EG-JRIF Ethiopian e-journal For Research and Innovation Foresight

Vol 7, no 2, (2016): pp(1 -18)

THE ISSUE AND DETERMINANTS OF RURAL POVERTY IN ETHIOPIA

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ABSTRACT

Poverty reduction is the primary goal of the governments, nongovernmental organizations and donors operating in Ethiopia; it is an essential first step to determine the true extent of poverty and where it is most severe. Toward this effort and provide statistical basis, a national HICE has been conducted by Ethiopian CSA since 1995/6. This study uses the 2010/11 HICE data with the aim identifying poor and assessing the determinants of rural households. Rather than looking at the association between poverty and various household characteristics on a one-to-one basis, which often oversimplifies complex relationships and can lead to erroneous conclusions, this study uses binary logit regression model to analyze the determinants of rural poverty econometrically. Based on the 2010/11 national poverty, it appears that 30.7% of the rural population at the time of the survey lived in a state of absolute poverty with 0.11 and 0.111 poverty depth and severity respectively. In terms of regional disparity, the incidence of poverty is the highest in SNNP with 38% and the lowest (26%) poverty incidence in Tigray. The second highest rural poverty is in Amhara region with 33%, 0.22 and 0.11 poverty incidence, depth and severity respectively. The econometric model revealed household size, heads age, sex, literacy status, dependency ratio, lowland agro-ecology, engagement in productive activities and involvement in income sources other than agriculture as the determinants of poverty in rural Ethiopia. Moreover, the model demonstrated the variation of statistical significance of various parameter estimates both across variables within a region and across regions. The policy implication of this study therefore, focusing not only on important rural dimensions of poverty but also the need to extend and refine into a more disaggregated regional level for the alleviation of rural poverty in Ethiopia.

Keywords: consumption, rural poverty, Ethiopia, regions, binary logit

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1. INTRODUCTION

Ethiopia is the second most populous country in Sub Saharan Africa with widespread, deep and severe poverty. Recent official reports widely claim significant reduction in poverty indicators in Ethiopia puts the poverty headcount index to 29.6% at national level, 25.7% in urban areas and 30.4% among rural household (MoFED, 2012). However, some authors don't agree on this significant number as an incredibly too exaggerated estimate to make any economic sense. Moges (2013), asked *"How can an economy that is essentially producing an equivalent of merely US\$1.13 per capita per day can have a dominant 70 percent of its population as non-poor!?"* (Moges, 2013, p. 106). The magnitudes of people requiring emergency assistance are steadily increasing from time to time. The vulnerable population that were supported by emergency food aid from 2000-2004 and both emergency aid and productive safety net program from 2005-2010 were 37.7 and 68.6 million respectively (DRMFSS, 2011; Rahmato, 2013).

The poverty situation in Ethiopia exhibits a number of unique features and characteristics that reflect the performance of the national economy, the dynamics of population growth, the distribution of opportunities, subsistence dominated agricultural sector, and the policy environment that hampered the realization of the economic potentials of the nation (Moges, 2013). Most empirical work that scrutinizes poverty analysis in developing nations and Ethiopia focused on explaining the extent of poverty at household level. Moreover, the state of poverty and performance of economy can be expressed in terms of regional and sector economic performances. With the increasing number of fiscal decentralization initiatives, under which funds and expenditure authority are being devolved down to sub-national jurisdictions and local government institutions, a better understanding of such aspects of poverty has become even more crucial (Chaudhuri, Jalan, & Suryahadi, 2002; Kristjanson, Radeny, Baltenweck, Ogutu, & Notenbaert, 2005; Haughton & Khandker, 2009).

In Ethiopia, there are nine regional states and two chartered city administrations at which power and responsibilities enshrined under the jurisdictions. Regional governments have the decisionmaking, legislative and executive powers and responsibilities to enact their constitution and laws; formulation and execution of economic, social and development policies, strategies and plans; administration of land and other natural resources in the territory; levy and collection of taxes assigned to the regional states; designing standards for state level civil services and payment; and maintenance of state level security forces (FDRE, 1995). Despite nine administrative regions, the majority of the population resides in Tigray, Amhara, Oromiya and Southern Nations, Nationalities and Peoples (SNNP). These four major regions account 86.2% of the entire population, of which 86.4% are rural (FDRE, 2008). It is therefore logical to derive rural poverty profile of Ethiopia by the characteristics of the rural households resided in the four major regions of the country. However, to make a more comprehensive rural poverty analysis with comparisons, we also consider the remaining five small regions that account 9.4% of the Ethiopian population of which 76.7% resided in rural areas. In such cases, estimation can made by combining all these smaller regions as one "Other regions" category with the major regions to get a clear picture of the country's poverty situation (CSA & WB, 2015).

Thus, given the importance of national poverty analysis, such sub-national index that takes into account the administrative, geographic and demographic particularities of the country would help

to better identify risk prone areas and target intervention programs and investments. This paper aims to add to the discussion of rural poverty by examining the socio-economic correlates and determinants of poverty to derive further meaningful insight about various poverty-generating factors which are relevant for policy design to alleviate rural poverty in Ethiopia. The structure of the paper is as follows. Section 2 briefly describes nature of Ethiopia's rural poverty. Section 3 discusses the methodology of the study. Section 4 focuses on poverty profile and its correlates. The final section provides the concluding remarks and discusses the implications that arise for policy.

2. RURAL POVERTY IN ETHIOPIA

Ethiopia is one of the poorest countries in the world where low income and productivity, weak capital accumulation and investment, high levels of unemployment and underemployment are the main features of the economy. Its economy is dependent on rain fed agriculture that employees more than 80% of the labor force with 41% of GDP and 70% of total export earnings contributions (Devereux, 2000; MoFED, 2012). The problems of poverty and food insecurity are deep rooted in Ethiopia. According to historical documents, in the 19th century alone Ethiopia has faced more than forty severe famine disasters including the ill-famous famine known as *'kifu ken'* (Evil Day) which took place between 1888 and 1892 and affected almost all parts of the country by taking the lives of one third of the total population and ninety percent of the cattle population (Pankhurst, 1985).

Since the 1970s, Ethiopia has achieved the dubious distinction of being the epicenter of humanitarian disaster with high food emergencies and greater frequency than any other country in the world. However, the high profile disasters and emergencies, which have attracted worldwide attention didn't obscure the grim day to day reality of the persistent hunger and malnutrition which is part of the lives of millions of peasants and pastoralists and which in the end provide the fuel for large scale catastrophes. The most noticeable ones are the 1972-1974 and the 1983-1984 famines in the northeastern parts of the country (Negatu, 2008; Rahmato, 2013). Poverty and food insecurity which were a hardship borne largely by people living in the countryside, has now crossed into urban areas and becoming a growing problem among the poor and the disadvantaged in the towns and cities of the country (Rahmato, 2013). These problems recently became the defining features of rural areas the country (Bogale, Hagedorm, & Korf, 2005).

According to Todaro & Smith (2012), on average, about 80% in Asia and Africa, of all target poverty groups are located in rural areas. As the majority of government expenditures in most developing countries over the past several decades has been directed toward the urban area and especially toward the relatively affluent modern manufacturing and commercial sectors, rural poverty is more prevalent, deeper a more severe than urban poverty. It is disproportionately high among households engaged in agriculture, informal business and casual labor or livestock owners (Todaro & Smith, 2012). In Ethiopia also, as more than 85% of the population resides in rural areas, poverty profile in Ethiopia could be represented by the characteristics of the rural poor. These rural households have less access to the socio-economic and infrastructural facilities than their urban counterparts like many of the households in developing countries. Rural poverty is nothing more than the concept of rural areas and has many dimensions and causes. The main underlying causes are a combination of multiple and intertwined short-term and long term structural economic, political, demographic, geographic, environmental, and policy related factors (Moges, 2013). The specific causes include population growth, land degradation, diminishing of land holdings, lack of non-farm technological innovations, lack of alternative income sources outside of agriculture, unreliable rainfall pattern, poor infrastructure and limited credit facilities (Devereux, 2000; Negatu, 2008).

The government of Ethiopia has been designed policies and programs and invested considerable resources with the support of the donor community over a period of more than four decades to reduce poverty. In 2002, the country has formally embarked on anti-poverty reduction strategy and the government put its objectives and policies in its poverty reduction strategy paper–Ethiopia: Sustainable Development and Poverty Reduction Program- which assesses the poverty situation in the country, the sources and constraints to economic growth, and outlines measures to address them (MoFED, 2002). This was followed by a revised policy plan to accelerate and sustainable development to end poverty (PASDEP) (MoFED, 2006). The revised policy also recognizes the importance of non-agricultural sector in promoting overall growth and in addressing pressing poverty problems. Ethiopia implemented another ambitious economic plan within the framework of poverty reduction strategy. The Growth and Transformation Plan (GTP) was implemented from 2010/11 to 2014/15 (MoFED, 2012). And currently the government has proposed another Growth and Transformation Plan (GTP II), which will be operationalized for 2015 to 2020 by succeeding the previous GTP.

Official figure for the estimated rural poverty of the country has stood as high as 47% in 1995. In 2000, there was a slight decline of rural poverty followed by a hiatus in 2005 as well as a continued decline in 2010. The pace of rural poverty reduction got even faster between 2005 and 2010. Households living below the poverty line have declined almost 1.14% a year since 1995, which is quite impressive. More importantly, the living standards of the rural poor section of the population improved substantially during the period between 2004-2010 as revealed by a greater decline in the depth and severity of poverty. Nonetheless, rural poverty in Ethiopia is still one of the highest in Sub-Sahara Africa and the number of households living below the poverty line remains as it was in the 1995/6.

Vaara	Total rural poverty				Rural food poverty		
rears	\mathbf{P}_0	\mathbf{P}_1	P_2	\mathbf{P}_0	\mathbf{P}_1	P_2	
1995/1996	47.5	13.4	5.3	51.6	15.2	6.2	
1999/2000	45.4	12.2	4.6	41	10.3	3.8	
2004/2005	39.3	8.5	2.7	38.5	12	4.9	
2010/2011	30.4	8	3.2	34.7	11	5	

Table 1. Trends of rural poverty in Ethiopia

Source: MoFED, 2012, based on 1995/95, 1999/00, 2004/05 and 2010/11 HICE data

In terms of regional rural poverty, the government also claims significant reduction since 1995. Moreover, there is significant regional variations poverty, despite the reliability of the percentages reported. For instance, in 2010/11, MoFED claims the highest poverty was in Tigray (36.5%) followed by Amhara (30.7%) and SNNP (30%). The lowest poverty reported in other regions (27.2%) followed by Oromiya (29.3%).

Table 2. Trends of headcount rural poverty of the regional states of Ethiopia

Regions	1995/1996	1999/2000	2004/2005	2010/2011
Tigray	58	61.6	51	36.5
Amhara	56.7	42.9	40.4	30.7
Oromiya	34.7	40.4	37.2	29.3
SNNP	56.5	51.7	38.2	30
Others	37.6	45	39	27.2
Total	47.5	45.4	39.3	30.4

Source: MoFED, 2012, based on 1995/95, 1999/00, 2004/05 and 2010/11 HICE data

Despite the government claims of successfully reducing poverty, there are concerns in accepting and believing the numbers reported. The criticisms notably came from the data and sampling techniques used to represent the entire population and yield unbiased estimates of the poverty situation of the country (Moges, 2013). This study, using the same data used by the government revealed some how different result from the percentages reported by MoFED, 2012. The highest rural poverty was in SNNP (37.7%) followed by Amhara (33.5%) and Oromiya (26.3%). The lowest was in other regions (24%) followed by Tigray (26%) incidence of rural poverty.

In general, poverty and food insecurity continues to elude a greater number of rural households, with periodic shocks and the threat of starvation facing millions of people. All the evidence suggests that the country will not be able to achieve food security nor will the relief interventions be brought to an end any time soon and hence, large food self-sufficiency gap at national level and food insecurity at household level (Negatu, 2008; Rahmato, 2013).

2. DATA AND METHODS

2.1. Data Basis

The determinants of rural poverty are a multi-variable analysis that extends the analysis of the poverty profile by attempting to infer the causality of specified household characteristics on household welfare. It can be recognized that poverty is fundamentally a phenomenon arising at the level of household; its measurement and determinants and characterization ideally require the use of household surveys by making multi-topic questionnaire. This study uses the dataset from 2010/2011 HCE surveys designed and conducted by Ethiopian Central Statistical Authority (CSA). The main objective of the survey was to provide statistical data that enable to understand the consumption-expenditure dimension of poverty. The survey covered all rural and urban areas of all regional states of the country except Afar and Somalia. To generate a representative sample, the country was categorized into rural, major urban centers and other urban areas.

To depict the true picture of economic development and poverty situation of the majority of the population, only the rural category of the survey was used here. This category used a two stage stratified sampling technique to select enumeration areas (EAs) which is the primary sampling unit and households as secondary sampling unit. In order to ensure proportional coverage of the rural population systematic random sampling based on a list ordered by population density was applied. Using the 2007 Population and housing census as a listing frame of rural households; EAs were sampled with a probability proportional to size of population while households were selected systematically from the fresh list of households within each EA during the survey year. A total of

864 EAs and 10368 households (i.e. 12 households per EA) were selected. However, due to errors in response for few households, this analysis was made from 10,322 rural households.

2.2. Methods

The methodology involves; generating poverty measure (consumption per adult equivalent), measuring poverty and specification of regression model.

2.2.1. Consumption generating process

Taking its advantage, consumption expenditure as opposed to household income is the common measure of household welfare in Ethiopia. Its aggregates include the sum of household consumption and non-consumption expenditures; categorized into food, non-food, durable and non-durable goods reported in different reference periods. The values were then all annualized. Undertaking these involves three steps: choosing a quantitative welfare indicator, choosing a means of discriminating between the poor and non-poor (through the use of a poverty line), and aggregating this information into a poverty measure for a particular population (Dercon, 2005). As current convention, the welfare indicator measured in the Ethiopia HCE was a basket of goods consumed at the household level. In order to make comparisons between households of different sizes, per capita consumption or per 'adult' consumption values are required. Adult equivalences use a weight assigned to each household member based on needs, which is typically contingent on age (for example, children need fewer calories than adults), and takes into account the economies of scale of large households. In Ethiopia, a series of adult equivalences were developed based on an equivalence scale developed for the 1996 Ethiopian household survey (Dercon & Krishinan, 1998).

As monetary values differed across the country and seasonally, household consumption expenditure was deflated regionally and seasonally, based on the local prices found in the regional price survey conducted throughout the year as part of the survey process. Statistics in Ethiopia used a cost of basic needs approach to develop a poverty line. The construction of poverty lines in Ethiopia based on consumption expenditure have been constructed by the Ethiopian MoFED since the 1995/6 poverty analysis report based on the cost of 2,200 kilo calories per day per adult food consumption with an allowance for essential nonfood items. The food and total poverty lines used since 1995/96 in the country are 648 and 1075 birr at national average prices, respectively. To compute the 2010/11 poverty indices, the 1995/96 poverty line was computed at 2010/11 prices. To do so groups of consumption items defined in 1995/96 that generate 2200 kilocalories are valued at 2010/11 national average prices in order to obtain food poverty line of 2010/11. Then this food poverty line is divided by the food share of the poorest 25 percent of the population to arrive at the absolute poverty line for year 2010/11. The food and absolute poverty lines for 2010/11 are determined to be Birr 1985 and 3781¹, respectively.

2.2.2. Measuring Poverty

The measurement of poverty can be computed based on the assumption that the survey was a random sample drawn from the population. The pioneer poverty measures that are used in many poverty analyses and for this study are the class of the consistent and additively decomposable

¹ 3781 Birr in 2011 prices is equivalent to 1.24 USD PPP using the 2005 International Comparison Project.

poverty measures by Foster, Greer and Thorbecke (FGT) (Foster, Greer, & Thorbecke, 1984). The FGT index is given by:

$$P_{\alpha} = \frac{1}{N} \sum_{i=1}^{q} \left[\frac{Z - Y_i}{Z} \right]^{\alpha} \tag{1}$$

where Z is the poverty line; Y_i is the poverty indicator in this case per adult consumption in decreasing order for all households; q is the number of poor people in the population; α is the poverty aversion parameter that takes the values of zero, one or two.

When $\alpha = 0$, equation (1) is equal to the headcount ratio of poor people. This is defined as the percentage of people falling below the poverty line and is the most commonly used measure of poverty, although a number of authors have highlighted some of its weaknesses (Deaton, 1992) (Ravallion, 1992). In particular, it is not sensitive to variations within the poor. When $\alpha = 1$, the index takes into account the number of those in poverty and the average depth of poverty. This is commonly referred to as the poverty gap and provides the cost (as a percentage of the poverty line) of lifting all the poor out of poverty. When $\alpha = 2$, the index also reflects the distribution of poverty amongst the poor and places greater weight on those furthest from the poverty line. This is referred to as poverty severity or the squared poverty gap index. It is sensitive to inequality amongst the poor, since a higher weight is placed on those who are farthest away from the poverty line (Dercon, 2005). For all of these measures; the higher the P will be the higher the poverty level.

2.2.3. Regression Model

Once the indicators, poverty lines and poverty measures done, the various characteristics of the different poverty groups (poor and non-poor) were compared to shed light on the determinants of rural poverty. Poverty and poverty changes are affected by both microeconomic and macroeconomic variables. Within the microeconomic context, as concerned and prime part of this study, the alternative simplest methods of analyzing the determinants of poverty are the econometric techniques, in terms of regression analysis. The regression analysis were used to see the effect of rural poverty of a specific household or individual characteristic while holding constant all other characteristics, which is the focus of this section.

In the case of a binary poverty status, i.e poor (Y = 1) if household consumption per adult equivalent per year is less than 3781 birr or non-poor (Y = 0) if household consumption per adult equivalent per year is above 3781 birr, the following regression equation can be formulated;

$$Y_i^* = X_i'\beta + u_i \tag{2}$$

where Y^* is the underlying latent variable that indexes poverty measure; X' is the vector variables; β is a column vector of parameters to be estimated and u_i is the stochastic error term.

To make the model practical, following Greene (1993) and assuming a cumulative distribution of u_i is logistic, we can obtain the logit model. In this case, the probability of being poor can be given by:

$$pro(Y_i = 1) = \frac{exp(X'_i\beta)}{1 + exp(X'_i\beta)}$$
(3)

Since the logistic model is not clear, the marginal effects of each independent variable on the dependent variable are not constant but are dependent on the values of independent variables (Greene, 1993). The marginal effect on the probability $pro(y_i = 1)$, implied by the marginal increase in a given explanatory variable, X_i is given by (Maddala, 1993);

$$Prob(Y_i = 1) = \frac{exp(X'_i\beta)}{\left[1 + exp(X'_i\beta)\right]^2}\beta_k \tag{4}$$

However, as opposed to the linear regression case, it is not possible to interpret the estimated parameters as the effect of the independent variables upon poverty in the case of logit model. Therefore, we calculate them at different levels of the explanatory variables to get an idea of the range of variation of the resulting changes in the probabilities.

2.2.4. Selection of Explanatory Variables

The set of variables that are hypothesized to determine household consumption, and hence poverty, includes household and community characteristics. A key consideration in selecting from potential determinants of consumption is to choose variables that are arguably exogenous to current consumption. Thus, the following explanatory variables are hypothesized to influence the dependent variable based on theoretical expositions and previous empirical studies. The dependent variable, i.e., household poverty status (being poor or non-poor) is calculated from household consumption per adult equivalent per year in relation to the minimum threshold (poverty line).

Variables	Variable definitions
Poverty	0=if the household is poor, 1=non-poor or otherwise. Poverty estimate
	based on consumption per adult equivalent.
Household size	Size of the household
Household size squared	Size of household squared (HSIZE* HSIZE)
Dependency ration	Dependency ratio
Literacy level	1=if household head is literate, 0=otherwise
Sex of head	1=if household head is female; 0=otherwise
Age of head	Age of the household head (years)
Head's age squared	Age of the household head squared (AGE*AGE)
Agro-ecology	1=if household live in a highland, 0=otherwise; 1=if household live
	in midland, 0=otherwise; 1=if household live in a lowland,
	0=otherwise.
Productivity	1=if household participate in productive activities;
	0=otherwise
Income source	1=if household participate in income activities other than agriculture;
	0=otherwise
Region	1=if household live in Tigray, 0=otherwise; 1=if household live in
	Amhara, 0=otherwise; 1=if household live in Oromiya, 0=otherwise;
	1=if household live in SNNP, 0=otherwise; 1=if household live in
	Others, 0=otherwise

Table 3. Definition of variables used in the estimated equations

3. RESULTS AND DISCUSSIONS

3.1. Rural poverty profiles

This section describes the basic characteristics of sample households included in the survey. A comparison is made the status of poverty across regional states and some basic demographic and

socioeconomic indicators of poor households. The intention of this section is to provide some insights on households' socioeconomic characteristics and to lay the foundations for the next econometric analysis. So, the poverty profile focuses on the poverty characteristics of various household groups. The choice of the types of groups will be driven by some ex-ante knowledge of important dimensions or bi-dimensions that are relevant for policies. The important and common method of presenting poverty data is to give poverty measures for various household groups. Whenever we measure poverty, it is important to take into account at least three different poverty indices: the head count, the poverty gap and the severity of poverty. These indices capture different aspects of poverty, presenting a more comprehensive picture.

Thus, before discussing the details of the empirical model of the determinants of rural poverty, it is important to look at the estimates of adult equivalent mean consumption and poverty indices obtained using Ethiopia's poverty line described above. The survey indicates that adult equivalent mean yearly consumption in Ethiopia is 5599.00 birr (ETB) per person. This is equivalent to about USD\$ 670.22 per person per year at the average exchange rate prevailing in 2005. Using the national poverty line, the national rural poverty rate (headcount ratio) is 0.307, while national average poverty gap index and squared poverty gap index are also high at 0.0798 and 0.0316 respectively in rural Ethiopia (table 4). The To interpret in another way, about 30.7% of the populations are classified as poor with 8% of households far off from the poverty line and 3.2% inequality among the poor in 2010/11.

Deciona	Population	Mean	Headcount	Poverty gap	Poverty
Regions	share (%)	consumption	$[P_0]$	$[P_1]$	severity
Tigray	11.1	6016	26.0	6.2	2.2
Amhara	19.5	5315	33.5	8.7	3.3
Oromiya	22.3	5747	26.3	6.9	2.6
SNNP	19.5	4926	37.7	10.0	4.4
Others	27.7	5984.5	24.0	6.4	2.4
National	100	5599	30.7	8.0	3.2

Table 4. Mean adult equivalent consumption and poverty estimates, by regions

Source: HICES survey 2010/11; computed by the author

Regional differences in poverty and welfare have also been a frequent issue in Ethiopia. Turning to table 4, we see significant disparities in mean consumption and poverty measures when the data is disaggregated into regional levels. The result indicate that highest incidence of poverty is in SNNP and the lowest in other regions. Poverty depth/gap is higher in SNNP, while the lowest incidence of poverty is observed in Other regions. The value of poverty depth shows that the cash transfers needed to lift the poor households out of poverty are 6.2%, 8.7%, 6.9%, 10%, 6.4% and 8% in Tigray, Amhara, Oromiya, SNNP, Others and national respectively. In other words, the value of poverty depth shows the gap or distance from the poverty line. About 2.2% in Tigray, 3.3% in Amhara, 2.6% in Oromiya, 4.4% in SNNP, 2.4% in Others and 3.2% for the whole country are the income inequalities among the poor.

Moreover, we can disintegrate poverty by different socio-economic characteristics of households reported in table 5.

Table 5. Poverty indexes by household characteristics, rural Ethiopia

	Headcount	Poverty gap	Poverty
Characteristics	$[P_0]$	[P ₁]	severity [P ₂]
Sex of head			
Male	32.0	8.4	3.35
Female	25.6	6.4	2.48
Agro-ecology			
Highland	27.9	7.2	2.78
Midland	30.9	7.8	3.0
Lowland	32.2	9.0	3.75
Literacy of head			
Illiterate	33.1	8.7	2.46
Literate	26.0	6.4	2.46
Household size			
Small	11.0	2.2	0.74
Medium	31.6	7.5	2.7
Large	48.8	14.5	6.3
Age of head			
15-30 young	17.3	3.7	1.3
31-64 adult	35.4	9.5	3.8
Above 65 old	26.4	6.3	2.3
Dependency ratio			
0-1(small)	25	6.2	2.4
1.1-3 (medium)	38.2	10.2	4.1
Above 3(large)	48	15.4	7.0

Source: HICES survey 2010/11; computed by the author

The incidence of poverty is high among the male headed households as 32% than female headed 25.6% are below the poverty line. As far as the acuteness of poverty of male headed households is concerned, poverty depth is 8.4%. In other words, 25% of the poverty line is needed to escape poverty. However, the intensity of poverty among male headed households equal to 0.335. In other words, about 3.4% are the inequality among the poor male headed household. Here female headed households are less poor in terms all poverty measures than male headed households.

According to the human capital models, education is an important dimension of non-homogenity of labor. The result suggests that the incidence, depth and severity of poverty are much higher among the population with no educational attainment (illiterate). The estimate in table 5 also suggests that all poverty measures gradually increases with household size. About 49% of are poor having large household size with 14.5% of poverty depth and 6.3% inequality among the poor households.

3.2. Determinants of rural poverty in Ethiopia

In this section, we estimate the determinants of rural poverty by logit model in order to find out why some households are poor and others are not. Logistic regression as another and alternative econometric technique can be used to analyze the main determinants of the poverty in terms of some qualitative variables. In particular, the purpose of the model is to determine the factors that explain the probability of being poor. The dependent variable as we already mentioned is poverty incidence, which is 1 when the household is poor, and 0 if not. Table 6 and 7 gives the estimated coefficients and marginal effects² of the binary logit model for Ethiopia and the regions. We report the marginal effect estimates for the poverty determinants equations. The statistical significance of various parameter estimates vary widely both across variables within the country and across the regions. There are many variables that have strongly significant coefficients at national level as well as across all the five regions. With only a few exceptions, the signs on the parameters are as expected, and the relative magnitudes of the parameters are also reasonable. All results and estimates of logistic regression analysis are obtained by using stata, statistical software in the present study.

From table 6 it can be clearly seen that in general, household size, the quadratic of household size, age, age square, dependency ratio, literacy, lowland agro-ecology, income, Amhara, SNNP and Other regions are the key determinants of rural poverty in Ethiopia. Characteristics that rather worsen the poverty situation of household are household size, age of household head, being illiterate, living in lowland agro-ecology, working in non-agricultural activities, and residing in Amhara region.

Table 6. Determinants of rural poverty in Ethiopia

Variables	Predicted prob.	Marginal Effects	
Household size	0.868***	2.383***	
	(0.0540)	(0.129)	
Household size squared	-0.0430***	0.958***	
-	(0.00408)	(0.00391)	

² the marginal effects are evaluated at the sample mean of the explanatory variables)

Age	0.0301***	1.031***
-	(0.0109)	(0.0112)
Age squared	-0.000257**	1.000**
	(0.000108)	(0.000108)
Dependency ratio	0.0503*	1.052*
	(0.0273)	(0.0287)
Female headed*	0.0685	1.071
	(0.0925)	(0.0990)
Illiterate head*	0.417***	1.518***
	(0.0560)	(0.0850)
Midland*	-0.0355	0.965
	(0.0739)	(0.0713)
Lowland*	0.298***	1.348***
	(0.0796)	(0.107)
Income*	0.983***	2.673***
	(0.117)	(0.314)
Engage*	0.171	1.187
	(0.123)	(0.146)
Amhara*	0.616***	1.851***
	(0.0982)	(0.182)
Oromiya*	-0.0176	0.983
	(0.108)	(0.106)
SNNP*	0.479***	1.614***
	(0.110)	(0.178)
Others*	-0.544***	0.580***
	(0.116)	(0.0671)
Constant	-5.519***	0.00401***
	(0.309)	(0.00124)
Observations	10,311	10,311

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; (*) dy/dx is for discrete change of dummy variable

Given the strong relationship between household size and consumption per adult equivalent, the estimated parameters are negative and significant. This is counterintuitive, especially in light of the descriptive information on poverty measures and household size presented in table 7. For a household who is average in all characteristics, an additional one household member increases the probability of the household's to become poor by 2.4%. The estimated coefficient on the quadratic term for household size is positive and significant, suggesting a U-shaped relationship between household size and consumption per adult equivalent.

The probability of a household being in poor tends to increase as age of household increases in rural Ethiopia. For a household who is average in all characteristics, an additional one year of the household head age increases the probability of the household's to become poor by 1%. This can be explained by asset depletion and as the age of household increases in contrary to the findings Bogale, Hagedorm, & Korf (2005). The sex of household head does have a significant effect on

rural poverty. A household who become female headed has a 1.1% probability of being in poverty higher than those who are male headed, holding other variables at their mean.

Based on the hypothesis that human capital (as measured by literacy) contributes positively to higher living standards, the illiteracy of head reflects its pivotal role in determining rural household poverty as education can lead to increased earning potential and can improve the geographical and occupational mobility of household labor.

With a view to examining the hypothesis that multiple income sources contribute to lower risks and higher income for the household. Income sources for the household other than agriculture revealed the opposite in this study. Agro-ecologically, the possibility of being poor is highly probable in lowlands than highlands.

3.3. Determinants of rural poverty across regional states of Ethiopia

Based on the observation that, the regional areas is associated with poverty, we fitted the model to data for each region separately in order to check whether the factor considered have similar impact on poverty. The statistical significance of various parameter estimates vary widely both across variables within a region and across regions. There are many variables that have strongly significant coefficients across all the five regions. With only a few exceptions, the signs on the parameters are as expected, and the relative magnitudes of the parameters are also reasonable here also.

	Tigray		Amhara	-	Oromiya	•	SNNP		Others	
Variables	Predicted	Marginal	Predicted	Marginal	Predicted	Marginal	Predicted	Marginal	Predicted	Marginal
	prob.	effects	prob.	effects	prob.	effects	prob.	effects	prob.	effects
House si	1.178***	3.247***	1.108***	3.027***	1.102***	3.011***	0.728***	2.072***	0.730***	2.075***
	(0.200)	(0.650)	(0.133)	(0.403)	(0.129)	(0.388)	(0.113)	(0.235)	(0.103)	(0.213)
House si.sq	-0.0661***	0.936***	-0.0613***	0.941***	-0.0593***	0.942***	-0.0341***	0.966***	-0.0296***	0.971***
	(0.0158)	(0.0148)	(0.0109)	(0.0103)	(0.00952)	(0.00897)	(0.00857)	(0.00828)	(0.00741)	(0.00719)
Age	0.0270	1.027	-0.00554	0.994	0.0199	1.020	0.0467**	1.048**	0.0596**	1.061**
	(0.0421)	(0.0432)	(0.0236)	(0.0234)	(0.0229)	(0.0234)	(0.0221)	(0.0231)	(0.0244)	(0.0259)
Age squared	-0.000263	1.000	9.58e-05	1.000	-0.000216	1.000	-0.000457**	1.000**	-0.000412*	1.000*
	(0.000402)	(0.000402)	(0.000231)	(0.000231)	(0.000228)	(0.000227)	(0.000221)	(0.000221)	(0.000243)	(0.000243)
Dep. ratio	0.184**	1.201**	0.0525	1.054	0.0414	1.042	0.0913	1.096	-0.00902	0.991
	(0.0899)	(0.108)	(0.0732)	(0.0771)	(0.0550)	(0.0573)	(0.0563)	(0.0617)	(0.0576)	(0.0571)
Sex*	0.558	1.747	0.169	1.184	0.0570	1.059	-0.0785	0.924	0.106	1.112
	(0.378)	(0.660)	(0.259)	(0.307)	(0.200)	(0.212)	(0.175)	(0.161)	(0.180)	(0.200)
Illiterate*	0.424**	1.527**	0.423***	1.526***	0.723***	2.061***	0.499***	1.647***	-0.000448	1.000
	(0.168)	(0.257)	(0.117)	(0.178)	(0.122)	(0.251)	(0.117)	(0.193)	(0.131)	(0.131)
Midland*	1.572	4.818	-0.0625	0.939	0.134	1.144	0.298*	1.347*	-2.021***	0.133***
	(1.261)	(6.075)	(0.121)	(0.114)	(0.162)	(0.185)	(0.155)	(0.209)	(0.451)	(0.0598)
Lowland*	0.174	1.190	-0.722***	0.486***	0.800***	2.227***	0.271	1.311	-0.0709	0.932
	(0.530)	(0.251)	(0.137)	(0.116)	(0.129)	(0.183)	(0.173)	(0.137)	(0.162)	(0.111)
Income*	-0.334	0.716	0.280	1.323	0.0971	1.102	0.903***	2.466***	1.679***	5.361***
	(0.530)	(0.380)	(0.406)	(0.537)	(0.259)	(0.285)	(0.300)	(0.740)	(0.182)	(0.976)
Engage*	0.838***	2.311***	0.339	1.403	0.743***	2.103***	-0.164	0.849	-0.364	0.695
	(0.312)	(0.722)	(0.266)	(0.374)	(0.278)	(0.585)	(0.318)	(0.270)	(0.267)	(0.186)
Constant	-6.127***	0.00218***	-5.261***	0.00519***	-6.491***	0.00152***	-4.712***	0.00899***	-5.912***	0.00271***
	(1.145)	(0.00250)	(0.743)	(0.00386)	(0.685)	(0.00104)	(0.576)	(0.00518)	(0.777)	(0.00210)
Observations	1,143	1,143	1,999	1,999	2,296	2,296	2,009	2,009	2,860	2,860

Table 7. Determinants of rural poverty in Ethiopia across regional states

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; (*) dy/dx is for discrete change of dummy variable

Confronting the regression results in table 7, we observe the following: in Tigray region, household size, dependency ratio, being female and being engaged in other productive activities increases the likelihood of being poor. The variable of dependency ratio has a statistically significant coefficient only in Tigray region, where it is probably capturing the importance of family relationships. In Amhara region, variables the increase the likelihood of being poor are household size, being illiterate and being located in lowland agro-ecology. While in Oromiya region, household size, being illiterate, being located in lowland agro-ecology and being participating in productive activities are the key variables that increase the probability of being poor. Variables that exacerbate being in poverty of the rural SNNP region households are household size, age, being illiterate, and being participate in income earning activities other than agriculture. The poverty situation of rural households who reside in Other regions of Ethiopia are exacerbated by higher number of household size, age, being located in midland agro-ecology and being participating in other income activities other than crop and animal production. The common variable that impact rural poverty in the major administrative regional states is human capital measured in terms of literacy. For household heads literacy, the results are strongest in all regions except other regions group in terms of the coefficients and statistical significance.

4. SUMMARY AND CONCLUSIONS

As a nationally representative household survey, the HICE provides a wealth of information on household well-being and living standards. However, the HICE has also significant limitations in representing the urban and rural areas ((Moges, 2013) as well as the administrative regions of the country (CSA & WB, 2015). It would be very useful to collect such data in the future that represent urban and rural areas based on their share as well as the regional states of the country to promote better analysis of the determinants of poverty and to facilitate the monitoring of poverty over time.

The analysis presented in this study seeks to extend the understanding of poverty in rural Ethiopia by descriptive analysis of a typical poverty profile and multivariate regression analysis to indicate important poverty reduction policy implications. However, in some cases regression results are inconsistent with poverty profile due to its ability to control the levels of other variables.

About 30.7% of the rural populations were poor with 8% far off from the poverty line and 3.2% inequality among the rural poor in 2010/2011. The targeting of poverty alleviation resources often based on regional administrative states poverty rate relative to the region's share to the total proportion of the poor. The fraction of poor ranges as low of 24% in other regions to a high of 38% in SNNP, while in Amhara and Oromiya regions, 33.5% and 26.6% of the rural population were poor respectively. These indicate the marked difference in the distribution of poverty across regional states suggesting the need for differential targeting across regional states.

Drawing upon the regression analysis presented here, sex, age, literacy of head, and household size, dependency ratio, lowland agro-ecology and other income sources are variables of a prospective poverty reduction strategies for rural Ethiopia. The disaggregated regional level analysis also indicate the differences of variables in determining rural poverty across these regions suggesting as a focus area in the design of programs and allocations of funds for poverty reduction in rural Ethiopia.

Overall, if Ethiopia wants to alleviate poverty, programs that are put in place should take account the socio-economic characteristics and agro-ecological locations of rural households. Moreover, taking account regional poverty disparities in the allocation of poverty alleviation funds could reduce the disproportional administrative concentration of rural poverty.

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APPENDIX

Region	Food	Non-food	Total	
Tigray	1.047	1.021	1.034	
Amhara	0.996	0.900	0.949	
Oromiya	1.010	0.951	0.981	
SNNP	0.908	0.904	0.906	
Others	1.098	1.108	1.108	

1. Regional level spatial price index in 2010/11 (national average==100)

Source: HICES survey 2010/11

Years of age Male Female 0-1 0.33 0.33 1-2 0.46 0.46 2-3 0.54 0.54 3-5 0.62 0.62 5-7 0.74 0.70 7-10 0.84 0.72 10-12 0.88 0.78 12-14 0.96 0.84 14-16 1.06 0.86 16-18 0.86 1.14 18-30 1.04 0.80 30-60 1.00 0.82 60 plus 0.84 0.74

2. Nutritional (calorie) based equivalence scales

Source: Calculated from Dercon and Krishnan (1998).