Poverty Dynamics and Vulnerability: Empirical Evidence from Smallholders in Northern Highlands of Ethiopia

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Abstract

This study is primarily intended to examine the dynamics and determinants of rural household poverty and vulnerability in Northern Highlands of Ethiopia. Besides, it compares the result of asset-based poverty measurement against the standard consumption-based approach between two purposively selected Peasant Associations (PAs) in the region. The data for this research is mainly based on the Ethiopian Household Survey (ERHS). Despite the substantial improvements in many of the measures of household's welfare (in terms of selected data on assets, education and participation in development activities) over the study period, considerable proportion of households are found poor and vulnerable in both PAs. However, the trends of both measures have been found to vary between the peasant associations. Moreover, the consumption based approach shows lower poverty incidences in shumsheha in all the survey rounds compared to Yetemen contrary to the results of the PCA approach, which appears to second previous village studies, indicating the limitation of the consumption based approach in accounting for over all changes in the wellbeing of households. The study also compared the different determining factors of poverty and vulnerability in the two PAs and important implications drawn from the results are discussed.

Key Words: Poverty Dynamics, Vulnerability, Rural Ethiopia

JEL: I32, R20

1. Introduction

In literature, poverty has mainly been measured by employing income or consumption expenditure as proxy for the living standard of an individual or a household vis-à-vis to a certain minimal accepted threshold. This approach has been considered as the standard approach and has been effective in guiding policy action and raising public concern for poverty (Booysen, Berg, Burger, Maltitz, & Rand, 2005; Brandolini, Magri, & Smeeding, 2009 and Brandolini, Magri, & Smeeding, 2010). Yet, it is not without shortcomings. First, income fails to represent the full amount of available resources, as individuals can also rely on real and financial assets to cope with the needs of everyday life and to face unexpected events. A second, more radical, critique of the income inadequacy approach is that income is only a means and not an end, and cannot account for the multiple dimensions of human well-being (Brandolini et al., 2010). Moreover, based on flow variables and informant recall, income-based poverty indicators are more prone to measurement error than are indicators based on visible assets such as land or livestock (Wooldridge, 2002).

The measurement of poverty has been broadened over the years to incorporate different aspects of human wellbeing besides the conventional approach to the measurement of poverty: the money-metric or income/expenditure based approach. These include a number of alternative approaches such as, for

instance, those that employ various other socio-economic indicators to measure poverty. Of these alternative or so-called multidimensional approaches to the measurement of poverty, the asset index approach applied to data from demographic and health survey has gained increasing popularity in recent years (Filmer & Pritchett, 1998; Sahn & Stifel, 2000; World Bank, 2012 and Booysen et al., 2005).

In many of the developing world, policy interventions are generally steered by the fundamental goal of poverty reduction. Typically these policies are often based more on ex post poverty incidences rather than ex ante predictions. A household's current poverty may be a bad guide to its future prospects explains the recent emphasis in the poverty literature on vulnerability, a forward-looking poverty concept (World Bank, 2001).

As one of the war-torn and drought ravaged countries, pervasive poverty and vulnerability are widespread in Ethiopia. This has attracted several studies on poverty and food insecurity in the country mainly based on cross sectional data over the past couple of decades. Most of the studies done applied the conventional income-based measurements of poverty. Some of the studies in this line include HAGOS & HOLDEN (2003), KEDIR & MCKAY (2003), ISLAM & SHIMELES (2007), BIGSTEN & SHIMELES (2008) & (DERCON et al., 2011). However, these studies do share the shortcomings of the standard poverty measurement approach. One notable exception in this regards is Liverpool & Nelson (2010). This paper compares asset-based versus consumption-based poverty measurements using panel data from rural Ethiopia for six rounds from 1994 to 2004 using a regression based approach. The aim of this paper is to analyze the trends and determinants of poverty in two purposively selected Peasant Associations (PAs) in northern highlands of Ethiopia for four rounds from 1994 and 2010 using an asset-based approach and comparing it with the results of the consumption based approach. This paper differs from earlier studies in three important aspects. First, it adds into the panel data an additional recent survey round for 2010. Second, it uses Principal Component Analysis (PCA) to develop the asset index as opposed to regression based approach done by Liverpool & Nelson (2010). And, third, it supplements the results of the ex post poverty measurements by an ex ante predictions of poverty and quests to unravel the determining factors behind the trend.

The rest of the paper is organized as follows. It starts with a brief description of the data used and the methodological approach applied. It then presents the description and the expected signs of the explanatory variables employed in the regression models followed by descriptive statistics and econometric analysis of the dynamics and determinants of poverty and vulnerability in Northern highlands of Ethiopia. Finally, the paper concludes.

2. Data and Research Methods

2.1 Data

The data for this research is mainly based on the Ethiopian Rural Household Survey (ERHS), a rich panel data set conducted by Addis Ababa University in collaboration with IFPRI and CSAE (University of Oxford) since 1994. Besides, a primary data was collected tracing the panel households of ERHS in two Peasant Associations (PAs) of Northern Ethiopia in 2010. This study hence constituted two PAs in northern highlands of Ethiopia namely Yetmen and Shumsheha. Peasant association has been the smallest unit of administration in the former regime and constitutes of roughly 1000 households. Shumsheha represents the semi-arid, insufficient rainfall, limited arable land, cereal growing and vulnerable parts of the region. On the other hand, Yetmen symbolizes the high rainfall, fertile arable land, grain dominated and relatively rich parts of region. Shumsheha and Yetmen constitute 10 and 8 villages under them respectively. The sample size is 209, in which 61 of them are from Yetmen and 148 from Shumsheha. The attrition rate is only 13.88 % in 16 years panel data, which means 0.93 % attrition rate per year. The sample is not representative of the northern highlands of Ethiopia but it could give a good agro-ecological representation of the northern highlands of the country.

2.2 Research Methods

The research methods used in this article has been treated in to three sections. The first part deals with the measurement of poverty dynamics in the region using both consumption-based and asset-based approaches. Second, we use a three steps Feasible Generalized Least Squares (FGLS) to analyze the vulnerability of rural households to poverty and, finally, fixed effects instrumental variable (FEIV) and multinomial logit models (MNL) are employed for assessing the determining factors for poverty and vulnerability to poverty. A brief description is provided below on the respective models employed in this study.

2.2.1 Poverty Dynamics and Decomposition

A) Poverty Dynamics

Given the panel data described in the preceding section, we attempt to compare consumption-based approach of poverty estimations vis-à-vis asset based approach as given below.

i) Consumption-based Approach

In this approach, households are deemed to be poor if their real monthly consumption expenditure per adult equivalent is less than 57.6 Ethiopian Birr (ETB) or 30 US dollars in 1994 Purchasing Power

Parity (PPP) prices. To put it precisely, our poverty threshold is 1 USD per adult per day in 1994 PPP prices, which is equivalent to 1.92 ETB per adult per day. Using this cut off point, we study the trends of poverty incidence over the panel years in absolute terms.

ii) Asset-based Approach

The alternative approach is to develop relative poverty indices for the panel years using Principal Component Approach (PCA). PCA is a mathematical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. Variables that are correlated with one another, possibly because they are measuring the same construct are reduced to a smaller number of principle components.

In developing the index, variables related to the factors that we explicitly considered as factors of poverty are taken to develop the index driven by previous literature in the area. Accordingly, several variables representing different dimensions of poverty are included given limitations of data. These factors falls into one of the forms of capital: human, natural, physical, social and financial capital. Thus, our prinicipal component is a function of all of these factors as follows:

$$PC = f(\text{natural capital}, \text{physical capital}, \text{human capital}, \text{social capital \& financial capital}) \ldots \quad (1)$$

A principal component is a linear combination of optimally-weighted observed variables. Accordingly, principle component analysis is used to reduce the variables to one composite index, poverty index. In the course of performing a principal component analysis, it is possible to calculate a score for each variable on a given principal component. Below is the general form for the formula to compute scores on the first component extracted in a principal component analysis.

$$PC_1 = \theta_{11}(X_1) + \theta_{12}(X_2) + \cdots + \theta_{1p}(X_p) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots .. (2)$$

Where PC_1 represents the score on principal component 1 (the first component extracted), θ_{1p} is the regression coefficient (or weight) for observed variable p, as used in creating principal component 1 and X_p refers to the value of observed variable p.

The regression weights are determined by using a special type of equation called an eigen equation. The weights produced by these eigen equations are optimal weights in the sense that, for a given set of data, no other set of weights could produce a set of components that are more successful in accounting for variance in the observed variables. The weights are created so as to satisfy a principle of least squares similar (but not identical) to the principle of least squares used in multiple regression.

Similarly, principal components are extracted equal to the number of observed variables being analyzed. However, in most analyses, only the first few components account for meaningful amounts of variance, so only these first few components are retained, interpreted, and used in subsequent analyses (such as in multiple regression analyses). When the eigen value is greater than one, those principal components are extracted. The first component extracted in a principal component analysis accounts for a maximal amount of total variance in the observed variables. Once the first component is identified, it is possible to calculate the vulnerability to poverty index for each household as follows:

$$PI_j = \sum F_i \left[{(X_{ji} - \mu_i)}/{\sigma_i} \right] \quad \ldots\ldots\ldots (3)$$

Where PI_j is the poverty index for household (peasant association) j, F_i is the weight of the ith variable in the PCA represented by the factor score, X_{ji} refers to the value of ith variable for the jth household (PA) standardized by the mean, μ_i, and standard deviations, σ_i, of variable i from over all peasant associations (households). By construction, the mean value of the poverty index is zero. To facilitate the index's comparability over the rounds, we employ the innovative approach of Cavatassi, Davis, & Lipper (2004). Accordingly, we pooled the data for the four survey rounds and estimate the principal components over the combined data. The resulting weight is then applied to the variable values for each round of the data using equation 3 above.

B) Poverty Decomposition

The spells and components approach are the most widely used methods of poverty dynamics and decomposition. In this paper, we use both approaches but emphasize on the latter approach as it has advantage over the former in terms of capturing information about the position of household's consumption expenditure relative to the poverty threshold. We start with a brief description of components approach, which was developed by RODGERS & RODGERS (1993) and used by JALAN & RAVALLION (2000). Jalan and Ravallion decomposed household poverty in to chronic and transient components using panel data. A household is in chronic poverty when its inter-temporal mean consumption is below the poverty line. The mathematical presentation of the method is presented below.

The contribution of household i to total poverty is defined as:

$$p_i = p(y_{i1}, y_{i2}, \ldots, y_{iT}) \quad \ldots\ldots\ldots (4)$$

Where y_{it} are the consumption expenditures of household i at time t, and there are T times in which it is measured and p_i is some well-defined poverty measure. We use the familiar Foster-Greer-Thorbecke (FGT) measure because of its additive decomposability property. Thus, total household poverty over the period is measured as the inter-temporal mean of the poverty measure.

$$\bar{p}_i = \frac{1}{T}\sum p_i \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (5)$$

Where, $\bar{p}_i$ is the mean of the FGT measure of the total poverty and T is the number of years. Hence, chronic poverty is measured by

$$P_i^* = \frac{1}{n}\sum_{i=1}^{m^*}\left(\frac{z-\bar{y}_i}{z}\right)^{\alpha} \qquad if\ z > \bar{y}_i;\ 0\ otherwise\ \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (6)$$

Where, Z is the poverty line, $\bar{y}_i$ is the mean consumption expenditure of household i, m^* is the number of households below the poverty line and n is the number of households in the sample. α is a positive parameter, which gives more weight for the poor when it increases. The most common values of α are 0, 1 and 2.

Transient poverty ($\tilde{p}_i$) is the difference of total poverty ($\bar{p}_i$) and chronic poverty (P_i^*). Hence, once chronic poverty is measured, it would be simple to find transient poverty as:

$$\tilde{p}_i = \ \bar{p}_i - p_i^* \ \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . (7)$$

The components approach is complimented by the spells approach for explaining the nature of poverty dynamics in the region. The spell approach involves identifying the poverty status of the household in the different time periods under investigation. A tool used for this type of analysis is the transition matrix. It is constructed by classifying the households' incomes in to different income groups. This matrix provides information on the proportion or number that move from one state of poverty to another. The rows of the matrix add up to unity or 100% (ODURU, AGGGREY-FYNN, BANNI, CROPPENSTEDT, & AGYAPONG, 2003). Transition matrices also give information on transient and chronic poverty based on the households' length or spells in poverty. The transient poor in this approach is defined as those households that have income or consumption above the designated poverty line in at least one period out of the periods the welfare indicator is measured. The chronic poor have their welfare measure below the poverty line in all the periods (MCCULLOCH & BAULCH, 2002). However, in this paper we define households to be in chronic poverty if they are under poverty line in half or more of the survey rounds following FOSTER (2007). Once the transition matrix is developed, it is easy to note poverty dynamics by using the Shorrocks mobility index. The Shorrocks Mobility Index is presented as follows.

The mobility index, M, for a transition matrix, P, is give as:

$$M(P) = \frac{n - tracep}{n-1} \quad \ldots (8)$$

Where, trace P is the trace of the transition matrix P, n is the number of states, for example quartiles or deciles. The index is normalized to take a value between 0 and 1 by dividing it by $\frac{n}{n-1}$. The closer the Shorrocks mobility index to 1 implies the existence of higher mobility.

2.2.2 Determinants of Poverty

An analysis of poverty will not be complete without explaining why people are poor and remain poor over time. Hence, an appropriate approach would be to analyze the impacts of household characteristics, village level factors, and policy related variables on the welfare of individuals or households using regression-based models at least at micro level. Two types of models are used for this purpose.

The first model we employed for this purpose is the fixed effects instrumental variable (FE IV). It has advantage over the random effects model as it controls unobserved heterogeneities among households. It is formulated as follows:

$$lny_{it} = d_{it}'\sigma + x_{it}'\beta + \tau_{it}'\theta + \alpha_i + u_{it} \quad \ldots (9)$$

$$d_{it} = f(x_{it}, z_{it}, \tau_{it}, v_{it}) \quad \ldots (10)$$

$$i = 1,2, \ldots, N; t = 1,2, \ldots, T$$

Equation 9 is original fixed effects model using log of real consumption expenditure per adult equivalent, lny_{it}, or the asset poverty index as a dependent variable against a set of identified endogenous variables, d_{it}, exogenous variables, x_{it}, period dummies, τ_{it}, and unobserved household fixed effects, α_i. In equation 10, we regress the endogenous variables against the rest of the variables in the system in addition to set of instrumental variables, z_{it}, to estimate their predicted values. The predicted values of the endogenous variable and their lagged values are used as instruments in equation 9. u_{it} and v_{it} are idiosyncratic error terms in the respected equations.

The second model used in this study is the Multinomial Logit model for analyzing the factors affecting the probability that a household is in chronic poverty as opposed to transient poverty or being non-poor. One of the main advantages of such an approach is ease of specification (GLEWWE & HALL, 1995; GROOTAERT & KANBUR, 1995). However, the main drawback is that it imposes the property of Independence of Irrelevant Alternatives (IIA). Once the data fulfill this property then the model will be appropriate to use.

In our model, the regressand takes the values of 0, 1, or 2 depending on whether the household was respectively never poor, poor in one of the rounds, or poor in 2 or more of the rounds. The multinomial logit regression gives the coefficient values for two groups relative to the third omitted group (here the never poor). However, the results are more easily interpreted in terms of the marginal effects and their significance. These show the impact of each explanatory variable on the likelihood of a household being in each one of the three groups.

In this paper, we primarily use household consumption expenditure as a welfare measure for computing poverty. But as in the case of any other welfare indicator, the poverty level computed using consumption expenditure can be contaminated by measurement errors. However, using the ERHS panel data BIGSTEN & SHIMELES (2008) proved that consumption based mobility estimates are not seriously distorted by measurement error.

The dependent variable of the model can take one of three discrete values indicating the poverty status of a household (non-poor, transient poor and chronically poor). The probability (P_{ij}) that a household *i* is in a particular poverty state *j* is modeled as a function of explanatory variables X_i as follows:

$$P_{ij} = Prob(Poverty = j) = \frac{e^{X_i' \beta_j}}{1 + \sum_{k=1}^{2} e^{X_i' \beta_k}} \quad for\ j = 0,1,2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Where, β_j represents a vector of coefficients, β_0 is set to 0**,** and *j* can take the values 0 (non-poor), 1 (transient poor) and 2 (chronically poor). The non-poor state (j = 0) is used as the base category in the regressions based on the equation above.

2.2.3 Vulnerability to Poverty

The other major inquisition of this article is to supplement the results of poverty incidences with the ex-ante probability of households being poor using three steps feasible generalized least squares. Linking poverty studies with that of vulnerability to poverty serves as a tool for poverty reduction strategies to attain their goals better. The approach is rooted in the pioneer work of CHAUDHURI, JALAN, & SURYAHADI (2002). Assuming consumption expenditure to follow a log-normal distribution and the consumption of household i in period t is determined by a set of variables X_i.

$$\ln c_i = \beta_0 + \beta_1 X_i + e_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

And, the variance of the unexplained part of households' consumption e_i is also assumed to be a function of the same explanatory variables used in model 12 as follows:

$$\sigma_{ei}^2 = \theta_0 + \theta_1 X_i + \eta_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

Then, we estimate equations (12) and (13) using three-step feasible generalized least squares (FGLS) suggested by AMEMIYA (1977) cited in (CHAUDHURI et al., 2002). Then, using consistent and asymptotically efficient estimators $\hat{\beta}$ and $\hat{\theta}$, which we obtained from equations 12 and 13, we derive:

$$\hat{E}(lnc_i/X) = \hat{\beta}_0 + \hat{\beta}_1 X_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (14)$$

$$\hat{V}(lnc_i/X) = \hat{\sigma}_{ei}^2 = \hat{\theta}_0 + \hat{\theta}_0 X_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (15)$$

Hence, using the estimated expected mean and variance of log consumption in equation (14) and (15) above respectively, the estimated vulnerability to poverty is given as

$$\hat{v}_i = \hat{P}(lnc_i < lnz|X,Z) = \Phi\left(\frac{lnz - ln\hat{c}_i}{\sqrt{\hat{\sigma}_i^2}}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (16)$$

Where $\Phi(.)$ denotes the cumulative density of the standard normal distribution function. The estimated values of the vulnerability to poverty index, $\hat{v}_i$, ranges from 0 to 1. Finally, the vulnerability status of households is evaluated using the standard vulnerability threshold of 0.5.

In addition to this, the determining factors of vulnerability to poverty are assessed using the fixed effects IV model as in section 2.2.2 except that the dependent variable is now the vulnerability to poverty index. The vulnerability indices found from the results of the above model are regressed against household characteristics, village characteristics and policy related variables.

3 Definition and Hypothesis of Variables

Based on theoretical expositions and previous empirical studies, the following explanatory variables are hypothesized to influence the welfare of households as follows. Annual real consumption expenditure per adult equivalent, asset-based poverty index and vulnerability to poverty index are the dependent variables in the fixed effects instrumental variable regression models while a categorical variable of being chronic poor, transient poor and non-poor in the multinomial logit model.

Sex of household head: the gender of household heads is vital in the context of rural Ethiopia since access to vital resources and decision making capabilities are highly biased against female household heads. In addition to this, female headed households are usually formed in rural Ethiopia when the male counterpart dies or looses functionality due to old age. In our analysis, it is included as a dummy regressor whereby male-headed households are given 1; otherwise 0. Hence, this variable is expected to be negatively correlated with poverty and vulnerability of households.

Age and Age Squared of the household head: Age and age squared (a proxy for experience or old age) are expected to positively and negatively associate with welfare of households in the respective order as aged household heads face a decline in labour supply and decision making capability.

Literacy of the household head: It is a proxy for the education level of the household head and is hypothesized to have a positive impact on the welfare of households as measured by real consumption expenditure per adult equivalent.

Household size: Its impact on the welfare of households is mixed as shown in previous empirical literatures. It is expected to affect the dependent variable either ways depending on the demographic composition of the household. Its effect will be positive if larger household size means more working force (hence less dependency ratio) and negative if it implies higher dependency ratio.

Monetary value of livestock asset: It is an important asset for mixed farming smallholders. It is expected to be positively associated with the welfare of households as it serves as source of draft power in the predominantly oxen-plough technology, source of income from their products, their dung for cooking and as manure, and as a hedge against risk.

Number of oxen owned: In Ethiopia, the plough technology is mainly driven by oxen and hence oxen have additional purpose of serving as the primary draft power source in rural Ethiopia. The possession of more oxen therefore guarantees the timely execution of agricultural activities thereby improving household welfare. Besides, oxen also derive revenue for households when rented to other households during farming pick times.

Number of ploughs owned: Ploughs are crucial productive assets and the possession of ploughs would enable households to plough their agricultural land in time and hence is hypothesized to contribute positively to the welfare of households.

Engagement in off-farm activities: It is one of the dummy regressors and is expected to positively impact the welfare of the households. As the data show, a modest figure of about 58 percent of the households participates in one or more of off-farm activities.

Size of cultivated land: refers to the size of the land the household owns and actually uses for cultivation in hectares. It is the most valuable asset for small holders and is hypothesized to impact the welfare of households positively.

Proportion (amount) of fertile land cultivated: In a society where the land distribution is not severely affected by inequality (in a case where it is more egalitarian), it is the proportion of fertile land they cultivate that partly determines their production and hence welfare status. In our questionnaire, respondents were asked to rate the fertility of their different plots of land as fertile, semi-fertile and

non-fertile based on their cumulative experience in farming and their answers have been aggregated weighted by the size of each plots of the land they cultivate. This variable is expected to positively influence welfare of households.

Number of plots: It is a proxy for land fragmentation and could influence the dependent variable either ways as witnessed in previous empirical works. In literature, arguments on the impacts of land fragmentation fall into two lines of factors: the demand side factors and supply side factors (BENTLEY, 1987 & SUNDQVIST & ANDERSSON, 2006). The latter merely treats land fragmentation as an exogenous imposition on smallholders hence detrimental on productivity as it hinders mechanization of agriculture and creates inefficiency in the allocation of labour and capital. The arguments on the demand side factors assert that farmers voluntarily choose beneficial level of land fragmentation as it helps them avoid labour bottlenecks, spreads risks of crop failure, allows crop rotation and fallow and promotes use of more fertilizers. Therefore, the ultimate effect of land fragmentation depends on which one outweighs from the two factors mentioned above. If the demand side factor outweighs, the impact on welfare of households will be positive, otherwise negative. Nearly four decades has passed after the first nation-wide land distribution was held in 1974. The most recent land distribution has been carried out in Amhara region (where our sample is drawn from) in 1996 with a primary criterion of household size compromising for fertility of the soil.

Number of crops grown: This regressor is included as a proxy for crop diversification. It is hypothesized to positively impact households' welfare as it spreads risks of crop failure and creates opportunities to use different soil conditions to their best advantage.

Membership for extension service (number of contacts with extension agents): This variable captures the effect of government's extension program on the welfare of rural smallholders and may take a binary or discrete form depending on its explanatory power in the different models employed in this article. When it is a dummy, it takes 1 if the household is a member of extension service and 0 otherwise. It is expected to have a positive impact on households' welfare.

If transfers received: It takes 1 if the household received transfers in the last 12 months and 0 otherwise. It captures both private transfers (remittances) and government direct transfers in both forms (cash and in kind). Empirical evidences show mixed impacts of transfers on the welfare of households (KANBUR, KEEN, & TUOMALA, 1994; QUARTEY, 2006 and MANGIAVACCHI & VERME, 2011). Transfers are advantageous in helping households get out of deprivation in the short run but their long run impacts have been widely questioned. Ample evidences are found that shows the negative impact of transfers by creating dependency syndrome and hence making household decrease labour supply. Thus, our expectation is that the impact of transfers might go either ways.

Credit: It is a dummy variable taking a value of 1 for those that take credit in the last 12 months and 0 otherwise. It is expected to be positively associated with the welfare of smallholders.

Membership in saving groups 'equb': It is also a dummy variable taking 1 for members of 'equb' and 0 for non-members. Saving helps households to accumulate more money for further investment and as provident in times of needs hence is hypothesized to have positive impact on households' welfare.

Household assets: refers, in this article, to the monetary value of assets used either in the house or in farming excluding livestock, land, house and other major assets of the household. More household asset is expected to positively influence the welfare of households to poverty as it serves as coping mechanism in the time of risk.

If households store cereals: It is a dummy variable representing if households have stored any amount of cereals in the last twelve months or not. Stored cereals are used as emergency buffer in time of risk to poverty and are hypothesized to reduce the risk of households falling into poverty.

Village dummy: It takes a value of 1 if the household is in Yetmen, 0 otherwise. This regressor is used only in the MNL model and is expected to be associated with transient and persistence poverty negatively as households in Yetmen are in average more affluent than that of Shumsheha.

4 Results and Discussion

4.1 Descriptive Statistics

Table 1 describes the change in household's welfare in terms of selected data on assets, education and participation in development activities. There are improvements in most of these measures, even if some outcomes remain low.

Household size has slightly increased in both Yetmen and Shumsheha. Oxen is a crucial asset for Ethiopian small holders as they depend on oxen-plough technology and the outcome is a dramatic rise in the percentage of households owning oxen in the 16 years since 1994. Similarly, the lack of access to oxen by households when they are most needed has decreased sharply and the cumulative livestock asset of households has exhibited a large growth.

Results of previous empirical studies show that education of a household head is positively correlated to the household's welfare. In our sample, the percentage of literate household heads declined while school enrollment for boys and girls increased remarkably in both villages implying that efforts of providing education access to adults remained low while the future seems promising if school dropouts are taken care of.

Table 1: Some descriptive statistics on household characteristics: 1994 - 2010

Household Characteristics	Yetmen		Shumsheha	
	1994	2010	1994	2010
Household size (person per household)	4.7	5.2	4.3	4.5
Households owning oxen (%)	5.45	75.5	5.6	45.6
Households who could not get oxen at the right time (%)	36.5	1.85	23.97	18.25
Livestock Asset (Birr)	2423	8607	1038	5547
Literacy of the household head (%)	54	44	34	29
School Enrollment: Boys aged 7-14 enrolled (%)	16.7	65.6	15.9	69.2
Girls aged 7-14 enrolled (%)	28	85.2	7.5	87
Agriculture extension service members (%)	0	13.5	0	51.6
Households who received transfers (%)	0	45	97	33
Households who stored cereals (%)	94	67	83	57

Source: Calculated from ERHS (1994) and primary survey (2010)

Though agricultural extension service started in Ethiopia in the mid of the 20th century, they were far from being stable and successful in transforming the livelihood of small holders due to numerous impeding factors[1]. The incumbent government launched a new extension system in 1995 after a brief period of discontinuity since the fall of the Derg regime in 1991. This system was able to attract some farmers in both villages since then but its significance is noticeable in Shumsheha than Yetmen.

Household receiving transfers increased from nil to 45% in Yetmen compared to Shumsheha, which exhibited a decline in 2010. However, Shumsheha have a predominant position on the average compared to Yetmen. The main reason is that Shumsheha is one of the areas severely hit by the 1985 famine in Ethiopia and has been considered vulnerable village since then. As a result it has been a beneficiary of safety net programs by the government and aid by other non-governmental organizations particularly in the aftermath of the famine to rehabilitate hard hit households. Finally, the percentage of households that store cereals has declined over the study period in both villages.

4.2 Changes in Relative Status of Welfare Group

Previous poverty studies have been most focused on the use of the standard classifications of poor and non-poor. Instead of this practice, which focuses on a certain cut off point, a closer analysis on the behavior of the different consumption groups is immense importance and has become influential for policy analysis. We have classified the welfare status of households using real consumption

[1] It would be advisable to read a paper by GEBREMEDHIN, HOEKSTRA, & TEGEGNE (2006) on the evolution of extension system in Ethiopia.

expenditure per adult equivalent based on 1994 PPP prices. Accordingly, households in the sample are divided into five equal groups, quintile, based on their real monthly consumption expenditure per adult equivalent values. The transition of households from their respective quintiles in 1994 to different consumption groups in 2010 is depicted in table below.

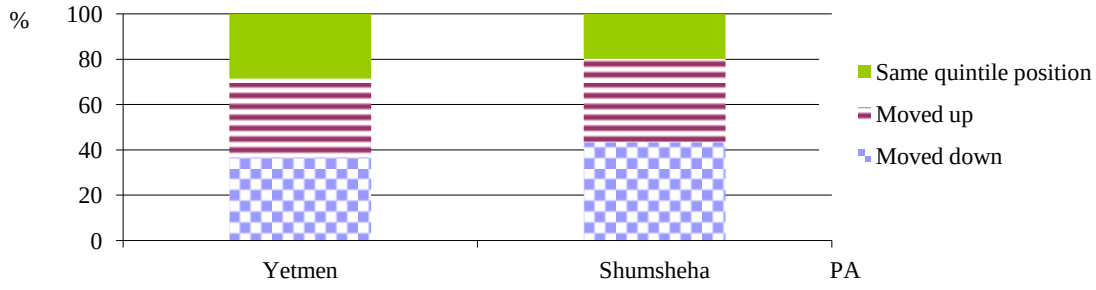
Table 2: Transition matrix for quintiles of real consumption expenditure between 1994 and 2010

		2010 real monthly consumption expenditure per adult quintile (1 = lowest to 5 = highest; values are percentage of households)					
		1	2	3	4	5	Total
1994 real monthly consumption expenditure per adult equivlanet quintile	1	19	12	22	16	31	100
	2	32	13	19	13	23	100
	3	10	22	19	23	26	100
	4	20	30	17	23	10	100
	5	19	23	23	25	10	100
	Total	100	100	100	100	100	100

Source: Calculated from ERHS (1994) and primary survey (2010)

For example, among those households in the third quintile (the middle 20 percent) in 1994, about 32 percent moved to lower quintiles (that is, 10 percent to the first quintile and 22 percent to the second quintile), 19 percent remained in the same quintile and the rest majority 49 percent moved to a higher quintile (23 and 26 percent to the fourth and fifth quintile respectively). Overall, in both PAs 44.2 percent of household moved to a lower quintile, 16.8 percent remained in the same quintile and the remaining 39 percent moved to a relatively higher consumption groups. On the other hand, using transition matrices, as reported in graph 1, the trend has been similar for the two villages over the panel period (1994-2010). The lion share is taken by households that moved to lower consumption groups followed by those who moved to upper quintiles and remained in the same groups respectively in both villages. Over all, both PAs have exhibited higher mobility as shown by the Shorrock's mobility index of 0.71 and 0.80 in Yetmen and Shumsheha respectively.

Graph 1: Movement of households across quintile groups by PA (1994 – 2010)



Source: Calculated from ERHS (1994) and primary survey (2010)

4.3 The Foster-Greer-Thorbecke Indices

The Foster-Greer-Thorbecke (FGT) indices are the most widely used poverty indices that comprises of three measures: the incidence of poverty, also called the headcount index; the aggregate poverty gap (poverty depth); and the squared poverty gap (poverty severity). Poverty incidence refers to the percentage of people living below a minimum threshold as measured by local living standards. The poverty gap captures the mean aggregate consumption shortfall relative to the poverty line across the whole population. In other words, it estimates the total resources needed to bring all the poor to the level of the poverty line. Poverty severity is a measure of relative deprivation among the poor, i.e., it takes into account not only the distance separating the poor from the minimum threshold, but also the inequality among the poor. It places a higher weight on those households further away from the poverty line.

In this paper, an international poverty line of 1 USD per adult-day is used at purchasing power parity (about 1.92 Ethiopian Birr using 1994 base year prices according to World Bank, International Comparison Program Database)[2]. To make prices across PA and time comparable, we used the Food Price Indices (FPI) of Yetmen as bench mark and deflated the FPI of Shumsheha for all years with an implicit assumption that food preferences of households remain the same across the panel rounds. Using this poverty line and the data on real monthly consumption expenditure per adult equivalent, the three FGT poverty indices have been computed for shumsheha and Yetmen for the four panel rounds.

Table 3: Foster-Greer-Thorbecke (FGT) Indices and Other Descriptive Statistics

FGT Indices	PA	1994	1999	2004	2010
Head Count Index (%):	Yetmen	32.07	46.30	15.38	32.00
	Shumsheha	26.32	14.75	12.28	40.17
Poverty Gap (%):	Yetmen	3.80	5.08	1.60	2.09
	Shumsheha	2.51	0.94	0.82	3.81
Squared Poverty Gap (%):	Yetmen	1.11	0.80	0.21	0.22
	Shumsheha	0.38	0.21	0.08	0.56
Mean monthly consumption expenditure per adult (Birr):	Yetmen	113.42	74.20	127.25	86.80
	Shumsheha	116.69	129.74	159.58	124.13
Median monthly consumption expenditure per adult (Birr):	Yetmen	84.87	59.31	122.34	72.90
	Shumsheha	79.60	99.41	111.86	66.39
Gini Coefficient of Inequality (%):	Yetmen	38.92	33.27	29.83	28.99
	Shumsheha	42.17	34.62	39.39	55.07

Source: Calculated from ERHS (1994, 1999 and 2004) and primary survey (2010)

[2] 1 US dollar per adult/day is preferred in this article as poverty threshold since our estimation is based on 1994 base prices. The exchange rate of 1 USD was 5 Ethiopian Birr (ETB) during the same year (DERCON & KRISHNAN, 1998).

The results indicate higher incidence of poverty, poverty gap and severity in Yetmen compared to Shumsheha in all the survey rounds except for the last round. This result is against our expectations as Shumsheha is considered as one of the most vulnerable PAs in Ethiopia in previous researches while Yetmen as a relatively better off PA in the northern highlands of Ethiopia (Webb and von Braun (1994) cited in DERCON & Krishnan (1998) and Bevan & Pankhurst (1996)); hence calling for an alternative approach of assessing poverty. Over the panel, Shumsheha has shown a consistent decline in poverty incidence until 2004 but a dramatic rise in 2010. The trend for Yetmen has been fluctuating throughout. Both mean and median real monthly consumption expenditure per adult equivalent fluctuated for Yetmen across the panel years. However, both measures have been consistently rising for Shumsheha in 1999 and 2004 before a substantial decline in the last rouond. When it come to consumption expenditure inequality, higher inequality is observed throught the panel years in Shumsheha compared to households in Yetmen as measured by the Gini-coefficient of inequality. The trend has a consistent decline for Yetmen but a considerable decline in Gini-coefficient in 1999 and a consistent rise afterwards for Shumsheha. In general, the uniform rise in all the poverty indices for both PAs over the last 5 years of the study could be partly associated with the rise in food prices in the country since 2006 and partly due to the collection of the 2010 data after six months of the 2009 harvest and appears to be supported by Dercon et al (2011). They found a fall in median and mean consumption between 2004 and 2009 using the ERHS data for 15 villages in rural Ethiopia.

4.4 Decomposition of poverty

In empirical work, decomposing inter-temporal poverty has been recognized as an important input for policies targeting on poverty. The respective policy responses for chronically poor section of the society differ from that of the transient one. Following the components approach, we found that there is higher proportion of transient poverty in terms of headcount, poverty depth and severity as compared to the proportion of households under chronic poverty similarly in both PAs. Transient poverty is a dominant feature of the poor in both PAs.

Table 4: Poverty Decomposition in Yetmen and Shumsheha (1994-2010)

Poverty Type (percentages)	Head Count (P0)		Poverty Gap (P1)		Squared Poverty Gap(P2)	
	Yetmen	Shumsheha	Yetmen	Shumsheha	Yetmen	Shumsheha
Chronic Poor	0.122	0.051	0.021	0.009	0.001	0.002
Transient Poor	0.189	0.197	0.069	0.057	0.038	0.024
Total Poor	0.311	0.247	0.090	0.066	0.039	0.026
Chronic/Total	0.608	0.798	0.767	0.864	0.974	0.923

Source: Calculated from ERHS (1994, 1999 and 2004) and primary survey (2010)

On the other hand, table 5 below provides us good information about the movement of households over the panel years vis-à-vis to the poverty threshold, which is 1 USD per adult/day in 1999 PPP prices in our case. Based on Foster (2007), which considers households that are poor half or more of the times as chronic poor, we found that dominant proportion of households in both PAs are under transient poverty followed by persistently poor in Yetmen and non-poor households in Shumsheha . Nearly 39 percent of households in Yetmen and over 45 percent in Shumsheha have been under transient poverty. The respective proportions of non-poor and chronic-poor households are 26.53 percent and 34.69 percent for Yetmen whereas 31.31 percent and 23.23 percent for Shumsheha.

Table 5: Poverty episodes 1994 to 2010 (Based on 4 rounds)

Poverty Status	Yetmen (% of households)	Shumsheha (% of households)
Never Poor	26.53	31.31
Poor once	38.78	45.45
Poor in 2 out of 4 rounds	22.45	18.18
Poor 3 out of 4 rounds	8.16	3.03
Poor in all rounds	4.08	2.02
Total	100.00	100.00

Source: Calculated from ERHS (1994, 1999 and 2004) and primary survey (2010)

4.5 Asset-based Versus Consumption-based poverty Estimates

PCA does not provide an easy way to generate a best-fit model to develop an index. The approach requires trial and error and continual scrutiny of variables to determine which combination yields the most logical results. The primary strategy is to systematically screen the list of variables that could be used in the model without compromising the explanatory power of the index. Despite the limitations of data, we have tried to accommodate different dimensions of poverty in the selection of variables based on a handful of literature in the area such as Filmer & Pritchett (1998), Sahn & Stifel (2000), Booysen et al. (2005) and Liverpool & Nelson (2010) .Accordingly, after successive trial and error, we eventually selected six variables for developing the index based on their strong correlation with our poverty indicator benchmark, real monthly consumption expenditure per adult equivalent, and a compromise to capture different dimensions of poverty. The six factors are namely number of ploughs owned, number of oxen owned, number of adult labor, livestock asset (excluding oxen), size of cultivated land and number of crops grown for final formulation of the index for the sample households in both PAs.

The PCA has been conducted at household level. All the six factors finally selected to develop the asset-based poverty index have their factor coefficients well above 0.300 to be screened following

Burt-Banks formula. The values of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.73, indicating that the models is commendable.

The results of the PCA also indicate that the first factor explains 43.76 percent of the total variation in the data; the second factor explains only about 17.37 percent of the variance. The first component loading coefficients, which are the most critical outputs for determining the composition of the asset-based poverty index, are shown in the component matrix below.

Table 6: Component matrix of the PCA analysis for the combined 1994 and 2009 data

Factors at household level	Mean	Standard Deviation	First component loadings
Size of cultivated land (ha)	1.411	0.948	0.595
Number of oxen owned per household	0.838	0.972	0.684
Number of ploughs owned	1.564	1.944	0.687
Number of Adult labor per household	2.506	1.409	0.583
Value of Livestock asset (Birr)	3050.618	4302.910	0.811
Number of crops cultivated	2.740	1.957	0.578

Source: Own computation from ERHS (1994 & 2009)

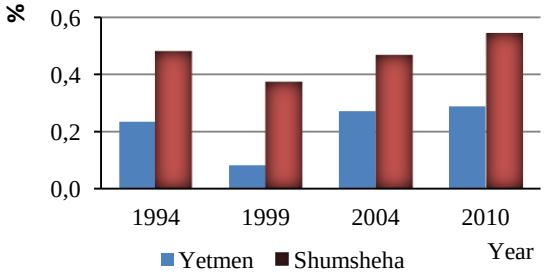
The component matrix above shows the loadings in the first component, which explains the highest variation in the data compared to the successive component loadings. All the factor coefficients have the expected sign consistent to previous literature. As shown in Table 6, value of livestock asset, number of oxen owned and number of ploughs owned have the highest component loadings.

A correlation analysis was done for each year to examine to what extent our index is associated with some of the factors commonly known to indicate poverty such as average real consumption expenditure per adult equivalent, mean value of food consumption per month, mean value of household assets owned, among others. The results show that our index is highly and significantly correlated with the variables in the expected directions. For example, the Pearson correlation with average real consumption expenditure per adult equivalent is 0.26, 0.27, 0.26 and 0.30 for the years 1994, 1999, 2004 and 2009 respectively with 1 percent significance in all cases, indicating the validity of our index in measuring the relative poverty status of smallholders in Northern Highlands of Ethiopia.

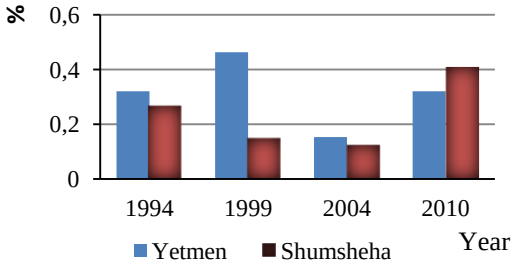
Figure 2 below compares the results of poverty estimates based on the asset-based and consumption-based approaches. In both figures, higher values of the bars represent higher poverty incidences and lower values of the bars denote lower poverty incidences in both PAs. Figure 2 (a) represents the percentage of poor households estimated based on the standardized poverty indices generated from the PCA. Figures 2 (b) reflects the proportion of households below the poverty threshold for the four panel rounds based on the standard poverty threshold.

Figure 2: Trend of household poverty at PA level using two approaches (1994 - 2010)

A) Based on Asset-based approach



B) Based on consumption-based approach



Source: Estimates from ERHS (1994 -2004) and primary survey (2010)

There are two important points worth mentioning from figure 2 (a and b) above. First, poverty incidence has declined in the second round but consistently increased in the rest rounds similary for both villages based on the asset-based approach. However, the trend has been different for each PA based on the consumption-based approach. Poverty incidence flacuated over the panel years for Yetmen while shumsheha experienced a steady decline in poverty incidence until 2004 followed by a dramatic rise in the last round. Second, the consumption based approach shows lower poverty incidence in Shumsheha compared to Yetemen contrary to the results of the PCA approach, which appears to second previous village studies and on ground actual realities. The difference in the ranking of the PAs in the two approaches of measuring poverty incidences indicates the limitation of the consumption based approach in accounting for over all changes in the wellbeing of households. Thus, complementing the consumption based approaches with the more comphrensive method of measuring observed poverty is actually indispensable.

4.6 Determinants of poverty dynamics

A thorough analysis of poverty requires a satisfactory study on the causes of poverty beyond a routine description of poverty profiles if we are able to tackle the root causes of poverty. Hence, this part of the paper attempts to address the question of what causes poverty. Both fixed effects IV and Multinomial Logit model (MLM) are employed for this purpose. The fixed effects model has been carried out using the log of real annual consumption expenditure per adult equivalent and PCA calibrated poverty indices as dependent variable for the consumption-based and asset-based approaches respectively covering the whole panel data. The Hausman's specification test rejected the null hypothesis that coefficients of the regressors are not stastically different and hence ruling out the use of random effects model in both approaches. Again, the time dummy relevancy test was carried out and their use is supported in both cases. However, Hausman-Wu test revealed the presence of endogeneity problem in one of the regressors. Hence, the Fixed Effects Instrumental Variable (FEIV) regression model is applied. Size of cultivated land is found to be endogenous similarly in both the

consumption and asset based regressions. We predicted the endogenous variables by regressing them against the exogenous variables in the system and used their predicted and lagged values as instruments. Hansen J test confirmed the validity of the instruments (see Appendix Table A).

Table 7: Fixed Effects IV regression for analyzing the determinants of poverty for the whole sample

Variables	FEIV (Asset based)	FEIV (cons based)
		Coeff. (SE)
Sex of household head (Dummy: 1 for male)	0.32654 (0.09020)***	0.17108 (0.13413)
Age of household head	0.01885(0.01450)	-0.04555 (0.02851)
Age square of household head	-0.00020 (0.00015)	0.00041 (0.00028)
Literacy of the household head (Dummy: 1 Yes)	0.09945 (0.12164)	-0.03920 (0.12942)
Household size	-0.23434 (0.13769)*	-0.00570 (0.04188)
Size of cultivated land (ha)	0.36401 (0.07119)***	0.49135 (0.13413)***
If transfers received (Dummy: Yes 1; No 0)	-0.24963 (0.11203)**	0.23499 (0.12049)*
Saving's Group (Dummy: 1 for Member)	0.01236 (0.07009)	0.16922 (0.13475)
Credit (Dummy: 1 for Member)	0.47377 (0.43242)	0.18498 (0.11093)*
Monetary value of livestock (Birr)	0.00010 (0.00002)***	0.00001 (0.00001)
Engagement in off-farm activities (Dummy: Yes 1; No 0)	0.00015 (0.00008)*	-0.00001 (0.00017)
Extension Service	0.02918 (0.07298)	0.16676 (0.12868)
Number of crops grown (proxy for crop diversification)	0.13505 (0.01541)***	0.05483 (0.02953)*
Number of plots of land (proxy for land fragmentation)	0.04285 (0.02662)	-0.08774 (0.05101)*
Household assets (Birr)	0.00003 (0.00002)*	0.00001(0.00005)
Time Dummy (Base: 1999)		
Year 1999	1.85808 (0.31660)***	1.67800 (0.53481)***
Year 2004	0.41710 (0.16816)**	0.63921(0.11559)***
Constant	-1.42116 (0.36754)***	4.429745 (0.67827)***
F(14, N)	26.26	7.37
Prob > F	0.000	0.0000
N	273	286

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 (Source: Calculated from ERHS (1994, 1999 and 2004) and primary survey in 2010)

Turning to the results, most of the important variables have similar association with the poverty indicator dependent variables in both models with the exception of transfers, which have been found to have different signs in the two models. In both regressions, size of cultivated land increases the welfare of households positively at 1 percent level of significance indicating that land is a crucial asset for mixed farming smallholders, which our data is taken from, in Ethiopia. Households headed by male appears to be associated with lower level of poverty only limited to the asset-based approach

significant at 1 percent level of significance reflecting the low empowerment as well as entitlement of females to valuable assets (such as land) in rural Ethiopia in general and in our sample in particular.

Again specific to the asset-based regression, household size is found to have a negative association while household assets and engagement in off-farm activities correlate positively with welfare of households all at 10 percent level of significance. The former result is in line with previous studies in Ethiopia by RAMAKRISHNA & DEMEKE (2002) and in Kenya by NYARIKI, WIGGINS, & IMUNGI (2002), which reported a negative association between household size and food security. On the other hand, the positive impact of household size on household income and food security has been found by ALENE & MANYONG (2006) in Nigeria and DEMEKE, KEIL, & ZELLER (2011) in Ethiopia. However, the rationale behind these two opposing results lies on the demographic composition of households. In a household having more dependents, large household size would mean more pressure on the income generating members of the household and hence impacting on the household's poverty status. The latter two variables are as expected and as previous empirical results confirmed except the significance level is low in this case. On the other hand, the significance of credit and number of plots (a proxy for land fragmentation) are limited to the consumption based approach. Whilst credit is positively associated with welfare of households positively, land fragmentation has a negative correlation. However, the significance is limited only to 10 percent.

Though transfers have significant values in both models, the coefficients have different signs. Households receiving transfers are negatively associated with higher levels of poverty incidence at 5 percent level of significance in the asset based approach while positively correlated in the consumption-based approach with only 10 percent level of significance. Previous empirical results assert the association of transfers in either ways as explained in section 3 of this paper. On the other hand, in both approaches number of crops grown (a proxy for crop diversification) is found to have a significant and positive association with the dependent variable as expected.

Credit access significantly contributes to improvement of households' welfare limited to the asset-based regression while engagement in off-farm activities is positively correlated to the dependent variable in the consumption-based regression but only limited to 10 percent level of significance. Though formal financial institutions and micro-enterprises are scant in rural Ethiopia in general and in the sampled peasant associations in particular, we can clearly see the positive role played by social linkages and local savings and credit associations in the study area.

Due to the use of lagged instruments, 1994 is dropped and 2010 is used as base year and the time dummies show a significant improvement in the average welfare of households in 2004 and 1999 respectively similarly in both models. Finally, most of the empirical results reported here correspond to the outcomes of the foregoing descriptive statistics.

In addition to the Fixed Effects IV model, we estimate the Multinomial Logit (MNL) model. The MNL uses a categorical variable of being chronically poor, transient poor and non-poor (base category) as a dependent variable to be regressed against the different household characteristics of the base year (1994 in this case) and a village dummy. Results are shown in table 8 below. MNL is based on a strong assumption of Independence of Irrelevant Alternatives (IIA). Hence, we employed the Hausman IIA test, which indicates that the assumption is not violated and thus use of MNL is appropriate. The explanatory variables included in the model are jointly significant at 1 percent and the McFadden's pseudo R2 value associated with the models is 0.2, which indicates that the fitness of the model is pretty satisfactory.

Table 8: Multinomial Logit model for analyzing the determinants of poverty for the whole sample

Variables	Transient poverty	Chronic Poverty
	Coeff. (SE)	Coeff. (SE)
Sex of household head (Dummy: 1 for male)	-2.69876 (0.95712)***	-1.93450(1.05745)*
Age of household head	-0.25974 (0.14324)*	-0.12792 (0.15842)
Age square of household head	0.00251 (0.00148)*	0.00135 (0.00160)
Literacy of the household head (Dummy: 1 Yes)	0.54398 (0.61177)	0.31785 (0.68098)
Household size	0.20620 (0.20252)	0.54898 (0.21964)**
Cultivated land (ha)	-0.04990 (0.33322)	-0.51849 (0.40218)
If transfers received (Dummy: 1 Yes; 0 No)	0.70239 (1.97328)	-0.03884 (1.89321)
Saving's Group (Dummy: 1 for Member)	-1.49396 (0.99619)	-0.00801 (0.88769)
Credit (Dummy: 1 for Member)	-0.74032 (0.55385)	-0.62977 (0.61116)
Monetary value of livestock (Birr)	-0.00008 (0.00018)	0.00002 (0.00017)
Engagement in off-farm activities (Dummy: Yes 1; No 0)	0.00038 (0.00043)	-0.00103 (0.00240)
Number of crops grown (proxy for crop diversification)	-0.23392 (0.20630)	-0.20155 (0.236547)
Number of plots of land (proxy for land fragmentation)	0.41115 (0.19213)**	0.46876 (0.21237)
Household assets (Birr)	-0.00153 (0.0010)	-0.00360 (.00199)*
Village Dummy (1 if Yetmen, 0 otherwise)	1.32713 (2.11246)	1.08215 (2.07464)
Constant	6.74751 (3.71044)*	1.82930 (4.03025)**
F(14, N)	47.39	
Prob > F	0.0023	
N	120	

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 (Source: Calculated from ERHS (1994, 1999 and 2004) and primary survey in 2010)

Addressing the results, households headed by male are less likely to remain in a state of chronic and transient poverty in the region with 1 and 10 percent level of significance respectively. This is in line with the less empowerment of women as well as their limited access to assets in Ethiopia especially in rural areas and supports the results of the asset-based regression in Table 7. Households headed by relatively younger adults are negatively associated with transient poverty while those headed by older adults have positive association with transient poverty with 10 percent level of significance in both cases. Land fragmentation is positively associated with transient poverty at 5 percent level of significance supporting the regression result of the asset-based approach in Table 7. Moreover, the larger the household size the higher is the probability of households being trapped in persistence poverty as compared to the non-poor households with 5 percent level of significance. The implication of this result is that most members of the households are inactive and are dependent on the productive adult members and hence increasing the risk of households falling into poverty. Again, households with larger household assets are likely to be in chronic poverty but limited to 10 percent level of significance. Both of the above results further support the robustness of the asset-based approach compared to the consumption based approach.

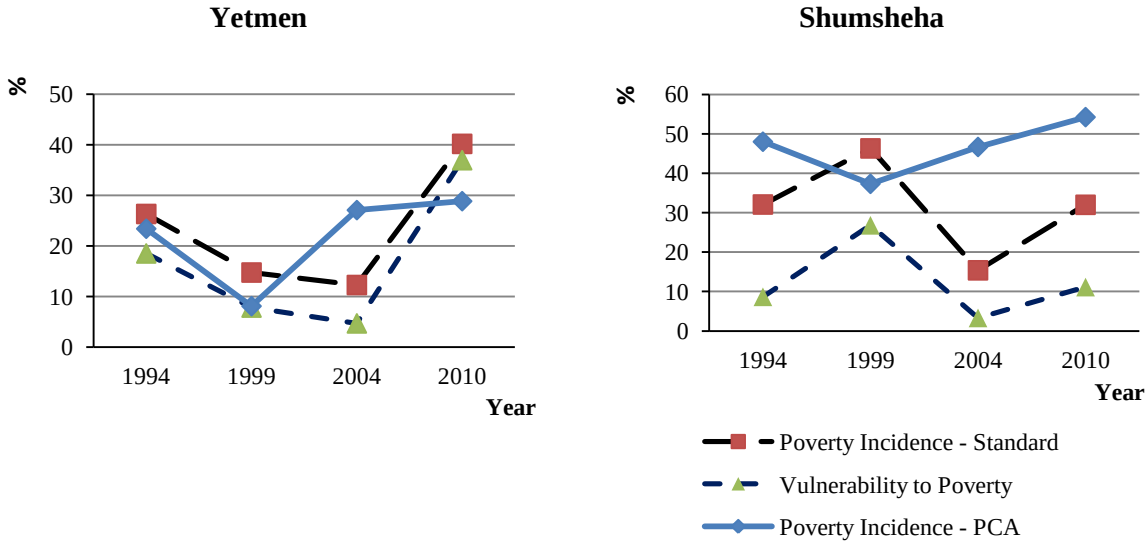
4.7 Vulnerability to Poverty

Vulnerability has long been ignored as valuable and necessary component to poverty in poverty literatures. It has gained momentum in recent times as a result of its crucial contribution to policy making. Poverty assessment studies have been immensely used for policy purposes. However, such kind of studies provide only an ex post measure of household's wellbeing (or lack thereof) as an input for poverty reduction strategies. However, they do not provide us a tool for a priori prevention of poverty incidences as a result of unforeseen risks. Hence, vulnerability studies complement poverty studies by providing an ex ante measure of wellbeing.

Previous studies attach closely related but different definitions to vulnerability to poverty. For this paper the working definition of vulnerability to poverty is the risk of an individual or a household to fall below the poverty line or, for those already below the poverty line, to remain in or to fall further into Poverty.[3] We use 0.5 as our vulnerability threshold and the results of the three steps FGLS model are reported in table below.

[3] Adopted from JHA, DANG, & SHARMA (2009)

Figure 3: Vulnerability to Poverty for both Peasant Associations (1994-2010)



Source: Estimates from ERHS (1994 – 2004) and primary survey (2010)

According to the consumption-based approach, the proportion of households observed to be poor and vulnerable to poverty followed similar trends over the panel years in both PAs. However, the comparison has been different between the two PAs. Households in Shumsheha have enjoyed a consistent decline in both poverty incidence and vulnerability to poverty measures except for a sharp rise in 2010 whereas the trend has been greatly fluctuating for Yetmen in both measures. On the other hand, according to the asset-based approach, the trends of poverty incidence for both PAs are similar as already mentioned in Figure 2. It is, however, pretty visible from figure 3 that the levels of poverty incidences have been consistently higher in Shumsheha than Yetmen across the panel years.

Beyond the trends of vulnerability to poverty in the two PAs, it is important to investigate the causes behind the difference in vulnerability of households to poverty between the two PAs over the four survey rounds. We applied the fixed effects instrumental variable model after carrying out Hausman's specification test and Hausman-Wu endogeneity test. Using Hasuman-Wu test, equb, transfers and number of crops are found to be endogenous for Yetmen where as participation in off-farm activities is the sole endogenous regessor for Shumsheha. Again following the same procedure as in the determinants of poverty, we predicted the endogenous variables by regressing them against the exogenous variables in the system and used their predicted and lagged values as instruments. Hansen J statistic confirmed the validity of the instruments (see Appendix Table B).

Table 9: Covariates of Vulnerability to Poverty Using Fixed Effects IV Approach

Vulnerability Index	FEIV – Yetmen (1994-2010)	FEIV – Shumsheha (1994-2010)
Sex of the household head	-0.01105 (0.06769)	0.06418 (0.06834)
Age of the household head	-0.03924 (0.01648)**	0.04931 (0.01291)***
Age squared of the household head	0.00045 (0.00019)	-0.00047 (0.00012)***
Household size	0.04636 (0.01734)***	0.05408 (0.02121)***
Literacy of head (Dummy: Yes=1)	-0.02331 (0.07753)	0.07546 (0.09573)
Credit (Dummy: Yes=1)	-0.24341 (0.08748)***	-0.19408 (0.05934)***
Membership in Local Savings Group(Dummy)	0.19735 (0.1426448)	-0.01432 (0.06275)
Proportion of fertile Land (%)	-0.00183 (0.00087)**	0.00011 (0.00091)
Number of oxen owned	0.00236 (0.05507)	-0.06353 (0.03731)*
Number of ploughs owned	-0.00793 (0.01724)	0.00222 (0.00849)
Number contacts with extension agents	-0.01635 (0.01302)	0.01294 (0.01374)
Engagement off-farm activities (Dummy)	-0.00004 (0.00007)	-0.00038 (0.00017)**
Number of crops grown in the year	-0.01876 (0.02470)	-0.07960 (0.01579)***
Number of plots	-0.00645 (0.02232)	-0.00359 (0.01864)
If transfers received (Dummy: Yes 1; No 0)	0.49582 (0.36101)	-0.16112 (0.04179)***
If households stored cereals (Dummy: Yes 1; No 0)	-0.24290 (0.08093)***	-0.04924 (0.05435)
Lag of vulnerability to poverty index	0.05124 (0.07742)	0.01476 (0.03666)
Constant	0.84043 (0.42310)**	-0.88735 (0.36594)**
F(17, N)	8.51	15.79
Prob > F	0.0000	0.0000

Source: Calculated from ERHS (1994) and primary survey (2010)

The result showed that the causes of vulnerability to poverty have indeed been different in the two PAs. All the rest significant variables have the expected signs and support the foregoing results on the determinants of poverty except for the age and age squared of the household head in shumesheha. Against our expectations, younger householeads (represented by age of the household head variable) are associated with higher vulnerability while older heads (embodied in age-squared variable) are less likely to be vulnerable to poverty for households in Shumsheha. These results appear to reflect the often ignored reality in this part of the country that younger adults (usually new couples in the context of rural Ethiopian) face challenges of having limited command on vital resources of farming such as land, oxen and other social assets, which increases their likelihood of falling to poverty. On the other hand, besides the small size of households headed by the aged, due to the presence of strong bond

among extended families in rural Ethiopia parents receive all rounded and unreserved cooperation from the families of their independent children hence that could positively affect the welfare of households with aged household heads. In both villages, whilst household size tends to increase vulnerability to poverty, access to credit appears to lessen vulnerability of households to poverty at 1 percent level of significance in both cases. In Ethiopia in general and in rural Ethiopia in particular local saving groups are differentiated based on the amount of contributions made by contributors, which are usually happen to be from similar standards of living. Young household heads, proportion of fertile land and households that store cereals are significantly less vulnerable to poverty than their counterparts in Yetmen. On the other hand, number of oxen owned, number of crops grown, participation in off-farm activities and receiving transfers reduce the likelihood of households falling into poverty trap at least for one more year significant only to households in Shumsheha.

5 Concluding Remarks

In this article, an attempt is made to analyze poverty dynamics using consumption-based approaches (components and spell approaches) and asset-based approach (PCA). Using Fixed Effects IV and Multinomial Logit models, the determining factors of poverty have been investigated. On the other hand, vulnerability to poverty and its determinants are examined using three step Feasible Generalized Least Square and Fixed Effects IV models respectively.

Despite the substantial improvements in most of the measures of household's welfare (in terms of selected data on assets, education and participation in development activities) over the study period, households moving to lower quintile consumption groups have dominated the sample. Considerable number of the households in both villages has been poor and vulnerable to poverty using 1 USD and 0.5 as poverty and vulnerability threshold respectively. However, a consistent decline in both measures has been observed in Shumsha until 2004 but increased dramatically in 2010 while the trend has been fluctuating for Yetmen over the entire panel years.

Decomposition of poverty into chronic and transient components using the components approach (FGT) revealed that transient poverty is dominant in the study area compared to that of chronic poor. This result was also supported by the Spells approach following the method by FOSTER (2007) indicating that programs targeting on poverty should primarily focus on risk factors that swing households in and out of poverty such as drought, conflict, price fluctuations and the like. This

essentially requires enhancing smallholders' access to insurance schemes; provision of credit facilities; promoting off-farm activities and helping farmers use improved technologies such as drought resistant seed varieties, irrigation facilities and so on.

A comparison of the consumption-based poverty measures with that of the asset-based approach provides us two interesting results. First, despite the difference in the trends of poverty incidence experienced by the PAs in the two poverty measurement approaches, there appears to be a consensus between the two approaches over the rise of poverty incidence in each of the PAs in the last survey round. Second, the consumption based approach shows lower poverty incidence in Shumsheha compared to Yetemen contrary to the results of the PCA approach, which appears to second previous village studies and actual on ground realities. The difference in the ranking of the PAs in the two approaches of measuring poverty incidences indicates the limitation of the consumption based approach in accounting for over all changes in the wellbeing of households. Thus, complementing the consumption based approaches with the more comphrensive method of measuring observed poverty is actually indispensable.

Turning to the regression results of poverty determinants, the results of the asset-based approach appears to be more robust than the consumption based approach in terms of the fitness of the model as well as based on the results of third alternative approach: the Multinomial logit model. Accordingly, land, livestock asset, crop diversification and male headed households are found to be associated with lower poverty levels while household size and transfers to higher poverty levels. One of the key policy variables for smallholders in Ethiopia, i.e. agricultural extension service, is found to have no meaningful relationship with smallholders' welfare in both villages indicating the need for the evaluation of the service in this part of the country in addition to strengthening incentives and monitoring mechanisms so that this decisive policy tool might serve the target it is intended for.

Smallholders' access to saving, credit and off-farm activities is very limited in rural Ethiopia. Except few local (informal) credit and savings institutions and self created off-farm activities, formal institutions for such services are almost non-existent. The insignificance of these variables in many of the foregoing regression results reveals this reality. Hence, increasing access of smallholders for such services in required by supporting local saving and credit institutions besides enhancing poverty oriented formal provision of such services and opportunities in these areas. As traditional saving and credit institutions tend to include the poorest, they need to be supported to accommodate a wider range of services, including insurance, that enable poor households to invest in and protect their assets, particularly from higher incidence events (such as common health risks) and covariate shocks such as extreme weathers.

Whilst age of the household head appears to impact vulnerability households to poverty in each PA differently, the rest of the explanatory variables have either similar impacts in both PAs or their importance only limited to one of the PAs. In general, awareness on family planning, enhancing smallholders' access to credit facilities and off-farm participation, crop diversification, targeted and timed transfers, encouraging farmers to store cereals and improving their storage facilities significantly reduces vulnerability of households to poverty in the region. Not all the important variables for poverty reduction work for reducing vulnerability of households to poverty or do they impact similarly. Therefore, for a meaningful intervention, strategies aimed at reducing poverty should critically consider factors that make households vulnerable to poverty. Finally, a piecemeal approach to solving individual problems is by no means sufficient to overall poverty alleviations. A comprehensive package of strategies that creates good governance, establishes functional infrastructure, builds schools and heath centers, fosters innovations and technologies and so on is needed to move rural households out of poverty trap and sustain pro-poor growth.

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Appendix

Table A: Hansen J tests of over identification for the Fixed Effects IV regressions

Sample	Chi-square	P-value
Asset-based regression	0.135	0.7137
Consumption Based regression	0.001	0.9701

Note: The null hypothesis is that instruments are not correlated with error terms. The null is accepted in all equations and that all instruments in the respective equations are found to be valid.

Table B: Hansen J tests of over identification for the Fixed Effects IV regressions

Sample	Chi-square	P-value
Yetmen	6.266	0.0993
Shumsheha	1.399	0.4967

Note: The null hypothesis is that instruments are not correlated with error terms. The null is accepted in all equations and that all instruments in the respective equations are found to be valid.