	0.192	-0.565**
	(0.612)	(0.347)	(0.953)	(0.283)	(0.122)	(0.431)	(0.276)
age	-0.006	0.007	-0.055	-0.005	0.039*	0.027	0.008
	(0.036)	(0.034)	(0.048)	(0.049)	(0.020)	(0.049)	(0.024)
age2	0.000	0.000	0.001	0.000	-0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
marst	0.893	-0.263	1.121*	0.188	0.011	0.253	0.840***
	(0.531)	(0.282)	(0.567)	(0.294)	(0.132)	(0.391)	(0.206)
edlev1	0.578**	0.301**	-0.319	0.016		0.276	1.614**
	(0.226)	(0.146)	(0.295)	(0.213)		(0.541)	(0.669)
roof	0.329	0.391**	0.057	0.133	0.300	0.769***	0.010
	(0.216)	(0.177)	(0.261)	(0.243)	(0.205)	(0.236)	(0.132)
edlev2		-0.088		1.203**	0.533***		
		(0.352)		(0.561)	(0.154)		
Wall		0.356**	0.421	0.673**	0.176*	0.021	0.007
		(0.140)	(0.370)	(0.312)	(0.093)	(0.296)	(0.156)
empst		-0.542	0.442	-0.147	-0.052	0.460	0.116
		(0.358)	(0.576)	(0.560)	(0.135)	(0.591)	(0.345)
Phone			0.587		0.534		0.759
			(0.804)		(0.380)		(0.649)
Floor				0.300	0.771***	1.345**	
				(0.312)	(0.288)	(0.512)	
edlev3					0.187*	0.096	-1.259*
					(0.102)	(0.527)	(0.653)
Constant	6.130***	6.157***	8.524***	5.509***	5.944***	4.876***	6.662***

	(0.977)	(0.836)	(1.589)	(1.161)	(0.476)	(1.129)	(0.586)
Observations	45	83	44	61	156	60	100
R-squared	0.445	0.362	0.435	0.636	0.429	0.449	0.601

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Karaga lnconsp	Gusheigu lnconsp	Saboba lnconsp	Chereponi lnconsp	Bunkpurugu-Yunyoo lnconsp	East Mamprusi lnconsp	West Mamprusi lnconsp
hhsize	0.032	0.031	0.010	0.561	0.114*	0.145	0.262*
	(0.121)	(0.154)	(0.152)	(0.407)	(0.068)	(0.108)	(0.132)
hhsize2	0.006	-0.004	0.012	-0.028	-0.002	-0.005	-0.011
	(0.007)	(0.012)	(0.009)	(0.023)	(0.003)	(0.007)	(0.009)
sex	-1.708**	0.228		0.156	-0.159	0.006	0.068
	(0.645)	(0.427)		(1.052)	(0.336)	(0.466)	(0.454)
age	-0.012	0.174***	-0.031	0.047	-0.008	-0.023	-0.049
	(0.048)	(0.045)	(0.050)	(0.074)	(0.026)	(0.051)	(0.039)
age2	0.000	-0.002***	0.000	-0.000	0.000	0.000	0.001
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
marst	1.395**	0.784*	0.205	-0.521	0.458	0.670	-0.128
	(0.516)	(0.410)	(0.457)	(1.535)	(0.279)	(0.494)	(0.436)
edlev1	0.500	0.702	2.231***	0.117		0.351	0.783
	(0.581)	(0.669)	(0.720)	(0.295)		(0.234)	(0.580)
edlev3	-0.035	-0.121	-2.090***		0.318		-0.103
	(0.640)	(0.655)	(0.739)		(0.204)		(0.562)
roof	0.452*	0.457**	0.109	0.098	0.172	0.411	0.398*
	(0.243)	(0.212)	(0.207)	(0.316)	(0.200)	(0.255)	(0.205)
Wall	0.279	0.231		0.776*	0.245	0.310	-0.479
	(0.595)	(0.645)		(0.393)	(0.256)	(0.338)	(0.384)
edlev2					1.519***	0.566	
					(0.380)	(0.358)	
Floor					-0.503		
					(0.314)		
empst					-0.637	0.183	-0.461
					(0.843)	(0.388)	(0.553)
Constant	7.627***	2.081**	7.222***	4.550**	6.435***	6.062***	6.871***
	(1.082)	(1.023)	(1.068)	(2.006)	(0.703)	(1.260)	(0.951)
Observations	45	89	45	30	89	75	88
R-squared	0.536	0.334	0.599	0.538	0.332	0.390	0.306

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	North Gonja lnconsp	Kumbungu lnconsp	Sagnarigu lnconsp	Mion lnconsp	Tatale-Sanguli lnconsp	Mamprusi Mogduri lnconsp

hhsize	-0.169	0.407***	0.273***	0.056	-0.007	0.040
	(0.165)	(0.145)	(0.085)	(0.075)	(0.063)	(0.157)
hhsize2	0.016	-0.017*	-0.010*	-0.001	0.004	0.007
	(0.011)	(0.009)	(0.006)	(0.004)	(0.003)	(0.009)
age	0.040	-0.030	0.002	0.032	0.031	-0.157**
	(0.052)	(0.047)	(0.021)	(0.031)	(0.032)	(0.067)
age2	-0.000	0.000	-0.000	-0.000	-0.000	0.002*
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
marst	1.213*	0.524	0.380*	-0.108		-0.246
	(0.522)	(0.412)	(0.217)	(0.498)		(0.375)
roof	0.161	0.391	0.349*	0.506**	-0.411	0.219
	(0.359)	(0.282)	(0.199)	(0.249)	(0.313)	(0.275)
Wall	0.645	0.321	0.332**	0.492*	0.356*	0.310
	(0.581)	(0.289)	(0.161)	(0.276)	(0.172)	(0.643)
sex		-1.391**	-0.208	0.403		0.052
		(0.588)	(0.220)	(0.734)		(0.529)
edlev1		0.157		0.125		-0.200
		(0.229)		(0.814)		(0.385)
edlev2		0.953	0.771***		0.854*	
		(0.570)	(0.235)		(0.464)	
Floor		-0.932*	0.935***	0.627		
		(0.529)	(0.324)	(0.464)		
empst		0.591	-0.016			
		(0.470)	(0.191)			
edlev3			0.264*	0.073	0.156	
			(0.144)	(0.823)	(0.187)	
Constant	3.799**	7.414***	5.999***	5.281***	6.838***	9.924***
	(1.333)	(1.166)	(0.568)	(0.961)	(0.790)	(1.424)
Observations	15	59	97	85	31	31
R-squared	0.772	0.567	0.580	0.298	0.594	0.506

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Having examine the socio-demographic characteristics, it would be insightful to know the key determinants of poverty in the study area. Results from the analysis revealed a positive and significant effect of household size on household poverty (see Table 2). It is seen that the coefficient (0.166) of household size is positive and significant at less than 1%. This shows that household size is an important determinant of poverty and per capita consumption is directly proportional to household size. That is keeping

the other variables constant an increase of one person in the household increases the per capita consumption of the household. The higher the size of household the more they consume. This results contradicts the results of Lanjouw and Ravallion, (1995). However the coefficient of the square of household size is negative (-0.005) and significant also at less than 1%. This means that from the beginning as the household size is increasing consumption per capita of households increase to a point beyond which per capita consumption begins to decrease as the household size increases. This could be due to the fact that larger members allow sharing or bulk purchases which result in a lower cost per person for a given standard of living as individuals are living together than separately (Lanjouw and Ravallion, 1995). This shows that household size is a very important determinant of poverty in the Northern Region of Ghana.

At the district level, six of the twenty-six districts have their coefficients being positive and significant at less than 1%. Four have their coefficients being positive and significant at 5%, and three are significant at 10% level while the rest were insignificant.

The coefficient of gender is negative and significant at 5% at the Regional level, an indication that male-headed households are better than female-headed households. That is female-headed households are more predisposed to poverty than male-headed households. At the district level only five districts have their coefficients being significant the rest are insignificant.

It is seen from table 2 that the coefficient of age is positive and insignificant at the regional level indicating that at the regional level there is no evidence that age has any impact on the welfare of households in the Northern Region of Ghana, though theoretically elderly headed households tend to increase households welfare (Gounder, 2012). The coefficient of the variable age square is negative and insignificant at all the districts except Gusheigu, Tamale and Mamprugu Mogduri.

This means age is not an important determinant of poverty in the Northern Region Ghana contrary to other researches.

The coefficient associated with marital status of head of households in the Northern Region is positive and highly significant at less than 1% level of significance. At the district level, only eight are significant. This means that marital status is a determinant of poverty in the Northern Region.

Educational variable has been divided into Basic, secondary and tertiary levels. Basic education is a very important determinant of poverty as its coefficient is positive and highly significant, less than 1%. Similarly tertiary education is also an important determinant of poverty as its coefficient is positive and significant. Because of multicollinearity secondary education has been omitted. From this results one can conclude that education is very important determinant of poverty in the Northern Region of Ghana.

The coefficients of roof, walls, and floor as well as that of possession of land (fixed) phone are all positive and significant at 1% indicating that they are increase households per capita consumption.

3.3 Model Diagnostics

From appendix 1, the model has an F-value of 52.64 with 13 and 1687 degrees of freedom which is highly significant at less than 1% level. It has an adjusted R^2 value of 28.31% indicating that other factors than those in the model determine consumption in the region. The results also supports Harold and Quentin, 2007 as the study is typical survey-based cross-sectional regression.

According to Harold Quentin 2007, the low R^2-value could be due to the fact that i) in many areas households are fairly homogeneous in terms of observable characteristics even if their consumption levels vary ii) a large number of potential correlates are simply not observable using standard closed questionnaire data collection methods iii) some good predictors have to be

discarded at first stage of the procedure when their distributions did not appear to be identical iv) many indicators do not take into accounts the quality of the correlates.

3.4 Model Adequacy for Ordered Probit

From appendix 1 the model has a chi-square value of 393.85 with 13 degree of freedom and highly significant at less than 1 % level of significance which shows that the independent variables have significant effect on the poverty level status in the Northern Region of Ghana.

It took the model 5 iterations to get the maximum log likelihood function (-1501.1098). Like the OLS regression the McFadden R^2 , also known as the Pseudo R^2 , is also very low (11.6%) as seen in appendix 2 which is characteristic of a survey data (Harold and Quentin, 2007).

The threshold parameters of *-1.64446* and *-0.8369* shows that there are three (3) possible values of *Y* which are.

$Y_i = 0 \; if \; y^*I \leq -1.6446$ …… ..…… (7)

$Y_i = 1 \; if \; -1.6446 \leq y^*I \leq -0.8369$ ……(8)

$Y_i = 2 \; if \; y^*I \geq -0.8369$ ……..……(9)

3.5 Robustness of the model

The robustness of the determinants of poverty is checked by estimating an ordered probit model. The results are in table three where the dependent variable is the *pstatus* (0=non poor, 1=poor and 2= very poor). As stated earlier those households where the consumption fell below *GHS793.00* is considered to be very poor, above *GHS793.00* but below *GHS1,314.00* (GLSS6) is classified as poor and those households whose consumption is above *GHS1314.00* are said to be non-poor.

From the results the coefficient of household size is negative and significant while the square of the household size is positive and also significant at less than 1% indicating that larger household size have greater probability of being poor which is a general finding in poverty literature (Lipton and Ravallion, 1995, Lanjouw and Ravallion, 1995). Gender, age and age square variables are all insignificant meaning that gender and age are not important determinants of poverty in the Northern Region of Ghana.

The coefficients for the Education variable both at the basic and secondary levels are positive and significant at less than 1% indicating that at the lower levels of education much is spent on them and as a result the probability of being poor at those levels increases. The tertiary level variable was omitted because of multicollinearity.

Marital status of the head of household is seen to be positive and significant at 1% level just like the OLS. The ordered probit regression results also show that the coefficients of floor and walls are positive and significant at 1% while roof and employment status are insignificant. However in the OLS regression, the coefficients of roof, walls, floor and phone are all positive and significant at less than 5%.

3.6 Marginal Effects

Results from the marginal effects (see Appendix 2) after ordered probit indicates that the probability of being non-poor is 0.16, being poor is 0.27 and being very poor is 0.57. The results also shows that the determinants of poverty have different impacts across the categories of poverty. For example, the results show that the marginal effect on household size is -0.11 for the very poor, 0.041 for the poor and 0.068 for the non-poor. This means that if the other variables are kept constant and the household size is increased by one the probability of falling into the very poor is

reduced by 11% whereas that of poor is increased by 4.1% and that of non-poor is increased by 6.8%.

The marginal effects of gender and age are found to be insignificant. However, the marginal effects of marital status of the head of household is significant at less than 1% for all the three categories of poverty. For the non-poor the likelihood of them becoming poor reduces by 10.5%, for the poor it reduces by 4.6% and for the very poor it increases by 15%.

Education is a positive determinant of poverty. Both basic and secondary levels are statistically significant at less than 1% for all three categories of poverty. However, for the non-poor, number of years of schooling at the basic level reduces poverty by 7.1% and at the secondary level by 12.5%. For the poor, number of years of schooling at the basic level reduces poverty by 4.5% and at the secondary level by 12.7%. While for the very poor poverty increase by 11.7% at the basic level and by 25.2% at the secondary level. From these analysis, one sees that education is a very important determinant of poverty.

From the results, having good walls and floors are all significant factors of poverty. Surprisingly employment status of the head of household appear not to be significant in determining the poverty level of households in the Northern Region of Ghana. This could be because the Northern Region is in the Guinea Savannah Zone where most heads of households are farmers and do not regard farming as a source of employment.

4.0 Conclusion and Recommendations

The objective of this study is to identify the correlates of poverty and determine a distribution function of households' per-capita consumption for the Northern Region of Ghana that can be used to estimate the poverty statistics at the District levels of the Region.

From the OLS results, the model to estimate the district level poverty statistics is

$$lnY_i = 5.857 + 0.165hhsize - 0.005hhsize2 - 0.177sex + 0.003Age + 0.364marst + 0.345edlev1 + 0.631edlev2 + 0.339roof + 0.413floor + 0.400wall + 0.767phone + 0.102empst - 0.00Age2 \quad \text{..(10)}$$

It is seen from the result that this model is a good fit to the data as it has explained 28.3% of the variation due to the explanatory variables and also coefficients are not all equal zero as indicated by the hypotheses. The robustness of the model was tested with an ordered probit model which showed that the estimated model is very robust to other empirical methods.

From the study the most important determinant of poverty in the Northern Region of Ghana are education (primary and secondary), household size, gender, marital status, roof of dwelling, walls of dwelling, floor of dwelling, and possessing of landline phone. However, it was revealed that age of head of household and employment status of head of households are not important determinants of poverty in the Northern Region. This results confirms earlier studies by Jolliffe, 2002 and Haruna and Anawart, 2012, it however contradicts the fact that employment status is not an important determinant of poverty in the northern region. It also revealed that female-headed households in the Northern Region are more disposed to poverty than their male-headed counterparts.

The above results show that seven factors influence poverty in the Northern Region of Ghana. Hence, in order to tackle poverty in the region, efforts should be focused on district-specific characteristics as well as household head-specific characteristics as the factors are not unique across the region.

The results of the study has policy implication for design and implementation of poverty reduction strategies. For instance, education should be a key priority area in the struggle against poverty. The findings support the effort of the government of Ghana to increase the provision of quality and access to education by introducing the free education policy to cover basic and secondary education which will go a long way to reduce dropout rate of students.

From the results very poor households need more family members probable to assist in working on their farmlands to produce more so that the excess can be sold to reduce their poverty whereas the non-poor and poor households do not need any extra member as any additional member in this category are more prone to poverty.

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Appendices

Appendix 1

. oprobit pstatus hhsize hhsize2 sex age age2 marst edlev1 edlev2 edlev3 roof Wall Floor Phone empst

note: edlev3 omitted because of collinearity

Iteration 0: log likelihood = -1698.0327

Iteration 1: log likelihood = -1503.7274

Iteration 2: log likelihood = -1501.1197

Iteration 3: log likelihood = -1501.1098

Iteration 4: log likelihood = -1501.1098

Ordered probit regression Number of obs = 1702

LR chi2(13) = 393.85

Prob > chi^2 = 0.0000

Log likelihood = -1501.1098 Pseudo R^2 = 0.1160

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pstatus | Coef. Std. Err. z P>|z| [95% Conf. Interval]

hhsize	-.2776843	.0302496	-9.18	0.000	-.3369725	-.2183961
hhsize2	.0092361	.0017156	5.38	0.000	.0058736	.0125987
sex	.0140931	.1212791	0.12	0.907	-.2236096	.2517957
age	-.0056653	.0120919	-0.47	0.639	-.029365	.0180344
age2	.0000604	.0001182	0.51	0.609	-.0001713	.0002921
marst	.3791513	.1129959	3.36	0.001	.1576835	.6006191
edlev1	.3017302	.0669948	4.50	0.000	.1704228	.4330377
edlev2	.7303979	.2105039	3.47	0.001	.3178179	1.142978
edlev3	0 (omitted)					
roof	-.0081196	.0637747	-0.13	0.899	-.1331158	.1168765
Wall	.4619983	.0812781	5.68	0.000	.3026962	.6213004
Floor	.9253792	.3031093	3.05	0.002	.3312958	1.519462
Phone	.5994305	.6897695	0.87	0.385	-.7524928	1.951354
empst	.1916375	.1736789	1.10	0.270	-.148767	.532042
/cut1	-1.644641	.2939894			-2.22085	-1.068433
/cut2	-.8369061	.2927378			-1.410662	-.2631506

Appendix 2

Marginal effects after oprobit

y = Pr(pstatus==0) (predict, outcome(0))

= .16247194

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
hhsize	.068243	.00751	9.09	0.000	.053529	.082957	5.59283

hhsize2	-.0022699	.00042	-5.38	0.000	-.003097	-.001443	42.7879
sex*	-.003482	.03012	-0.12	0.908	-.062521	.055557	.884841
age	.0013923	.00297	0.47	0.639	-.004432	.007217	44.4136
age2	-.0000148	.00003	-0.51	0.609	-.000072	.000042	2212.37
marst*	-.1046687	.03451	-3.03	0.002	-.172301	-.037036	.837838
edlev1*	-.0719468	.01558	-4.62	0.000	-.102485	-.041408	.39953
edlev2*	-.1248153	.0221	-5.65	0.000	-.168127	-.081504	.048766
roof*	.0019941	.01565	0.13	0.899	-.028682	.03267	.588132
Wall*	-.1000323	.01549	-6.46	0.000	-.130401	-.069663	.233843
Floor*	-.1372618	.02172	-6.32	0.000	-.179836	-.094687	.017039
Phone*	-.1060824	.07906	-1.34	0.180	-.261033	.048868	.002938
empst*	-.0430601	.03539	-1.22	0.224	-.112425	.026305	.044066

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Marginal effects after oprobit

y = Pr(pstatus==1) (predict, outcome(1))

= .26743394

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
hhsize	.0408227	.0053	7.71	0.000	.030442	.051204	5.59283
hhsize2	-.0013578	.00027	-5.02	0.000	-.001888	-.000828	42.7879
sex*	-.0020585	.0176	-0.12	0.907	-.036555	.032438	.884841
age	.0008329	.00178	0.47	0.640	-.002653	.004319	44.4136
age2	-8.88e-06	.00002	-0.51	0.610	-.000043	.000025	2212.37
marst*	-.0455149	.01068	-4.26	0.000	-.066449	-.02458	.837838

edlev1*|	-.04545	.01066	-4.27	0.000	-.066334	-.024566	.39953
edlev2*|	-.1273518	.03724	-3.42	0.001	-.200335	-.054368	.048766
roof*|	.0011947	.00939	0.13	0.899	-.017212	.019602	.588132
Wall*|	-.0747742	.01459	-5.13	0.000	-.103366	-.046183	.233843
Floor*|	-.1601557	.04747	-3.37	0.001	-.253202	-.067109	.017039
Phone*|	-.1051336	.12524	-0.84	0.401	-.350599	.140332	.002938
empst*|	-.0306691	.02977	-1.03	0.303	-.089022	.027683	.044066

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Marginal effects after oprobit

y = Pr(pstatus==2) (predict, outcome(2))

= .57009412

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
hhsize	-.1090657	.01185	-9.21	0.000	-.132283	-.085848	5.59283
hhsize2	.0036277	.00067	5.39	0.000	.002309	.004946	42.7879
sex*|	.0055405	.04772	0.12	0.908	-.087993	.099074	.884841
age	-.0022252	.00475	-0.47	0.639	-.011533	.007083	44.4136
age2	.0000237	.00005	0.51	0.609	-.000067	.000115	2212.37
marst*|	.1501836	.0445	3.37	0.001	.062967	.237401	.837838
edlev1*|	.1173968	.02571	4.57	0.000	.06701	.167784	.39953
edlev2*|	.2521671	.05828	4.33	0.000	.137944	.36639	.048766
roof*|	-.0031887	.02504	-0.13	0.899	-.052271	.045893	.588132
Wall*|	.1748065	.02911	6.01	0.000	.117755	.231859	.233843
Floor*|	.2974176	.06784	4.38	0.000	.164459	.430376	.017039
Phone*|	.211216	.20408	1.03	0.301	-.188779	.611211	.002938

empst*|	.0737292	.06508	1.13	0.257	-.053829	.201288	.044066

(*) dy/dx is for discrete change of dummy variable from 0 to 1