DETERMINANTS OF RURAL POVERTY AND ITS PERSISTENCE IN GHANA

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Abstract

Waging a successful fight against poverty requires being able to identify its nature and causes in specific situations, over both space and time. The study investigates the determinants of rural poverty by location for three consecutive rounds of the Ghana Living Standards Survey (GLSS) between 1998 and 2013, using mixed methods. It also estimates the effects of a household's access to productive assets on its welfare or poverty status, and assesses why poverty and inequality persist, and the role of agriculture in that process. We find that irrespective of location, increasing dependency ratio and female headship of households reduce the likelihood of being moderately poor or non-poor relative to being poor. But education of household head at post-basic level increases the likelihood of the household being non-poor or moderately poor compared to being poor. We conclude that the determinants of poverty may vary by location; but access of households to productive assets is key to fighting rural poverty. Also, evidence from the GLSS data confirms public perceptions on poverty and inequality, and rural households in Northern Ghana are more likely to be poor. In the short to medium term we recommend providing access to productive assets for rural households; promoting family planning education and removing barriers to education, that constrain progression beyond basic education would be more effective for fighting poverty in the medium to long term.

Key words: Rural poverty, Inequality, Persistence, Determinants of poverty, Mixed methods

Introduction

Poverty reduction has been a principal developmental goal in Ghana since 1995. This was clearly spelt out in the Ghana Vision 2020 development plan (1996 – 2000) (Al-Hassan and Jatoe, 2007) and continued through other development frameworks including both GPRS I & II (2003 - 2009) which made poverty reduction through growth their focus. The country chalked some success experiencing significant declines in poverty levels since the 1990s. From a high of 51.7% in 1991/1992, consumption poverty in Ghana declined to 24.2 by 2012/2013 (GSS, 2014). Reductions in extreme poverty over the period follow similar trends (see GSS, 2014; Cooke et al. 2016). However, many researchers have noted that the extent of these changes has varied across locations and socioeconomic groups.

In fact the savanna zones, and groups in agriculture-related employment have shown the least improvement in poverty levels over the period (see GSS, 2000, 2007, 2014; Jatoe et al 2011; Cooke et al. 2016) despite some positive growth performance (GDP growth rate averaged 4.65 percent per annum during 1991-1999, and 4.98 between 1999 and 2006 (GSS, 2007); annual GDP growth rates for the period 2005 to 2013 ranged from 4.0 percent to 15.0 percent, with an average of 7.8 percent (GSS, 2014)). This has led to worsening inequality between different regions; especially the north and south but also within regions or even districts (see GSS, 2015). As Ghana works towards the SDGs (especially SDG 1, 8, 10 & 12) there is the need for not only a better understanding of the links between

economic growth and poverty reduction, but also the nature and causes of poverty as well as its persistence. GSS (2015) notes that poverty in Ghana is still very much a rural phenomenon, and in an attempt to provide policy relevant information, has presented poverty maps at the district level, the smallest administrative unit. Whilst this is commendable, Wodon (2012) raises concerns about the quality of poverty correlates as used in poverty maps, as these do not often adequately reveal detailed local variations in living conditions. For example, all households in a given district are presumed to fall in the same poverty or welfare category, masking vital differences that may be crucial to targeting policy interventions. Indeed, it is not enough knowing the poor, but what causes their state if success at fighting poverty is the goal. Thus waging a successful fight against poverty rests crucially on being able to identify its nature and causes in specific situations (World Bank, 2000). Previous studies have explored the determinants of poverty in Ghana (see Kyereme and Thorbecke, 1991; Adjasi and Osei, 2007). However, none has examined the determinants by location, and over time. Identifying the determinants of poverty by location[1] and over time will overcome the limitation of correlates in poverty maps and provide the tools needed to tackle poverty in slow growth environments. It is not clear what determines poverty by location in Ghana and whether such determinants are time-varying. We also do not know which determinants (correlates) are more strongly associated with or exert stronger influences on poverty.

The purpose of this study is to contribute to the debate on the drivers of poverty and pro-poor growth in Ghana. The study investigates the determinants of poverty by location for three consecutive rounds (periods) of the Ghana Living Standards Survey (GLSS) between 1998 and 2013. It also investigates the stability of individual determinants by testing for changes in their effects on poverty across time or survey periods. In addition, the study estimates the effects of a household's access to productive assets on household welfare or poverty status. Finally, the study assesses why poverty and inequality persist, and the role of agriculture. The study employs the Multinomial Logit model, a discrete choice model that allows the identification of poverty categories (Diamond et al. (1990) rather the binary classification on a poor versus non-poor basis.

Research Objectives
The research objectives are to:
- identify the determinants of poverty by location (rural North versus rural South) and assess their stability (i.e. any changes) over time
- estimate the effects of a household's access to productive assets on household welfare
- assess perceptions on why persistence of poverty and inequality, and the role of agriculture

Related Literature and Knowledge Gaps

Whilst poverty has been defined variously, it generally connotes pronounced deprivation in well-being (World Bank, 2000). However, well-being is such a broad concept and can be measured by an individual's possession of or access to and/ or endowment of various things that afford one a broad or wide choice set for living. Commonly used measures of well-being include an individual's possession of income, health, nutrition, education, assets, housing, endowment of social capital and certain rights in a society such as freedom of speech (Adjasi and Osei, 2007; World Bank, 2000). Poverty is also a lack of opportunities, powerlessness, and vulnerability and leads the individual to limited choice (Watts, 1968). Poverty is thus a complex and multi-facetted phenomenon; one that defies being captured by a single, fitting and universal measure or indicator (Ravallion, 2011). It also lends itself to both quantitative and qualitative measurement, as demonstrated in the literature including studies that focus on multi-dimensional poverty (for examples see Bourguignon and Chakravarty,

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[1] Rural North consists of rural areas within Northern, Upper East & Upper West Regions; Rural South is rural areas in the rest of country.

2003: Duclos, Sahn and Younger, 2006; UNDP, 2010; Ravallion, 2011; Alkire and Foster, 2011; Alkire and Santos, 2014; Chakravarty and Lugo, 2016; Duclos and Tiberti, 2016; Ngo, 2018). But its commonest measure, consumption poverty, employs a poverty line defined on an assumed welfare function of the individual which specifies the minimum requirements to meet their basic food and non-food needs. This poverty line thus defines the minimum expenditure per head below which an individual is said to be poor (Ravallion, 2011; Ravallion, 1992). Indeed, numerous quantitative measures of poverty have been devised and countless studies in the literature focus on changes in poverty and the growth-poverty relationship (see Foster, Greer and Thorbecke, 1984; Alkire and Foster, 2011; Permanyer, 2014; Alkire, Roche and Vaz, 2017; Ngo, 2018).

However, as the World Bank (2000) observes, identification of what causes poverty is the key to understanding the phenomenon, and waging any successful fight against poverty. Several studies across the developing world have explored the underlying determinants of poverty. In West Africa, Grootaert (1997), and Glewwe (1991) investigated the determinants of household welfare in Cote d'Ivoire; Coulombe and McKay (1996) modelled the determinants of poverty in Mauritania; Fagernäs and Wallace (2007) modelled the determinants of poverty in Sierra Leone and Kyereme and Thorbecke (1991) studied the determinants of food poverty in Ghana. Other studies in Ghana are Ashiabi (2000) who studied the correlates of childhood poverty, and Adjasi and Osei (2007) on the correlates of poverty in Ghana. Other studies on the determinants of poverty or welfare include Geda et al. (2001) in Kenya, Jollife and Datt (1999) in Egypt, Grounder (2013) in Fiji, and Nguyen, Linh and Nguyen (2013) in Vietnam.

In the literature, studies that seek to identify the causes or determinants of poverty have adopted one of two basic approaches. The first uses real household expenditure per capita as a dependent variable in multivariate regression analysis with various variables which lead to households having low income levels (proxied by consumption in this context) relative to their needs (Coulombe and McKay, 1996). This approach has the advantage of making use of the information on expenditure in its entirety and allows for consistent estimation under less restrictive assumptions about the error than its alternative. However, this use of real household expenditure per capita as the welfare measure assumes that the poor are not different from the rich; essentially, the poor are rich people with less money at this time. As Grootaert (1997) argues, this assumption is untenable, and is a critical flaw as it imposes constant effects of any given determinant across the whole distribution. What this means, for example, is that the marginal contribution or value of a factor such as education is the same irrespective of the segment of the welfare distribution to which the beneficiary of the education belongs. This certainly is not the case since the poor and the rich do not often face the same constraints (e.g. to borrow, to insure against risk, among others). Indeed, Carter and May (1999) found that poverty is a matter of not only having few assets, but also of constraints which limit the effectiveness with which those assets are used. Therefore, one expects returns to assets or endowments to reflect this hard reality.

The alternative to the regression of expenditure as a measure of welfare or standard of living involves use of discrete models that allow prediction of poverty in terms of categories. Its basic form is the binary response model which basically predicts the probability that a given household will fall below the poverty line, imposed on the consumption expenditure, usually estimated with probit or logit (Grootaert, 1997). The explanatory variables are often various household characteristics, including access to or possession of productive assets. The use of binary (probit and logit) models in the literature, though recent in the literature on measurement of welfare, has become very common; examples include Adjasi and Osei (2007) for Ghana, Grootaert (1997) for Cote D'Ivoire, Alderman and Garcia (1993) for Pakistan, and Lanjouw and Stern (1991) for Palanpur. Other studies that use this approach are Kabubuo-Mariara (2002) and Geda et al. (2001) for Kenya, Amuedo_Dorantes (2004) for Chile, and Yusuf, Shirazi, Ghani, (2016) for Pakistan.

The main shortcomings of this approach comprise the loss of information due to the categorization of households based on the poverty line; the assumption that all the poor are the same or all the non-poor are homogenous; and stronger assumptions about the error distribution for consistent estimation.

But there are a number of good reasons for the popularity of categorical response models in modelling the determents of poverty. For example, it has been shown that imposition of log-linear functional form on the levels regression often leads to poor fit on the actual distribution (see Diamond et al. 1990). Also, Gaiha (1988), points out that income or expenditure distribution data often contain non-negligible errors; this is particularly true about such data for developing countries. Grootaert (1997) argues that in both these situations, categorical models may predict better the probability to be poor (or to fall in a certain segment of the distribution) than levels regressions. In addition, Diamond et al. (1990) point out that some categorical response models such as multinomial logit allow for predicting the probability of belonging to a particular segment of the welfare distribution, and thus avoids the imposition of constant coefficients under the levels regression.

Indeed, while being rather critical of the practice of measuring poverty as a binary outcome on the basis of a single arbitrary poverty line, Ravallion (1996), as an alternative suggests estimating a multinomial model of poverty based on different poverty lines. This approach is consistent with the methodology of Diamond et al. (1990) who defined poverty in terms of income categories such as percentiles. The good thing about this approach is that it allows for the classification of households or the population into poverty categories. This is useful for policy, and in particular for targeting interventions for optimum results or outcomes. By allowing the identification of the factors of poverty categories in different periods, this approach would enable us explore the stability of these factors over time.

The Dogit ordered extreme value (DOGEV) discrete choice model proposed by Fry and Harris (2002) is particularly useful for predicting a qualitative dependent variable with a multi-modal distribution and which is also potentially ordered. Fissuh and Harris (2004) argue that the DOGEV model tries to capture any heterogeneity between the different poverty categories (e.g. absolute poor, moderate poor and non poor) with a possibility of weak test for any captivity or "poverty trap" in a static sense in each group. Unfortunately, the execution algorithm for the DOGEV model is not currently present in commonly available software such as SPSS and STATA. Use of the multinomial logit rather than the DOGEV model limits our ability to test for poverty traps.

The empirical determinants of poverty explored in the literature are generally factors that are expected to affect the welfare of households based on optimization decisions in the context of household models (see Deaton and Muellbauer, 1980). Thus, various economic and social factors (income generating activities, education, among others) expected to influence the earning potential or consumption needs of households have been investigated by previous studies. Optimal production choices provide the basis for factors related to the earnings potential (e.g. physical capital stocks, education, among others.) of the household whereas factors related to consumption needs (e.g. household size, composition, dependency ratio, number of children, among others) derive from the optimal consumption bundles. Coulombe and Mckay (1996) investigated household demographics, education and sector-specific factors as determinants of living standards, and hence poverty in Mauritania. Factors investigated include household size, composition, dependency rates; characteristics of the economic head of household such as education, gender, ethnic group, and marital status. In the case of group-specific variables such as measures of use of fixed and variable inputs, sector of activity, and technology, the authors found that among agricultural households herding as opposed to crop farming, land ownership and employing hired labour had strong positive influence on household welfare. Kyereme and Thorbecke (1991) found that income, fertility and maturity indices, age, sex and education explain

household calorie (intake) gaps, given location, in Ghana.

Indeed, Glewwe (1991) argued that in analyzing the determinants of household welfare, one can group explanatory variables into five categories. These include household composition variables, regional dummy variables, and physical assets owned by the household. The rest are human capital (e.g. education and work experience of household members), and then community characteristics. Glewwe (1991) described these variables as the underlying determinants of welfare as they help explain variation in household welfare conditional on past decisions. Another variable explored as a determinant of poverty in the literature is transfers (e.g. remittances received) (see Adjasi and Osei, 2007; Fagernäs and Wallace, 2007).

Previous studies have assigned a positive relationship between household size and poverty or the likelihood of being poor, and argue that there will be more mouths to feed and more needs to cater for. However, the presence of a non-linear relationship between poverty and household size due to the emergence of economies of scale in consumption has been found (see Dreze and Srinivasan, 1997; Lanjouw and Ravallion, 1995). In this case, increasing household size has a negative effect on welfare only up to a point; beyond that, as the household gets larger the incidence of poverty would tend to reduce. A similar relationship has been found for age of the head of household (Adjasi and Osei, 2007; Coulombe and McKay, 1996), whilst others have postulated a positive linear relationship (e.g. Pindiriri, 2015).

Coloumbe and McKay (1996) argue that location factors are instrumental in poverty determination as it defines the nature and extent of economic opportunities and returns to capital (including human capital, see Glewwe, 1991), and hence living standards. Indeed, since being located in less economically endowed towns or regions makes a household more likely to be poor it is no surprise that poverty is often higher in rural areas (see for example, GSS, 2015; Adjasi and Osei, 2007; Fagernäs and Wallace, 2007; Okurut et al., 2002; Coloumbe and McKay, 1996). In other

words, there are externality benefits in terms of proximity to well endowed towns and regions which often partly motivate rural-urban drift or migration.

Methodology

The study employs mixed methods in its analysis; the first two objectives are addressed using quantitative methods by specifying and estimating a multinomial logit model. The third objective makes use of qualitative methods in which we assessed perceptions of Ghanaians through focused group discussions. The focused group discussions allowed the researchers to explore further findings from the regression model estimates.

Model specification

The central question to this study revolves around the probability that a household with given identifiable characteristics will be found in a specific poverty stratum. This question is addressed by Diamond et al. (1990) using a multinomial probability model of income distribution to predict the conditional (upon characteristics) probability of a household/individual being in a particular income percentile. Diamond et al. (1990) argue that while there are many distributions from which these probabilities may be derived, perhaps the only tractable one is that of multinomial logit.

Following Borooah (2005), let $z_1 > z_2 \ldots > z_J$ represent J "poverty lines", defined in terms of household income (proxied by consumption expenditure in this case), such that household i is "poor" at "level j" if: $z_{j-1} < hinc_i \leq z_j$. For example, if J = 2, there are two levels of poverty, the level of poverty being indicated by the value assumed by a variable Y_i: a household is "not poor" if $hinc_i > z_1$: $Y_i = 0$; a household is "moderately poor" if $z_2 < hinc_i \leq z_1$: $Y_i = 1$; a household is "extremely poor" if $hinc_i \leq z_2$: $Y_i = 2$.

Under a multinomial logit formulation, the log-odds ratio of being poor at level j ($Y_i = j$, $j = 1, 2$) relative to being non-poor ($Y_i = 0$), can be written as a linear function of $X_i = \{X_{ik}, k = 1 \ldots K\}$, the vector of values, for the household, of K "poverty conditioning" variables.

Multinomial logit model of poverty

Given various arguments about consumption expenditure measurement and the arbitrary imposition of poverty lines, it may be reasonable to assume that the real poverty status of the household is not observable or is not correctly indicated by the welfare ratio. In an attempt to model poverty in this probabilistic framework, we adopt the multinomial logit model following Diamond et al. (1990). But rather than income percentiles we employ lower and upper poverty lines, based on consumption expenditure per equivalent adult per year, as defined in the literature for Ghana and hence two levels of poverty (see GSS, 2000). The lower poverty line defines the extreme poverty line; people whose standard of living measures lie below this would not be able to meet their calorie requirements even if they spent their entire budget on food. The upper poverty line defines an overall poverty line and thus allows for non-food requirements; people whose standard of living measures lie above the upper poverty line are non-poor. The study thus categorizes the poor into two; extremely poor and moderately poor.

Suppose there are N households (indexed, $i = 1 \ldots N$) which can be placed in G mutually exclusive and collectively exhaustive groups $g = 1 \ldots G$, each group containing N_g households. Then, under a multinomial logit model, the likelihood of a household, from group g, being in income category j is:

$$\Pr(Y_i = j) = F\left(X_i^g \widehat{\beta}_j^g\right) \qquad (1)$$

where: $X_i^g = \{ X_{ik}^g, \ k = 1 \ldots K \}$ represents the vector of observations, for household i of group g, on K variables which determine the likelihood of it being in a particular income category, and $\widehat{\beta}_j^g = \{ \widehat{\beta}_{jk}^g, \ k = 1 \ldots K \}$ is the associated vector of coefficient estimates for that group and for that income category outcome.

The average probability of a household from group g being in income category outcome j is:

$$\overline{P}_j^g = P(X_i^g, \widehat{\beta}_j^g) = N_k^{-1} \sum_{i=1}^{N_k} F\left(X_i^g \widehat{\beta}_j^g\right) \qquad (2)$$

One may use the estimated equations to test the stability of the coefficients across the different levels of poverty, using the null hypotheses $\beta_r = \beta_s$, r, s = 0, 1, 2; r ≠ s. This relaxes the first-order dominance assumption implicit in attaching a single parameter to the "poverty-conditioning" variables. In such a case, as Ravallion (1996) suggests, we may specify a set of regression functions, the parameters of which vary according to the segment of the income distribution being considered. The estimated equations in this study rejected the above null hypotheses for all r, s hence justifying the analysis of poverty at different levels of poverty rather than on the basis of a simple poor/ non-poor distinction. Unlike the DOGEV model the MNL model requires the IIA assumption, which we empirically tested using the Small-Hsiao test (see appendices for test results).

Data requirements and sources

The source of data for measurement of poverty in Ghana is the Ghana Living Standards Survey (GLSS), conducted in 1987/88, 1988/89, 1991/92, 1998/99 2005/2006, and 2012/2013. For consistency and ease of comparison the analysis in this study made use of the last three surveys (GLSS 4 – 6); obtained from the Ghana Statistical Service. Each survey is a nationally representative sample of households and contains detailed information on all aspects of living conditions in Ghana, including income, expenditure, health, education, household assets and access to services, savings and credit, as well as employment, and housing conditions. Other details of the samples and the variables used for each survey are presented in section 4.5. Various reports by the Ghana Statistical Service provide more detailed information on these surveys (see GSS, 2000, 2008, 2014). It is noteworthy that over time, the survey has evolved; it not only broadened to cover more aspects of living conditions but also the variables included and how they are defined and measured. The change is particularly immense between GLSS4 and GLSS5.

Independent variables

Two categories of variables, household level and community level characteristics, are used in the econometric analysis as presented below. The

definitions of some variables slightly differ between the last two GLSS rounds and the GLSS4. This was done in order to benefit from improvements in the questionnaires over time and allow for investigating the effects of a wide range of potential variables.

Household Characteristics

The unit of analysis is the household. In addition to the standard use of basic information about the head of the household, the educational status and age of the adult female with the highest education within the household are included. To avoid potential double counting, the head of the household was excluded from the sample before selecting this female member. This allows capturing the effect of female education on households' welfare status. Both the head of the household's education and highest education attained by an adult female member are categorical variables with basic education as the base. The effects of post-basic education and the situation when educational attainment is unknown (mainly missing education information) are compared with this base outcome. Due to insufficiency of information, highest female education was reduced to a dichotomous variable, taking 1 for post-basic education and 0 otherwise in GLSS6. For both household members we expect that increasing levels of education will lead to improvements in a household's welfare status.

In addition, the age for each of these two household members is included. For the female with the highest educational attainment, the highest age is used in cases where more than one female attained this level of education. Since the age is unlikely to have a linear effect, we include the square of age as well. As Canagarajah and Pörtner (2002) noted, it is likely that younger and older people will be worse off than those in their prime working years. Therefore, we also included the dependency ratio to capture the effect of the proportion of non-working members in the household. Increasing share of non-workers is expected to have a negative effect on a household's welfare status.

Access to land may be an important contributor to household income in the rural areas, and may be measured in terms of total landholdings or land under cultivation or the value of land. However, only few households could estimate the size of their land. Instead, we capture the effect of land ownership. The ownership of other productive assets such as farm and fishing equipment and various types of livestock (large and small livestock[2], and poultry) may enhance capacity of a household to generate income, and its ability to cope with potential income shocks. We expect ownership of each type of these assets to improve the welfare status of the household[3]. Financial capital (cash) may also be considered as productive assets. The role of financial capacity is captured through a proxy of credit condition. Access to credit is divided into four categories comparing, respectively, the effect of not having access to credit, having limited access, and having access to situations where need for credit was not expressed at all.

Households not having access to credit are those reporting zero credit, with at least one member reporting unsuccessful loan application(s). Households with limited access to credit are those for which only some loan applications were successful. Access to credit refers to situations where all loan applications had positive feedback; this however, does not suggest that the full amount requested was obtained in each case. It is expected that increasing access to credit by a household is associated with improvement in its welfare. Indeed, access to credit enables an individual or a household to take advantage of available income generation opportunities. However, it is also likely that credit is accessed by better off households due to them having collateral, which poor households may not have. It may also be the case that credit is requested to boost some already running activities.

Community Variables

As Canagarajah and Pörtner (2002) indicated, though household level factors may be key determinants of welfare status, they are not easily

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[2]Large livestock refers mainly to cattle and draught animals; small livestock refers to sheep, goats, pigs and others.

[3] However the role of livestock may not be straight forward, as Kazianga and Udry (2006) observe, rural households may keep livestock at the expense of stable consumption.

influenced by policy measures. This emphasizes the need to understand the effects of community variables, which are generally more easily influenced by policy measures. Community level variables may be divided into economic, infrastructure, health and geographic factors.

Economic factors include access to electricity, extension services and farm inputs such as fertilizers. While electricity expands the set of opportunities available in a community, extension services and farm inputs are likely to increase return to farming, improving households' welfare. But it may also be the case that extension services are placed into more deprived areas, which may tend to reduce their effectiveness if this is not taken into consideration. One may consider community connectedness as an enabling economic factor. For instance, access to community by motorable road allows households to sell their products and labour in other communities and also access inputs and other services. However, forced sale of farm produce at harvesting (e.g. due to lack of storage facilities, need to pay back loan in time or other reasons), may reduce the returns to access to such infrastructure or connectedness due to low seasonal prices.

Health factors are captured by the presence of any health facility in the community, whether malaria is one of the four major problems identified in the community, whether households have access to public pipe-borne water and the presence of toilet facilities in the household. These are assumed to improve a household's welfare either directly by reducing the potential cost associated with their absence or indirectly by improving the household's income generation capacities through an improved health status.

Finally, we included agro-ecological zone to capture the effect of geographic location differences. Other general variables such as rainfall outcomes may also be significant determinants of poverty in rural areas given the overwhelming role of rainfall in agriculture in Ghana. However, all information related to weather is restricted to whether a community received more, lower or similar level of rainfall in the survey year than the previous year. Such information is likely biased and is not used in the study. We use the presence of irrigation facilities in a community to proxy access to irrigation facilities for agriculture. The size of community population would have provided great information about the potential demand for goods and services, which drives the demand for labour. However, only few communities had information regarding this variable.

Descriptive statistics of variables used

Tables 1 to 4 show descriptive statistics for the total sample, the national rural, the rural north and rural south, respectively per GLSS round. Table 3 summarizes the descriptive statistic comparing rural south and rural north for the three data rounds[4]. As expected, the proportion of non-poor households has significantly increased between the GLSS4 and GLSS5 and all sub-samples. The proportion of non-poor was relatively stable between GLSS5 and GLSS6 except for the rural north where there was a sharp increase in the percentage of non-poor. For the rural south there was slight decrease (from 79% to 77%). While this may reflect the results of the public programmes, it highlights the need to take into consideration the spatial distribution of poverty in designing anti-poverty programs. For instance, while the proportion of poor is less than a quarter at the national level and in the South, the poor still make about 60 percent of the households in the rural North.

There is some evidence of improvement in the education of both heads of households and female members in all sub-samples. This increase is reflected by an improvement in the attendance of post-basic education. There has been a slight decrease in the dependency ratio which may be a result of declining fertility rates, except in rural north where the dependency ratio slightly increased between GLSS5 and GLSS6. There is also some increase in ownership of land which may reflect potential land transfers (market). The access to rural infrastructure has increased over time. This is reflected in a sharp increase of access

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[4] All tables report proportions for dummy variables and means for continuous variables.

to public pipe-borne water, electricity and health facilities. There has also been a marked decline in the proportion of households living in areas where malaria is one of the four major problems, and an improvement in community accessibility by motorable roads.

Table 1: Summary of variables used (National Level)

Variables	GLSS4	GLSS5	GLSS6
	Mean	Mean	Mean
Poor	0.212	0.260	0.239
Moderately poor	0.105	0.080	0.141
Non-poor	0.683	0.760	0.760
Households headed by male	0.660	0.721	0.717
Head education is basic	0.476	0.487	0.483
Head education is post-basic	0.134	0.163	0.200
Head education is unknown	0.390	0.350	0.317
Age of the head	37.680	45.340	45.840
Highest female education is basic	0.924	0.499	0.483
Highest female education is post-basic	0.076	0.141	0.159
Highest female education is unknown		0.360	0.358
Age of the female with highest education		38.230	38.850
Dependency ratio	0.437	0.390	0.394
Ownership of farm equipment	0.030		
Ownership of motorized farm equipment		0.039	0.174
Ownership of fishing equipment	0.018	0.019	0.014
Not demand credit		0.711	0.880
No access to credit		0.020	0.010
Limited access to credit		0.019	0.001
Access to credit		0.250	0.105
Ownership of small livestock		0.294	0.290
Ownership of large livestock		0.059	0.069
Ownership of poultry		0.364	0.369
Ownership of land	0.400	0.450	0.400
No household has public pipe-borne water		0.907	0.150
Only some have public pipe-borne water		0.065	0.630
Most have public pipe-borne water		0.028	0.220
Presence of toilet facilities	0.648	0.736	0.700
No household has electricity	0.701	0.688	0.376
Only some households have electricity	0.110	0.086	0.200
Most households have electricity	0.189	0.226	0.424
Health facility in community	0.111	0.126	0.206
Extension services	0.112	0.124	0.181
Availability of fertilizers	0.917	0.790	0.962
Presence of bank	0.033		
Access to community by motorable road	0.666	0.823	0.847
Irrigation facilities	0.108	0.059	0.179
Malaria is not a major problem	0.165	0.129	0.076

Observations	5998	8689	16773

Table 2: Summary of variables used (National Rural)

Variables	GLSS4	GLSS5	GLSS6
	Mean	Mean	Mean
Poor	0.276	0.249	0.164
Moderately poor	0.131	0.108	0.200
Non-poor	0.593	0.643	0.636
Households headed by male	0.686	0.754	0.760
Head education is basic	0.469	0.461	0.471
Head education is post-basic	0.073	0.069	0.101
Head education is unknown	0.458	0.470	0.428
Age of the head	46.549	46.642	47.408
Highest female education is basic	0.965	0.483	0.935
Highest female education is post-basic	0.035	0.050	0.065
Highest female education is unknown		0.467	
Age of the female with highest education		39.545	40.280
Dependency ratio	0.467	0.442	0.439
Ownership of farm equipment	0.043		
Ownership of motorized farm equipment		0.055	0.258
Ownership of fishing equipment	0.023	0.028	0.022
Not demand credit		0.683	0.880
No access to credit		0.025	0.010
Limited access to credit		0.022	0.001
Access to credit		0.270	0.106
Presence of bank	0.036		
Ownership of small livestock		0.427	0.444
Ownership of large livestock		0.089	0.112
Ownership of poultry		0.522	0.556
Ownership of land	0.410	0.580	0.554
No households have public pipe-borne water		0.906	0.154
Only some households have public pipe-borne water		0.066	0.650
Most households have public pipe-borne water		0.028	0.196
Presence of toilet facilities	0.786	0.599	0.546
No households have electricity	0.790	0.691	0.408
Only some households have electricity	0.125	0.087	0.200
Most households have electricity	0.085	0.222	0.392
Health facility in community	0.132	0.122	0.177
Extension services	0.127	0.120	0.162
Availability of fertilizers	0.906	0.793	0.960
Access to community by motorable road	0.623	0.824	0.839
Irrigation facilities	0.124	0.059	0.168
Malaria is not a major problem	0.195	0.131	0.080

Observations	3779	5069	9327

Table 3: Summary of variables used (Rural North versus Rural South)

Variable	Glss4		Glss5		Glss6	
	Rural North	Rural South	Rural North	Rural South	Rural North	Rural South
	Mean	Mean	Mean	Mean	Mean	Mean
Poor	0.664	0.208	0.574	0.103	0.323	0.064
Moderately poor	0.125	0.132	0.112	0.107	0.255	0.166
Non-poor	0.211	0.660	0.314	0.790	0.422	0.770
Households headed by male	0.887	0.648	0.877	0.700	0.830	0.720
Head education is basic	0.133	0.532	0.157	0.597	0.230	0.616
Head education is post-basic	0.036	0.080	0.045	0.080	0.080	0.114
Head education is unknown	0.831	0.388	0.798	0.323	0.690	0.270
Age of the head	46.498	46.558	47.156	46.411	47.412	47.407
Highest female education is basic	0.163	0.958	0.133	0.636		0.916
Highest female education is post-basic		0.042	0.041	0.055	0.039	0.084
Highest female education is unknown			0.722	0.309		
Age of female with highest education			42.330	37.820	42.125	38.940
Dependency ratio	0.476	0.465	0.451	0.438	0.462	0.424
Ownership of farm equipment		0.034	0.017	0.072	0.205	
Ownership of motorized farm equipment		0.034				0.290
Ownership of fishing equipment		0.022	0.026	0.029	0.016	0.026
Not demand credit			0.776	0.641	0.910	0.867
No access credit			0.016	0.028	0.008	0.011
Limited access to credit			0.019	0.024	0.001	0.001
Access to credit			0.189	0.307	0.080	0.121
Ownership of small livestock			0.711	0.297	0.670	0.308
Ownership of large livestock			0.250	0.016	0.264	0.021
Ownership of poultry			0.775	0.405	0.708	0.464
Ownership of land	0.336	0.426	0.763	0.496	0.742	0.440
None household has public pipe-water			0.969	0.879	0.106	0.181
Only some has public pipe-water			0.031	0.081	0.770	0.578
Most has public pipe-water				0.040	0.124	0.241

Variable	Glss4		Glss5		Glss6	
	Rural North	**Rural South**	**Rural North**	**Rural South**	**Rural North**	**Rural South**
	Mean	Mean	Mean	Mean	Mean	Mean
Presence of toilet facilities		0.750	0.093	0.827	0.157	0.781
No household has electricity	0.940	0.761	0.886	0.606	0.586	0.298
Only some households have electricity	0.060	0.138	0.062	0.098	0.259	0.165
Most households have electricity		0.101	0.052	0.296	0.155	0.537
Health facility in community		0.151	0.086	0.137	0.180	0.175
Extension services	0.048	0.142	0.031	0.157	0.128	0.183
Availability of fertilizers	0.870	0.911	0.626	0.860	0.960	0.955
Access to community by motorable road	0.618	0.624	0.655	0.897	0.765	0.886
Irrigation facilities		0.140	0.104	0.040	0.148	0.181
Malaria is not a major problem		0.227	0.156	0.120	0.118	0.055
Anti-malaria control	0.348					
Access to market	0.423					
Presence of bank		0.042				
Observations	600	3199	1574	3495	3512	5815

Results and Discussion
Descriptive overview of rural poverty in Ghana
This section presents an overview of the distribution of extreme poverty and poverty status of households by location, in Ghana, between 1998 and 2013. The rural Savannah has the highest incidence of both extreme poverty and poverty in Ghana over the period (Tables 4 & 5). From 59.3% in 1998 the incidence of extreme poverty dipped to 42.9% in 2005 and was 27.3% in 2013. While this indicates marked improvement, it is worthy to note that rural Savannah has borne a disproportionate burden of poverty throughout the period. With a population share of 20.6% in 1998 it contributed 45.5% of national extreme poverty compared to 24.8% for rural Forest which had a population share of 31.6%. This situation is not different (or even got worse) by 2013 when rural Savannah contributed 58.3% of national extreme poverty with only 18% of the population share.

Table 4: Distribution of extreme poverty by location in Ghana (1998 – 2013)

Locality	1998/1999			2005/2006			2012/2013		
	Pop'n share	P_0	C_0	Pop'n share	P_0	C_0	Pop'n share	P_0	C_0
Rural Coastal	14.6	28.2	15.3	10.9	9.6	6.4	5.7	9.4	6.3
Rural Forest	31.6	21.1	24.8	28.1	12.6	21.4	26.2	7.8	24.2
Rural Savannah	20.6	59.3	45.5	23.3	42.9	60.6	18.0	27.3	58.3
National	100.0	26.8	100.0	100.0	16.5	100.0	100.0	8.4	100.0

Sources: GSS (2000), Table A1.1, p.35; GSS (2014), Table A1.2, p.47.

The trend in poverty status over the period is no different (see Table 5). In 1998, with a population share of 20.6%, rural Savannah contributed 36.6% of national poverty and had a poverty incidence of 70%. While its population share declined to 18% in 2013, rural Savannah contributed 40.8% of national poverty and had a head count ratio of 55%. Note that in terms of geographical coverage rural Savannah is more or less rural Northern Ghana, covering the rural parts of Northern, Upper East and Upper West Regions.

Table 5: Distribution of poverty by location in Ghana (1998 – 2013)

Locality	1998/1999			2005/2006			2012/2013		
	Pop'n share	P_0	C_0	Pop'n share	P_0	C_0	Pop'n share	P_0	C_0
Rural Coastal	14.6	45.2	16.7	10.9	27.2	9.3	5.7	30.3	6.9
Rural Forest	31.6	38.0	30.4	28.1	33.1	29.1	26.2	27.9	30.1
Rural Savannah	20.6	70.0	36.6	23.3	64.2	46.9	18.0	55.0	40.8
National	100.0	39.5	100.0	100.0	31.9	100.0	100.0	24.2	100.0

Sources: GSS (2000), Table A1.2, p.36; GSS (2014), Table A1.1, p.46.

Empirical model results
This section presents results of the econometric model of the determinants of poverty by location, focusing on rural poverty at the North-South disaggregation for 1998/99 2005/2006, and 2012/2013. It also presents and discusses the model diagnostics, and the predicted probabilities and their implications for the statistically significant variables (determinants of poverty).

Determinants of Rural Poverty Status at National Level (1998 – 2013)
Table 6 presents the econometric results of the determinants of poverty at national level over time covering the period 1998 – 2013. For each survey round, two columns of coefficients present the effects of the associated variables on the likelihood of being moderately poor and non-poor, respectively, as compared to the poor (i.e. the base).

For all rounds, there is evidence of gender bias in terms of welfare status of households. Indeed, the results suggest that households headed by males are more likely to be better off. Nyugen, Linh and Nguyen (2013) and Adjasi and Osei (2007) reported similar findings that associated female-headed households with poverty. In fact, Adjasi and Osei (2007) observed that female-headed households were not only more likely to be poor but also were poorer compared to their male-headed counterparts. Fagernäs and Wallace (2007) reported mixed results with female headship of households negatively related to welfare only in non-rural areas of Sierra Leone. The effect of the age of the household head, and the age of female with the highest education is a U-shaped pattern in line with the expectation that youngsters are likely to be worse off. The results on age support the findings of Adjasi and Osei (2007).

As expected, as the head of the household is concerned, having post-basic education improves welfare status as compared to attainment of basic education. On the other hand, attainment of basic education leads to better welfare status as compared to households where the education of the head is unknown. This suggests that the latter were likely household heads without education. Similar results arise for highest female education but this was only significant for GLSS6. Fissuh and Harris (2004) found that the probability of being poor relative to non poor increases if one does not have formal education; but also that basic education will not suffice. In fact, Nyugen, Linh and Nguyen (2013) noted that education is an important determinant of poverty and observed that having higher education leads to larger reduction in the probability of being poor. Other studies that found education to improve household welfare or reduce the likelihood of being poor include Gounder (2013), Adjasi and Osei (2007), Okurut et al. (2002) and Grootaert (1997).

The results also indicate that an increasing dependency ratio has a decreasing effect on household's welfare. In other words, increasing dependency ratio increases the likelihood of being poor (see Lekobane and Seleka, 2017; Coulombe and McKay,1996). Ownership of land, motorized farm equipment and fishing equipment improves welfare status of households. Ownership of these assets increases the likelihood of being moderately poor or non-poor, relative to being poor. Similar results on land and farm equipment are reported in Glewwe (1991) for Cote D'Ivoire. An unexpected result is that ownership of small livestock appears to have a negative effect on household welfare; however ownership of both large livestock and poultry leads to an improvement in the household's welfare status (see results for GLSS6). The finding on ownership of large livestock supports Lekobane and Seleka (2017) on cattle ownership in Botwana; but their results were mixed for one of two survey periods.

While the presence of toilet facilities leads to an improvement of welfare (significant for only GLSS5), access to public pipe-borne leads to welfare improvement only where most households have access to the facility. Whereas provision of public water supply to severely deprived (lowest income) communities, is expected to improve the health status of residents it may not sufficiently raise labour incomes to make such areas better off than other areas. Access to electricity increases the likelihood of being better off (i.e. being moderately poor or non-poor compared to being poor). The same holds for availability of fertilizers and irrigation facilities. However, the latter is only significant in GLSS6.

Finally, for all three waves of the living standards survey, households in the Savannah zone are likely to be worse off compared to those in the Coastal zone. In other words households in the Savannah zone are less likely to be moderately poor or non-poor, relative to being poor. However, results from GLSS4 suggest that households in the Forest zone were likely to be better off compared to those in the Coastal zone in 1998.

Table 6: Determinants of Poverty Status at National Level (1998 – 2013)

VARIABLES	GLSS6		GLSS5		GLSS4	
	Moderately poor	Non-poor	Moderately poor	Non-poor	Moderately poor	Non-poor
Gender of the head (male=1)	0.331*	0.504***	0.634**	0.621***	0.196	-0.0947
	(1.851)	(2.831)	(2.209)	(3.061)	(1.045)	(-0.654)
Education of the head (Basic education=0)						
Head has post-basic education	0.250	1.044***	0.290	0.871***	0.243	0.465**
	(0.871)	(3.876)	(0.730)	(2.757)	(0.824)	(2.176)
Head education is unknown	-0.255**	-0.640***	-0.323**	-0.347**	-0.323**	-0.814***
	(-1.974)	(-5.100)	(-2.082)	(-2.543)	(-2.073)	(-6.660)
Log age of the head	-7.144**	-14.95***	-0.967	-7.663**	-12.98***	-25.39***
	(-2.060)	(-4.397)	(-0.217)	(-2.190)	(-2.615)	(-6.355)
Log age of the head (squared)	0.962**	1.958***	0.192	1.016**	1.710***	3.330***
	(2.152)	(4.455)	(0.330)	(2.200)	(2.627)	(6.370)
Highest female education (Basic education=0)						
Highest female education is post-basic	0.0659	0.563**	-0.538	-0.119	0.435	0.623*
	(0.228)	(2.214)	(-1.420)	(-0.429)	(0.927)	(1.764)
Highest female education is unknown			0.00456	0.0744		
			(0.0320)	(0.600)		
Log age of female with highest education	1.476	-4.546**	-9.593***	-14.37***		
	(0.752)	(-2.388)	(-3.351)	(-6.223)		
Log age of female with highest households (squared)	-0.275	0.511**	1.216***	1.868***		
	(-1.041)	(1.995)	(3.139)	(5.979)	-0.0870	-1.723***
Dependency ratio	-0.677***	-1.954***	-0.735**	-2.015***	(-0.277)	(-7.133)
	(-3.087)	(-8.614)	(-2.076)	(-7.283)		
Ownership of motorized farm equipment	0.245*	0.694***	0.742***	1.024***		
	(1.774)	(4.916)	(2.834)	(4.231)		
Ownership of farm equipment					-0.112	0.201
					(-0.412)	(1.095)
Ownership of fish equipment	-0.0925	0.224	0.881**	1.154**	1.302***	1.539***
	(-0.223)	(0.454)	(2.039)	(2.461)	(3.372)	(4.260)

VARIABLES	GLSS6		GLSS5		GLSS4	
	Moderately poor	Non-poor	Moderately poor	Non-poor	Moderately poor	Non-poor
Presence of bank					0.301	0.364
					(0.642)	(1.029)
Access to credit (Not demand credit=0)						
No access to credit	0.491	0.424	0.581	1.157***		
	(0.926)	(0.799)	(1.124)	(2.826)		
Limited access to credit	-0.430	13.35***	1.171**	1.540***		
	(-1.312)	(17.40)	(2.574)	(3.934)		
Access to credit	0.0448	0.314*	0.563***	0.826***		
	(0.235)	(1.675)	(3.689)	(5.697)		
Ownership of small livestock	-0.0843	-0.264**	-0.227	-0.0596		
	(-0.676)	(-2.096)	(-1.627)	(-0.483)		
Ownership of large livestock	0.206	0.321**	-0.213	-0.124		
	(1.603)	(2.088)	(-1.180)	(-0.660)		
Ownership of poultry	0.369***	0.465***	0.0504	0.0289		
	(3.043)	(3.599)	(0.317)	(0.197)		
Land ownership	-0.000854	0.169	0.204	0.474**	0.0284	0.210**
	(-0.00511)	(0.913)	(1.080)	(2.568)	(0.209)	(2.033)
Access to public pipe-borne water (no household = 0)						
Only some households have access	-0.429**	-0.290	-0.528	0.666		
	(-2.012)	(-0.959)	(-0.975)	(0.953)		
Most households have access	-0.296	0.0335	0.667*	0.705		
	(-0.903)	(0.0840)	(1.940)	(1.636)		
Toilet facilities	0.0174	0.199	0.500**	0.973***	-0.154	-0.478***
	(0.101)	(1.005)	(2.449)	(4.682)	(-0.790)	(-3.221)
Access to electricity (no household = 0)						
Only some households have electricity	0.381*	0.797***	0.0722	0.103	-0.368	0.00470
	(1.719)	(3.188)	(0.219)	(0.345)	(-1.088)	(0.0202)
Most households have electricity	0.157	0.516*	0.387	0.730***	-0.233	0.228
	(0.677)	(1.889)	(1.592)	(2.771)	(-0.701)	(0.918)

VARIABLES	GLSS6		GLSS5		GLSS4	
	Moderately poor	Non-poor	Moderately poor	Non-poor	Moderately poor	Non-poor
Health facility in community	0.0284	0.189	-0.0882	-0.0331	-0.535**	-0.136
	(0.169)	(1.050)	(-0.351)	(-0.133)	(-2.101)	(-0.728)
Extension service	0.364*	0.289	0.175	0.0356	-0.401	-0.000953
	(1.759)	(1.108)	(0.563)	(0.0983)	(-1.559)	(-0.00504)
Availability of fertilizer	0.829**	0.637	0.509**	0.234	-0.0264	0.220
	(2.197)	(1.432)	(2.326)	(0.881)	(-0.122)	(1.234)
Community is accessible by motorable road	-0.171	-0.430	0.337	-0.110	0.288*	0.346***
	(-0.794)	(-1.635)	(1.435)	(-0.399)	(1.843)	(2.829)
Irrigated fields in community	0.364*	0.513**	0.00610	0.0942	0.0906	-0.133
	(1.696)	(2.035)	(0.0197)	(0.228)	(0.270)	(-0.569)
Malaria is not a major problem	-0.0710	0.0283	0.115	-0.317	0.585***	0.222
	(-0.223)	(0.0811)	(0.524)	(-1.170)	(2.673)	(1.275)
Ecological zone (costal=0)						
Forest	-0.421	-0.637	-0.220	-0.274	0.472***	0.639***
	(-1.285)	(-1.609)	(-0.789)	(-0.960)	(2.663)	(4.541)
Savannah	-1.495***	-2.203***	-0.770***	-1.582***	-0.759***	-0.872***
	(-4.648)	(-5.539)	(-2.580)	(-5.105)	(-3.872)	(-5.699)
Constant	12.22*	40.35***	18.02**	42.31***	23.78**	49.52***
	(1.701)	(5.669)	(2.027)	(6.089)	(2.512)	(6.482)
Observations	5,013	5,013	3,253	3,253	2,462	2,462
Log likelihood	-4134	-4134	-2489	-2489	-2191	-2191
Chi-Squared	1711	1711	445.9	445.9	436.6	436.6

Robust z-statistics in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Determinants of Rural Poverty Status in Northern Ghana (1998 – 2013)

Table 7 presents the determinants of poverty status in the rural north for the period 1998 – 2013. In this sub-section, we emphasize the discussion on results that are different from the national level. Table 6 shows females with unknown level of education are associated with an improvement in household welfare status, unlike for the head of household; tending to suggest that female members with missing information on education likely have higher than basic education. Having a female with unknown level of education increases the likelihood of being moderately poor or non-poor, compared to being poor. While lifecycle effects are present in GLSS4, they are evident for only non-poor in GLSS6; there is no significant effect as far as the head is concerned in GLSS5.

Results from GLSS5 seem to suggest that availability of credit in a community and all forms of access to credit lead to improvement in households' welfare status. In other words, credit increases the likelihood of being moderately poor or non-poor, compared to being poor. However, in GLSS6 only having limited access to credit has a positive effect on the likelihood of being non-poor. This is probably due to improvements in the measurement of the variable over time. Results on land ownership is rather mixed; with an unexpected negative effect on the likelihood of being non-poor for GLSS4. A similar unexpected result is the negative effect of ownership of small livestock on the likelihood of being non-poor, relative to being poor, for GLSS6. For GLSS5 land ownership has an unambiguous positive effect on household welfare; it increases the likelihood of being moderately poor or non-poor, compared to being poor. While ownership of farm equipment improves welfare status in both rounds, ownership of livestock assets only affects welfare status in GLSS6.

Access to public water and the presence of toilet facilities negatively affects the likelihood of being moderately poor and non-poor, relative to being poor. This suggests that the improvement of income through an improvement of health was not enough to make households better off. Households in areas where electricity is available are likely to be better off in all rounds. For the rural north, availability of fertilizer positively affects welfare status only in GLSS5 while the availability of irrigation facilities has positive and significant effect in GLSS6. Also, access to extension services has a positive effect in GLSS4. But access to community by motorable road increases the likelihood of being moderately poor in GLSS5 relative to being poor. However, it reduces the likelihood of being non-poor relative to being poor in GLSS6, which is unexpected. Similarly, anti-malaria campaign in a community reduces the likelihood of households being non-poor in GLSS4, compared to being poor; an unexpected result, again raising issues of measurement or data quality.

Table 7: Determinants of Poverty Status in Rural Northern Ghana (1998 – 2013)

VARIABLES	GLSS6		GLSS5		GLSS4	
	Moderately poor	Non-poor	Moderately poor	Non-poor	Moderately poor	Non-poor
Gender of the head (male = 1)	0.316	0.752***	0.0245	1.182***	0.803	0.227
	(1.252)	(2.605)	(0.0509)	(2.909)	(0.696)	(0.286)
Education of the head (basic education = 0)						
Head has post-basic education	-0.0282	1.179***	1.384**	1.260***	-0.0904	0.693
	(-0.0711)	(3.254)	(2.345)	(2.753)	(-0.111)	(1.179)
Head education is unknown	-0.0471	-0.328*	0.0344	-0.153	-0.554	-0.232
	(-0.270)	(-1.947)	(0.120)	(-0.699)	(-1.385)	(-0.587)
Log age of the head	-5.938	-15.04***	-2.427	-6.405	-14.58*	-18.64**
	(-1.425)	(-3.433)	(-0.355)	(-1.296)	(-1.777)	(-2.091)
Log age of the head (squared)	0.763	1.942***	0.438	0.904	1.927*	2.388**
	(1.416)	(3.418)	(0.491)	(1.388)	(1.756)	(2.016)
Highest female education is basic					0.0155	0.453
					(0.0387)	(1.351)
Highest female education (basic education = 0)						
Highest female education is post-basic	-0.339	0.783**	-0.548	-0.0591		
	(-0.819)	(2.339)	(-0.860)	(-0.123)		
Highest female education is unknown			0.603**	0.190		
			(2.211)	(0.974)		
Log age of female with highest education	1.841	-5.376**	-11.20**	-15.50***		
	(0.772)	(-2.093)	(-2.386)	(-4.215)		
Log age of female with highest education (squared)	-0.304	0.592*	1.411**	1.927***		
	(-0.947)	(1.703)	(2.222)	(3.851)		
Dependency ratio	-0.854***	-2.090***	-1.663***	-1.424***	-0.734	-1.791***
	(-2.915)	(-6.468)	(-2.955)	(-3.442)	(-1.018)	(-2.757)
Ownership of motorized farm equipment	0.332*	0.609***	1.128*	1.252**		
	(1.727)	(3.183)	(1.747)	(2.327)		
Ownership of fish equipment	-0.718	-0.446	-0.103	-0.426		
	(-1.145)	(-0.672)	(-0.147)	(-0.877)		

VARIABLES	GLSS6		GLSS5		GLSS4	
	Moderately poor	Non-poor	Moderately poor	Non-poor	Moderately poor	Non-poor
Access to credit (not demand credit = 0)						
No access to credit	0.472	0.0512	1.740**	1.558**		
	(0.729)	(0.0684)	(2.066)	(2.420)		
Limited access to credit	-0.297	13.81***	1.830**	1.257**		
	(-0.699)	(15.34)	(2.523)	(2.045)		
Access to credit	-0.0404	0.0774	0.977***	0.995***		
	(-0.155)	(0.254)	(4.054)	(5.229)		
Ownership of small livestock	-0.220	-0.384**	-0.214	0.0640		
	(-1.316)	(-1.969)	(-0.897)	(0.316)		
Ownership of large livestock	0.301**	0.518***	-0.110	-0.0503		
	(2.191)	(3.248)	(-0.477)	(-0.278)		
Ownership of poultry	0.129	0.578***	0.367	-0.0872		
	(0.787)	(2.988)	(1.165)	(-0.374)		
Land ownership	0.234	0.297	1.108***	1.390***	-0.00662	-0.749**
	(0.975)	(0.998)	(3.273)	(5.923)	(-0.0235)	(-2.428)
Access to public pipe-borne water (no households = 0)						
Only some households have access	-0.711***	-0.733*	-13.40***	2.364***		
	(-2.629)	(-1.859)	(-17.11)	(3.285)		
Most households have access	-0.510	-0.0154				
	(-1.117)	(-0.0268)				
Toilet facilities	-0.273	-0.619**	-0.398	0.326		
	(-1.086)	(-2.184)	(-0.824)	(1.093)		
Access to electricity					-0.343	0.728
					(-0.387)	(1.226)
Access to electricity (no household = 0)						
Only some households have electricity	0.536*	1.111***	0.0779	-0.134		
	(1.865)	(3.387)	(0.183)	(-0.412)		
Most households have electricity	-0.0278	-0.0157	-0.568	1.140**		
	(-0.0924)	(-0.0372)	(-0.693)	(2.514)		

VARIABLES	GLSS6		GLSS5		GLSS4	
	Moderately poor	Non-poor	Moderately poor	Non-poor	Moderately poor	Non-poor
Health facility in community	0.0625	0.358	-0.0135	-0.159		
	(0.287)	(1.416)	(-0.0365)	(-0.487)		
Extension service	0.216	0.574	-0.0234	-2.621	0.0638	1.076**
	(0.780)	(1.525)	(-0.0332)	(-1.573)	(0.0948)	(2.198)
Availability of fertilizer	0.727	0.798	0.704***	0.410**	0.000772	-0.00749
	(1.552)	(1.174)	(3.060)	(2.316)	(0.00190)	(-0.0153)
Community is accessible by motorable road	-0.175	-0.702**	0.453*	-0.0832	0.831	1.050**
	(-0.606)	(-2.044)	(1.926)	(-0.498)	(1.575)	(2.301)
Irrigated fields in community	0.513*	0.262	0.240	0.336		
	(1.786)	(0.719)	(0.691)	(1.338)		
Malaria is not a major problem	-0.317	0.00561	-0.425	-0.0907		
	(-0.835)	(0.0123)	(-1.353)	(-0.414)		
Anti-malarial campaign					-0.181	-0.697*
					(-0.369)	(-1.690)
Access to market					-0.492	0.403
					(-1.058)	(0.989)
Constant	8.462	40.44***	21.21	38.65***	25.43*	34.77**
	(0.951)	(4.253)	(1.628)	(4.143)	(1.670)	(2.093)
Observations	2,128	2,128	1,169	1,169	511	511
Log likelihood	-2050	-2050	-890.1	-890.1	-374.8	-374.8
Chi-Squared	1558	1558	3324	3324	65.58	65.58

Robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Determinants of Rural Poverty Status in Southern Ghana (1998 – 2013)
Table 8 presents the determinants of poverty in the rural South. In contrast to the results at national level, presence of a female with unknown level of education reduces the likelihood of being moderately poor relative to being poor in GLSS5. This result is in line with the results for the head of the household reported earlier. If this tends to suggest that members with missing information on education tend to have lower than basic education, it raises a concern about the quality of the data collection process across the country. For example, it may be the case that information on education was given more attention in the rural south than in the north. In all rounds, the U-shape profile of age is observed.

Results from GLSS4 show that ownership of land, farm or fishing equipment has positive effect on household welfare, as expected. In other words, ownership increases the likelihood of a household being moderately poor or non-poor, compared to being poor. While the ownership of productive assets (farm and fishing equipment) was not relevant in explaining welfare status in GLSS6, it had a positive effect on the likelihood of being non-poor in GLSS5. On the other hand, while ownership of livestock assets improves welfare status in GLSS6, it had no significant effect in GLSS5. This may reflect the role of exogenous factors such as weather outcomes that determine the returns to land and associated productive equipment. For instance, if in a particular year households face poor weather conditions, ownership of such productive assets may not make households any better off.

Ownership of livestock may enable households to cope with various shocks and stresses. Results from GLSS6 suggest such a positive influence of ownership of poultry and large livestock; the same cannot be said of ownership of poultry and livestock in GLSS5 in rural South. Availability of fertilizer or electricity improves welfare status; increasing the likelihood of being moderately poor or non-poor, relative to being poor. An unexpected result is that extension services reduces the likelihood of being moderately poor or non-poor (a negative welfare effect) compared to being poor in GLSS4. This raises issues about data quality especially in relation to definition and measurement of concepts and or variables. However, while the presence of irrigation facilities or the absence of malaria as one of the four major health problems in a community negatively affects welfare status in GLSS5, they both have positive effect in GLSS6. The same issue regarding the quality of the data and administration of the questionnaire may be raised.

Table 8: Determinants of Rural Poverty Status in Southern Ghana (1998 – 2013)

VARIABLES	GLSS6		GLSS5		GLSS4	
	Moderately poor	Non-poor	Moderately poor	Non-poor	Moderately poor	Non-poor
Gender of the head (male = 1)	0.419	0.494*	0.844**	0.564**	0.304	0.0571
	(1.461)	(1.769)	(2.460)	(2.155)	(1.584)	(0.390)
Education of the head (basic education = 0)						
Head has post-basic education	0.440	1.040**	0.0409	0.877**	0.259	0.448*
	(0.976)	(2.488)	(0.0810)	(2.118)	(0.791)	(1.790)
Head education is unknown	-0.428**	-0.718***	-0.215	-0.190	-0.122	-0.596***
	(-2.308)	(-3.907)	(-0.985)	(-1.091)	(-0.698)	(-4.303)
Log age of the head	-9.016	-15.88**	-6.934	-15.65**	-12.61**	-28.93***
	(-1.265)	(-2.344)	(-0.947)	(-2.571)	(-1.971)	(-5.456)
Log age of the head (squared)	1.289	2.133**	0.869	1.958**	1.636*	3.764***
	(1.409)	(2.444)	(0.913)	(2.473)	(1.958)	(5.436)
Highest female education (basic education = 0)						
Highest female education is post-basic	0.349	0.599	-0.485	-0.148	0.735	0.890**
	(0.720)	(1.344)	(-0.904)	(-0.363)	(1.420)	(2.200)
Highest female education is unknown			-0.353*	-0.0837		
			(-1.706)	(-0.508)		
Log age of female with highest education	0.255	-6.757*	-15.30***	-19.37***		
	(0.0683)	(-1.907)	(-3.409)	(-5.201)		
Log age of female with highest education (squared)	-0.107	0.869*	2.108***	2.674***		
	(-0.212)	(1.814)	(3.414)	(5.205)		
Dependency ratio	-1.151***	-2.620***	-1.344***	-3.300***	-0.0620	-1.924***
	(-2.911)	(-6.439)	(-2.717)	(-7.985)	(-0.172)	(-6.823)
Ownership of motorized farm equipment	-0.230	0.305	0.566	0.893***		
	(-1.103)	(1.465)	(1.606)	(3.071)		
Ownership of farm equipment					0.868*	1.293***
					(1.908)	(3.263)
Ownership of fish equipment	-0.408	-0.291	0.774	1.089**	1.105**	1.087***
	(-0.918)	(-0.562)	(1.558)	(2.416)	(2.502)	(2.766)

VARIABLES	GLSS6		GLSS5		GLSS4	
	Moderately poor	Non-poor	Moderately poor	Non-poor	Moderately poor	Non-poor
Presence of bank					0.478	0.583*
					(1.006)	(1.670)
Access to credit (not demand credit = 0)						
No access to credit	0.723	1.023	-0.0660	0.708		
	(0.671)	(1.002)	(-0.113)	(1.539)		
Limited access to credit	-0.534	12.13***	1.032	1.668**		
	(-1.625)	(15.68)	(1.233)	(2.179)		
Access to credit	0.385	0.825**	0.374*	0.702***		
	(1.138)	(2.427)	(1.846)	(4.203)		
Ownership of small livestock	0.318	0.163	-0.0503	0.0900		
	(1.493)	(0.785)	(-0.261)	(0.562)		
Ownership of large livestock	1.299*	1.446**	-0.414	-0.0911		
	(1.719)	(1.997)	(-0.753)	(-0.199)		
Ownership of poultry	0.538***	0.532**	0.0805	0.165		
	(2.687)	(2.557)	(0.424)	(1.062)		
Land ownership	-0.0967	0.139	0.0580	0.408***	0.0581	0.335***
	(-0.467)	(0.630)	(0.320)	(2.773)	(0.368)	(2.743)
Access to public pipe-borne water (no households = 0)						
Only some households have access	0.203	0.445	-0.452	0.356		
	(0.631)	(1.092)	(-0.954)	(1.003)		
Most households have access	0.0718	0.344	0.296	0.252		
	(0.177)	(0.724)	(0.633)	(0.648)		
Toilet facilities	0.0605	0.326	-0.120	0.245	0.0296	-0.304**
	(0.276)	(1.277)	(-0.508)	(1.213)	(0.148)	(-2.019)
Access to electricity (no household = 0)						
Only some households have electricity	0.162	0.747*	-0.0270	0.0216	-0.590*	-0.282
	(0.416)	(1.766)	(-0.0930)	(0.0912)	(-1.723)	(-1.231)
Most households have electricity	0.330	0.792**	0.302	0.577***	-0.456	-0.0685
	(1.133)	(2.298)	(1.333)	(3.225)	(-1.350)	(-0.271)

VARIABLES	GLSS6		GLSS5		GLSS4	
	Moderately poor	Non-poor	Moderately poor	Non-poor	Moderately poor	Non-poor
Health facility in community	0.0340	0.146	-0.124	-0.0135	-0.913***	-0.487***
	(0.131)	(0.542)	(-0.431)	(-0.0578)	(-3.549)	(-2.787)
Extension service	0.316	0.00531	-0.291	-0.345	-0.689**	-0.403**
	(1.157)	(0.0155)	(-1.122)	(-1.614)	(-2.535)	(-2.117)
Availability of fertilizer	0.973*	0.477	0.533*	0.171	-0.261	-0.104
	(1.723)	(0.646)	(1.881)	(0.765)	(-0.909)	(-0.426)
Community is accessible by motorable road	0.117	0.277	0.0419	-0.359	0.0847	0.138
	(0.428)	(0.780)	(0.139)	(-1.445)	(0.431)	(0.886)
Irrigated fields in community	0.329	0.800**	-0.540	-0.767**	0.261	0.0262
	(1.072)	(2.115)	(-1.405)	(-2.486)	(0.774)	(0.114)
Malaria is not a major problem	0.922**	0.696	-0.0672	-0.819***	0.276	-0.223
	(2.019)	(1.098)	(-0.292)	(-4.134)	(1.211)	(-1.318)
Ecological zone (costal=0)						
Forest	-0.489	-0.668	-0.0217	-0.0619	0.405**	0.539***
	(-1.405)	(-1.586)	(-0.0868)	(-0.296)	(2.272)	(3.862)
Savannah	-0.590	-0.823	0.446	-0.274	0.229	0.603***
	(-1.466)	(-1.628)	(1.404)	(-1.006)	(0.811)	(2.814)
Constant	15.95	43.65***	40.83***	68.10***	23.64*	57.06***
	(1.134)	(3.310)	(2.947)	(5.959)	(1.923)	(5.602)
Observations	2,885	2,885	2,084	2,084	1,951	1,951
Log likelihood	-1948	-1948	-1454	-1454	-1730	-1730
Chi-Squared	842	842	269.6	269.6	218.8	218.8

Robust z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Perceptions on rural poverty and inequality and why they persist

This section presents the summary of key issues identified in focus group discussions which are guided by findings from section 5.2 of this study. The group in northern Ghana describes poverty as 'inability to provide for one's needs'; 'inability of a breadwinner in a household to provide at least the basic needs of family members in terms of food, health, clothing, shelter and education'. In the south poverty is described similarly, as inability to afford a 'desired standard of living' or lack of access to basic services (unavailability or unable to afford) such as water, health facilities, schools, among others.

Why poverty and inequality persist - causes

The causes of poverty and inequality and their persistence in northern Ghana are numerous and diverse, but many relate to the reliance of majority of the populace on rain-fed agriculture with a single cropping regime, with a rather long more or less unproductive dry season. Along with lack of market opportunities (i.e. lack of demand for farm produce), poor rural roads and poor storage infrastructure for farm produce, farm incomes remain stagnant for the predominantly food crop producers. Other factors are, declining crop yields due to exhaustion of soils; rapid conversion of farm lands into residential areas which pushes farmers onto farm lands in distant places, or in some cases peasants lose their livelihood; inability to afford fertilizers and or hire labour in the face of urbanization which has led to out-migration of the youth from the farming communities; low interest of the youth in farming that denies families the once dependable family labour; and over dependence on traditional methods of production. Another factor is inadequate institutional support for officially designated cash crops over the years e.g. cotton and sheanuts have no guaranteed prices or other incentives comparable to those for cocoa, rubber and coffee in the south.

One other important factor remains access to credit from formal sources – borrowers have to resort to informal lenders with exorbitant interest rates; existing beliefs discourage potential borrowers from formal credit whilst those who dare are discouraged by complex and difficult demands from financial institutions, leaving producers in a low productivity trap. Other contributory factors include the reduction in communal spirit within families and community coupled with increasing dependence on the family head for basic needs. There is also the issue of higher birth rates leading to increasing dependency burden.

There is also a rising tendency to 'look down upon' indigenous economic activities such as dawadawa, shea nut and shea butter processing which were predominantly women's income generating activities in preference for "buying and selling" of manufactured goods – leading to decline in their importance. Another factor is the tendency of some "have-nots" to adopt and try to maintain false lifestyles or standards, which discourages wealth accumulation. In rural south limited farm land, low soil fertility and low yields; weather failure; high cost of farm inputs and high cost of living; non-remunerative prices for farm produce and unreliable buyers; lack of access to credit (for working capital); macro-instability and general 'monetization' are the main causes of poverty among farmers. For similar produce farmers in the south make more income, and would be rich had they been in the north, but remain poor owing to the high cost of living in the south.

The findings on causes of poverty from focus group discussions with farmers complement those from the multinomial logistic model. Farmers to a large extent see their production environment as the cause of their poverty. The production environment or the nature of farming, access to markets, soil degradation, loss of farmlands to urbanization and built environment could all be causes. Ironically urbanization and development of residential areas are a result of economic growth and therefore suggests

that growth has not been pro-poor. The tendency to prefer trading in manufactured goods over processing of wild fruit for economic purposes can be attributed to urban influence; so can the loss of communal spirit to individualism (erosion of social capital especially for the poor).

Poverty and inequality trends

Rural poverty in Ghana in one sense has reduced in the last two to three decades but in another sense, the poverty situation has become worse. Poverty appears to have decreased as more families now own and live in out-houses rather than compound houses; now more women are openly acquiring and owning assets such as livestock, land, and other landed properties; and there are more diverse economic opportunities now e.g. non-traditional trades such as metal works, car mechanics, and artisanship.

However, it appears that rural poverty and inequality in both northern and southern Ghana has increased over time. Crop yields have become poorer and communal support for the poor is no longer available; some peasants have lost their livelihoods as their farm lands are taken over for estate development; increasingly, farming (main livelihood activity) is left in the hands of the aged as many youth migrate down south in search of greener pastures leading to poor harvests; lower prices for agricultural products and post-harvest losses are now higher than they were in the past – the poor are getting poorer.

Reasons for the observed changes

In northern Ghana those getting ahead are people with education and skills, and women in income generating activities with access to loans (credit), whilst peasant farmers have become more impoverished due poor food production outcomes. This is consistent with the determinants identified from the poverty model. In the rural south, differences in initial endowments explain observed changes with those with working capital faring better. This also supports our argument that the poor are not homogenous.

How to combat poverty and inequality

Respondents suggest the following interventions to help combat poverty and inequality:
- Facilitate people's access to affordable credit
- Set up skill training programmes to equip the youth with entrepreneurial skills
- Embark on public education on the dangers and negative effects of our belief system on productivity and economic progress by traditional leaders and opinion leaders
- Support cash crop production in northern Ghana e.g. plantation production of shea and dawadawa
- Use incentive schemes such as matching funds to encourage a culture of saving especially for women entrepreneurs
- Provide appropriate storage facilities and motorable or paved roads to ease storage and transportation challenges in farming communities to reduce 'forced or premature' sale of farm produce
- Provide small dams at vantage localities to enable irrigation for all year round farming
- Promote the setting up cottage agro-processing industries to help stabilize food crop prices and incomes of farmers
- Provide guaranteed prices for the farm produce of farmers in northern Ghana, especially for cash crops such as sheanuts, rice, cotton
- Facilitate access to additional farm land
- Reduce cost of farm inputs (e.g. seeds, agrochemicals, etc.)
- Ensure consistent supply of quality certified seeds for all crops, including vegetables
- Engage extension officers with passion for the job

Members of the group in the south prefer to work for themselves than work for a government or individuals

Stability of determinants of rural poverty over time

This section discusses factors that appear to be consistently associated with poverty status of households over time from 1998 through 2013. A variable is considered a stable determinant if it is statistically significant across two surveys and the estimated coefficients have the same expected sign. The results presented in section 5.2 identified a wide variety of determinants of rural poverty and suggests, amidst data quality issues, that some variables can be good predictors of poverty status of households. Irrespective of location, increasing dependency ratio and female headship of household reduce the likelihood of being moderately poor or non-poor relative to being poor (see Tables 7 and 8). But education of household head at post-basic level increases the likelihood of the household being moderately poor or non-poor compared to being poor (see Tables 6, 7 and 8). Other policy-relevant variables identified that increase the likelihood of being moderately poor or non-poor relative to being poor, for the rural North, are ownership of motorized farm equipment and access to credit (Table 7); and for the rural South ownership of fishing equipment, access to credit, land ownership and availability of fertilizer in the community (Table 8).

Conclusion and Recommendations
Conclusions
- Households in rural Northern Ghana are more likely to be poor
- Access of households to productive assets (education, credit, farm equipment, fishing equipment, irrigation facilities, fertilizer, land and livestock ownership) is key to fighting rural poverty
- Identifying stable determinants of poverty status is a challenge but these factors may also vary by location
- Inconsistent estimates or unexpected results may be due to data quality and measurement issues even though the survey has been evolving and improving over time
- Evidence from the GLSS data confirm public perceptions on poverty and inequality

Recommendations
- In the short to medium term, efforts to fight poverty must focus on providing access to credit and promoting ownership of motorized farm equipment in rural Northern Ghana. In rural Southern Ghana efforts must focus on providing access to credit, promoting ownership of fishing equipment and availability of fertilizer in the communities.
- In the medium to long term, efforts to fight poverty must focus on promoting family planning education; and removing barriers to education for all that constrain progression beyond basic education.
- There is a need to engage the public more in attempts to understand poverty and its determinants, particularly the social contexts and implications of development for the poor.

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