

ASSESSMENT OF VULNERABILITY TO PERSISTENT DEPRIVATION: EVIDENCE FROM A PERIPHERAL PASTORALIST POPULATION IN ETHIOPIA

WASSIE BERHANU

Department of Economics, Addis Ababa University, Addis Ababa, Ethiopia

ABSTRACT

This paper examines household vulnerability to poverty among a traditional pastoralist society inhabiting a peripheral dryland environment. It is directed to contribute to the literature by broadly focusing on quantitative assessment of poverty trends and pastoralist vulnerability to poverty in the study area. Poverty is found to be very persistent, and vulnerability to poverty is considerably high in this peripheral setting. A considerable segment of households that are vulnerable are the non-poor, which implies that the conventional stance of targeting the currently poor alone is not enough. In aggregate, results for this sampled peripheral population generally indicate trends inconsistent with Ethiopia's reported recent macroeconomic developments of remarkable growth performance and falling poverty rates. The prevailing status and trends signify the need for comprehensive long-term program designs that equally embrace both poor and non-poor pastoralists.

JEL Classification: O12, O13, Q56

Keywords: Borana, Pastoralism, Poverty, Vulnerability, Ethiopia

INTRODUCTION

This paper is motivated to assess rural household vulnerability to poverty in a special context of a peripheral dryland environment. We specifically explore trends in the state of deprivation and vulnerability to poverty among Borana pastoralists in southern Ethiopia. Poverty incidence is currently the highest and above the national average in the

pastoralist regions of Ethiopia (UNDP, 2015). Ethiopia's pastoralist systems, especially since the great Sahelian drought of the early 1970s, have notoriously experienced devastating cyclical droughts and erratic conditions of frequent rain failures. This has entailed their increasing vulnerability and subsequently growing pastoralist heavy dependence on external relief assistance. Recent interventions efforts have, therefore, fairly exhibited a trend of an increasing focus on conventional emergency response operations and social protection programmes primarily directed to support the currently poor. However, general understanding of the current status of welfare is not enough to successfully attack poverty in these marginal environments without considering the prevailing condition of pastoral households' risk of exposure to sudden deprivation and possible permanent destitution. Poverty as a structural problem is often triggered by recurrent exposure to a wide variety of shocks which could push the rich into poverty or keep the currently poor in a state of permanent deprivation (Chaudhuri, Jalan, & Suryahadi, 2002). An important task of crucial policy significance is, therefore, the identification of those which are potentially becoming vulnerable to shock-induced poverty traps due to their inability to recover from inherently damaging recurrent exposure to extreme events such as droughts.

The static conventional poverty measures are well-established tools of expressing current welfare status or incidence of deprived well-being among a population. However, measured welfare status at a particular point in time does not necessarily reflect the future well-being of a household due to its likelihood of risk exposure. It is, therefore, evidently underlined in this paper that some of the presently non-poor themselves, in all probability, will experience undesirable shifts in their status as a result of negative shocks. We illustratively argue that intervention efforts that merely target the poor alone are not sufficient for

a successful fight against poverty in this distinct ecological setting. The expected poverty status in the studied rangeland ecosystem is explored with an aim to offer some thoughts of preventive anti-poverty initiatives that can be considered *ex ante* rather than the currently predominant approach of targeted social protection and related poverty alleviation programmes implemented *ex post*. Moreover, a relevant point of interest with respect to this peripheral population is to generally make an interference of as to whether their prevailing circumstances evidently reflect the expected trickle-down effects of the widely reported Ethiopia's recent spectacular growth performance.

A subsidiary argument of this paper is that poverty trends and vulnerabilities of pastoralist societies in Ethiopia are profoundly associated with their unfavourable position of prolonged marginalization and state of social exclusion. In Ethiopia, pastoralism is a direct source of livelihoods to 12-15 million traditional herders who lead risky living conditions in arid and semi-arid peripheral areas where they manage about 60 per cent of the country's landmass, and producing valuable commodities (meat and milk) of relatively higher income elasticity of demand. All the same, the apparent paradox of increasing pastoralist impoverishment, despite the importance of pastoralism, is related to structural factors particularly defined within the broad context of marginalization and mistaken perceptions which kept them in protracted alienation and inappropriate transformative approaches guided by the national economic and anxious security interests of the state (discussed below).

The paper is structured as follows. The next section presents the structural origins of pastoral livelihood crisis and vulnerability to poverty. It presents the argument that the observed trends in the state of deprivation and pastoralist vulnerability is in essence structurally linked to the underlying complex factors of economic, socio-political and environmental origins. This is followed by description of the

method of estimation and source of data in section 3. Section 4 is devoted to the presentation and discussion of empirical results. Concluding remarks are given at the end.

STRUCTURAL ORIGINS OF PASTORAL LIVELIHOOD CRISIS AND VULNERABILITY TO POVERTY

In Ethiopia, pastoralist vulnerability to poverty is generally believed to be driven by a catalogue of multiple challenges, which include climatic variability, catastrophic asset losses triggered by periodic droughts, stiff resource competition, politically motivated threatening risks of violent conflicts, and inappropriate policy interventions (Devereux, 2006; Pavanello, 2009; Rettberg, 2010;). These multiple external pressures along with other trends, such as high population growth, may have induced pastoralists' increased risk of exposure to widespread permanent destitution. Persistent poverty in pastoralist territories in Ethiopia in some cases is also usually linked to power relations. This includes the conflict between the quest for central control and regional autonomy, which of course implies the consequent incompatibility between perceived aims of the state and that of the pastoralist society (Rettberg, 2010). Rettberg (2010) shows the fundamental differential perceptions of Ethiopian state actors and the pastoralist society about factors underlying pastoral livelihood crisis and vulnerability to poverty. This is profoundly associated with correspondingly differing attitudes towards stipulated risk management and pathway scenarios such as sedentarized cereal cultivation and pastoralist resettlement (for the state) versus pastoralist need for free mobility, tenure security and freedom from political interference. The often stated acrimonious relationship between the central authority and the peripheral pastoralist people is believed to

have in some ways contributed to pastoral livelihood crisis and vulnerability to poverty traps.

The post-1991 regime is thought to have particularly exhibited an added intensity of instigated inter-ethnic conflicts, haphazard and artificial regional boundary demarcations, and an intensified rush for conversion of pastoral lands into irrigated agriculture (Behnke and Kerven, 2011; Hagmann, 2005; Rettberg, 2010). The nature of the post-1991 violent conflicts in Ethiopia's pastoralist territories, which is now observed to have gone well beyond the traditional resource use clashes among neighbouring pastoral groups, is found to be more complex and highly disruptive (Hagmann, 2005; Rettberg, 2010; Rettberg, Beckmann, Minah, & Schelchen, 2017; Richards and Bekele, 2011;). This is believed to have significantly weakened pastoralist adaptive capacity to changing climatic conditions and natural resources degradation, and hence leading to a clearly visible ultimate effect of growing massive impoverishment and pastoralist destitution.

The traditional pastoralist strategies and adaptation mechanisms have been continuously upset by multiple external pressures and inappropriate policies that are significantly defined by misconceptions about the pastoralist production systems. Government transformative approaches are considerably influenced by the longstanding inappropriate understanding of the pastoralist mode of life, which is often equated to antiquity, ignorance and poverty. The Ethiopian state development planning practice generally considers mobile pastoralism as an inefficient production system and backward way of life, and this perception has dynamically implied such programmes of pastoralist sedentarization, land alienation and conversion of pastoral rangelands into irrigated commercial agriculture (see Behnke and Kerven, 2011; Rettberg et al., 2017). In the Awash valley, the history of pastoralist deprivation and worsening livelihood crisis is much intertwined with the

advent and continuous expansion of irrigated commercial agriculture and vertically integrated agro-industrial processing schemes which are operated by using migrant labour and settlers from the highlands. Protracted land alienation in this region has been experienced since the 1960s when Afar and Oromo pastoralists lost their ancestral land of transhumance pastoralism to commercialized plantation agriculture. The prevailing experience under the current regime is perhaps even more perilous for the peripheral people. Fratkin (2014), for example, critically presents the case of planned extensive pastoral land alienation in different river basins as a result of large scale hydroelectric dam construction and commercial agriculture irrigation schemes stipulated in Ethiopia's recent transformation plans. In fact, the trickle down effects of Ethiopia's accelerated growth plans on the peripheral people inhabiting the arid and semi-arid lands evidently remain quite minimal due to the deep structural problems of their prolonged marginalization and exclusion.

ESTIMATING VULNERABILITY TO POVERTY

The notion of vulnerability embraces adverse exposure to risk and associated state of deprivation (Dutta, Foster, & Mishra, 2011). Vulnerability is so much a general term of widely dissimilar technical meanings across disciplines. It is broadly considered here as a risk of falling into or remaining in undesirable state of well-being due to some form of exposure to idiosyncratic or covariate shocks. There is a linkage between the concept of poverty, which refers to the *ex post* realization of household's state of well-being, and the notion of vulnerability (to a state of deprived well-being) as the *ex-ante* probability of failure to attain a certain level of welfare (Chaudhuri *et al.*, 2002). A distinction between poverty and vulnerability is that the latter is extended to include risk, which is signified by a

condition where the currently non-poor are in danger of being in a state of deprived well-being due to unpredictable future misfortunes (covariate and idiosyncratic shocks). There is a considerable disagreement in the vulnerability literature as to how the term should be conceived and measured. Well summarized presentations of suggested approaches and perspectives are found in Hoddinott and Quisumbing (2003) and Guimaraes (2007). The complexity and daunting task of predicting future poverty has in fact prompted several approaches and correspondingly suggested different measures of vulnerability (e.g. Chaudhuri *et al.*, 2002; Christiaensen and Subbarao, 2004; Dutta *et al.*, 2011; Calvo and Dercon, 2013; Gallardo, 2013). Calvo and Dercon (2013) illustrate their approach by using rural household panel data generated through routine periodic surveys in Ethiopia's highland mixed farming areas of peasant agriculture. The effort in this paper, based on cross-section data, is a modest exploratory inquiry directed to investigate the prevailing conditions in the marginal setting of the pastoralist production system which is usually neglected in rural household panel data surveys.

Here the reported vulnerability estimates are generated by following the approach of vulnerability as expected poverty (VEP) most commonly used in recent studies. Therefore, following Chaudhuri *et al.* (2002), we consider vulnerability as the probability of falling below an established welfare threshold indicator, Z . We accordingly define the vulnerability of household h at time t as the probability that the household will be poor at time $t+1$:

$$VEP_{h,t} = Pr(C_{h,t+1} < Z) \quad (1)$$

where $C_{h,t+1}$ is household's per capita consumption at time $t+1$ and Z is appropriate poverty line. At a general conceptual level, consider that a pastoral household's measured well-being at any period of time is given by:

$$C_{h,t} = C(X_h, A_h, \beta_t, \alpha_h, e_{ht}) \quad (2)$$

where $C_{h,t}$ = household's measured well-being at time t , X_h = a vector of household's socio-economic characteristics, A_h = household's adoptive risk management response, β_t = vector of parameters describing the aggregate state of macroeconomic and socio-political factors at time t , α_h = unobserved but fixed household characteristics, and e_{ht} = stochastic factors that contribute to differences in inter-household welfare levels. Vulnerability to poverty can be derived by substituting from equation 2 into equation 1:

$$VEP_{ht} = Pr(C_{h,t+1} = C(X_h, A_h, \beta_{t+1}, \alpha_h, e_{t+1}) < Z | X_h, A_h, \beta_t, \alpha_h, e_{ht}) \quad (3)$$

Equation 3 represents a general conceptual expression that vulnerability to poverty is broadly based on the stochastic properties of periodic movements in a household's measured well-being, which are in turn affected by a host of influences of specific household characteristics, aggregate socio-economic and natural environmental factors, and corresponding mechanisms of adaptive response behaviour directed to smooth out possible fluctuations in household consumption. It is a general formulation that the probability of falling into poverty, in addition to current status of household socio-economic characteristics and underlying response behaviour, is based on unanticipated changes in the structure of the economy (represented by β_{t+1}) and aggregate shocks (e_{t+1}). The possible contributions of β_{t+1} , which is considered to be stable or constant across households, and aggregate shocks ($e_{h,t+1}$) are usually neglected due to lack of information, especially in estimations based on single period cross-section consumption or income data.

Quite remarkably, a central assumption in using a single cross-section data for vulnerability assessment is fundamentally associated with its key consideration that cross-section variability approximates inter-temporal variation. A larger part of the observed cross-sectional variability in household consumption levels is assumed to be

explained by differences in their observable characteristics rather than unobserved household-specific determinants that are persistent over time (Chaudhuri 2003). In this sense, cross-sectional variance may capture inter-temporal variability resulting from idiosyncratic risks. The approach assumes that household risk response mechanisms are generally similar over time, the macroeconomic environment is fairly stable, and that shocks do not result in “survivorship bias” (Chaudhuri 2003; Hoddinott Quisumbing, 2008). These assumptions are quite strong, and it is often indicated that the approach may not produce good vulnerability estimates in the case of time varying (household invariant) large common economic shocks. Despite the limitations, the approach still remains to be quite attractive to fairly explore the state of vulnerability to poverty mainly due to its simplicity and absence of panel data, which is especially quite severe in our special context of remote territories that are usually ignored in regular nationwide surveys.

The adopted empirical model is based on procedures developed and elaborated in Chaudhuri *et al.* (2002) (also, Chaudhuri, 2003). The statistical procedure usually proceeds from specification of a relationship expressed based on an assumed stochastic process generating the consumption of a household, which is given by:

$$\ln C_h = X'_h \beta + e_h \text{ where } e_h \sim N(0, X_h \theta) \quad (4)$$

where $\ln C_h$ is log per capita consumption expenditure, X_h is vector of explanatory variables, β is vector of parameters and e_h is mean-zero stochastic errors which capture idiosyncratic shocks to measured household well-being. The variance of the disturbance term, e_h , is assumed to depend on a vector of observable household characteristics and is commonly represented by a simple functional form of:

$$\sigma_{e,h}^2 = X_h \theta \quad (5)$$

The parameters β and θ are estimated using the three-step Feasible Generalized Least Squares procedure. In the first stage, equation 4 is estimated using an ordinary OLS procedure. Next, the squares of the estimated residuals generated are regressed against covariates of the consumption model to obtain the predicted values of the disturbance term:

$$\hat{e}_{OLS,h}^2 = X_h\theta + \eta_h \quad (6)$$

The obtained predicted values of the disturbance term in equation 6 are then used to transform the same equation as follows:

$$\frac{\hat{e}_{OLS,h}^2}{X_h\hat{\theta}_{OLS}} = \left[\frac{X_h}{X_h\hat{\theta}_{OLS}} \right] \theta + \left[\frac{\eta_h}{X_h\hat{\theta}_{OLS}} \right] \quad (7)$$

This transformed equation (equation 7) is estimated using OLS to obtain an asymptotically efficient FGLS estimate represented by $\hat{\theta}_{FGLS}$. It is noted that $X_h\hat{\theta}_{FGLS}$ is a consistent estimate of $\sigma_{e,h}^2$, the variance of the idiosyncratic component of household consumption expenditures.

Now, the estimates:

$$\hat{\sigma}_{e,h} = \sqrt{X_h\hat{\theta}_{FGLS}} \quad (8)$$

are used to transform the consumption model (equation 4) as follows:

$$\frac{\ln C_h}{\hat{\sigma}_{e,h}} = \left[\frac{X_h}{\hat{\sigma}_{e,h}} \right] \beta + \frac{e_h}{\hat{\sigma}_{e,h}} \quad (9)$$

Equation 9 is estimated using OLS to obtain a consistent and asymptotically efficient estimate of β .

Using the estimates of $\hat{\beta}$ and $\hat{\theta}$, we can find the estimated log-consumption and variance of log-consumption for each household as follows:

$$\begin{aligned} \widehat{\ln C_h | X_h} &= X_h' \hat{\beta} \\ \widehat{Var}[\ln C_h | X_h] &= \hat{\sigma}_{e,h}^2 = X_h' \hat{\theta} \end{aligned} \quad (10)$$

Assuming that consumption is log-normally distributed and letting $\Phi(\cdot)$ denote the CDF of the standard normal distribution, the probability that a household, with characteristics X_h , will be poor in the future is given by:

$$V\hat{E}P_h = \hat{Pr}(\ln C_h < \ln Z | X_h) = \Phi \left[\frac{\ln Z - X_h \hat{\beta}}{\sqrt{X_h \hat{\theta}}} \right] \quad (11)$$

We consider a pastoral household as vulnerable to poverty if its $V\hat{E}P_h$ is greater than a probability threshold P :

$$\hat{V}_h = \begin{cases} 1 & \text{if } V\hat{E}P_h > P \\ 0 & \text{if } V\hat{E}P_h \leq P \end{cases} \quad (12)$$

where $\hat{V}_h$ is a binary indicator variable whether household h is vulnerable or not. It is expected that $0 < \hat{V}EP_h < 1$ and the commonly used reference threshold for P is 0.5. A vulnerable household is one whose probability of shortfall exceeds 0.5, which is considered as having a chance of 50 per cent or more to fall below poverty line in the future. The level of vulnerability is thus determined by identifying the proportion of households which score $P > 0.5$ (Chaudhuri *et al.* 2002; Christiaensen and Subbarao, 2004).

The dependent variable of the model (equation 2) in our case is log household annual per capita consumption expenditure in adult equivalent measure. A similar approach is used for the asset-based assessment where log household cattle-holding is used as a dependent variable. The household socio-economic characteristics (age of household head, gender of household head, household size, livestock size, level of education of household head) represent the first category of explanatory variables included in the empirical

model for the estimation of vulnerability to consumption poverty. Included in the vector of the second category of variables are household location (distances from the market centre) and adaptation choice variables. The latter refer to household participation in non-pastoral activities of dryland farming, low-return activities such as casual labour, charcoal burning and petty trade. The low-return adaptation choice variable is included with a view that such a strategy is expected to guard pastoral households' livelihood position (for example, by preventing distressed livestock sales) as an additional option to avoid the likelihood of falling into poverty. In other words, despite the apparent reverse causation implied by this choice variable, here the adopted empirical strategy assumes that poor households may normally embrace less rewarding non-pastoral activity participations that are generally pursued for asset smoothing.

Quite noticeably, in addition to the usual approach of estimating vulnerability to consumption poverty, an additional effort is made here to assess vulnerability to asset poverty, which in essence is broadly associated with the ability to accumulate wealth and generate income. For the estimation of vulnerability to asset poverty, therefore, the variable "shock survival index" is additionally included in an attempt to capture the effects of past drought shocks. It is a ratio of current stock size to the highest reportedly attained pre-shock livestock holding multiplied by frequency of exposure to known catastrophic asset shocks in the area (Berhanu and Beyene, 2015). Frequency of exposure refers to the number of times a respondent household experienced drought related huge livestock losses in the past. See Table A2 in the Appendix for the underlying regressions for consumption and asset holdings.

An important consideration in the estimation of equation 1 is the threshold level of well-being, Z , below which a household is considered to be poor. Here, the national *consumption* poverty line (equal to 4337 Ethiopian

Birr) is used for assessment of vulnerability based on our consumption data. It is a poverty threshold computed in 2011 prices (MOFED, 2013) and slightly adjusted for general year-on-year and regional inflation (CSA, 2013) and aligned with the year of household survey (2013). All the same, we have also an additional specific concern of the need to assess the risk of a pastoral household falling below a minimum *asset* poverty threshold level, which is often considered as the minimum level of asset endowment for viable asset accumulation in the rangelands. Therefore, in addition to using the national *consumption* poverty line, we have identified two types of *asset*-based poverty thresholds for the slightly different approach of asset-based vulnerability assessment in our special context of a traditional pastoralist society.

The first asset poverty threshold is based on the well-known traditional wealth ranking categories of the Borana system. Wealth status in the Borana society is measured by the size of *cattle* ownership. The cattle are traditionally considered as having a “complete function” of economic and unique social values attached them as compared to camel and goats, which have no cultural significance in the Borana tradition (Berhanu, Colman, & Fayissa, 2007). The major four Borana wealth ranking categories are: *Qolle* (very poor), *Deega* (poor), *Bultiqabesa* (middle wealth) and *Duresa* (rich). Five (5) head of cattle was the traditional minimum threshold of *asset* poverty, which is a minimum threshold presumably required to establish a family, continue to accumulate wealth, and to support deprived community members. Nevertheless, from our recent field investigation, this old traditional criterion seems to have lost its currency, and a person with 5-10 head of cattle is now considered to be poor. Therefore, in addition to the traditional asset-poverty threshold of 5 head of cattle, we have also considered a revised minimum threshold of 10 head of cattle. Secondly, an average of 12 head of cattle is

also used as an additional asset poverty threshold, which was previously identified for the study area (see Lybbert *et al.*, 2004) as a poverty trap threshold.

The Setting and Source of Data

This study is based on household survey data that were generated during our 2012/2013 fieldwork in the Borana rangelands of southern Ethiopia. The Borana pastoral area of southern Ethiopia is an important peripheral territory which form an extensive part of Ethio-Kenyan borderlands of a total border length of 861 kilometres. The survey area is inhabited by one of the well-known east African pastoral groups, Borana Oromo pastoralists, who also populate the arid areas of northern Kenya across the national frontier. Boranaland is ecologically comprised of arid and semi-arid zones with average annual rainfalls of 400-700mm. An estimated more than 90 per cent of production value-added in the Borana pastoral village economy is contributed by traditional pastoralism (Berhanu, 2015). Borana herders predominantly keep the cattle group in their species mix portfolios of the traditional animal husbandry. Dryland farming is a relatively recent (predominantly from the 1980s) phenomenon of uneven practice which is only limited to the semi-arid grazing territories of the area.

We use the pastoral household database created based on a survey conducted by the author in 2012/2013. It was a complex survey in which a total of 327 randomly selected pastoral households were interviewed using structured tabular and verbatim questionnaires. The household survey was conducted in selected sites of varied locations of arid and semi-arid areas of different traditional grazing territories of the Dire region (Garacha-Tula, Malbe, Wayama, Golbo) of Borana rangelands which were identified based on conditions of range ecology, distance,

and other socio-economic and environmental characteristics of the region. Survey respondents were selected from seven survey sites of the traditional pastoralist grazing territories in the Borana rangelands. We first followed the track of our 2002/2003 pastoral household livelihood survey in which four study sites were covered in Dire region. The 2012/2013 survey increased the covered area by including three additional sites from *Wayama* and the more arid *Golbo* traditional grazing territories. Selections of sample sites were followed by complete listing and random draw of pastoral villages (encampments) within reachable radii of selected areas for detailed enumeration. Sample respondents, stratified based on wealth status differentials, were then randomly chosen from prepared list of households in the selected encampments. Detailed descriptive statistics of key variables used in the analysis are provided in Table A1 in the appendix. The present sample also includes a panel sub-sample of 78 households covered in the investigator's 2002/2003 survey of the area. This survey, as mentioned, laid the foundation for the robust sampling procedure followed in the 2012/2013 survey but, due to the small size of the panel sub-sample, we employ it here for a limited exploratory account of illustrating shifts in wealth status and vulnerability to asset poverty in the study area.

ESTIMATED RESULTS

Estimated Vulnerability and Poverty Rates

The comparative status of poverty incidence and depth of poverty among the sampled peripheral population are shown in Table 1. As it can be seen, the depth of poverty among the surveyed Borana households is twice the reported national and regional averages. The depth and severity of poverty are particularly very noticeable for pastoralist female-headed households. Absolute poverty among the surveyed female-headed Borana households is 54.2 per cent,

which is two times the rate reported for the same social group at the national level. Incidentally, at the national level, the reported poverty indices are relatively lower for female-headed households than their male counterparts. The possible underlying reason, according to the official national poverty report, is the supposedly improved condition of female-headed households' increased access to land and their added advantages of focused attentions obtained in productive social protection programmes (MOFED, 2013); a claim which does not appear to hold in the peripheral pastoralist settings.

Table 1: Consumption poverty indices (sample and national averages)

Poverty Index	Total	Male-headed	Female-headed
Head count index (P_0)			
- Borana sample	0.447	0.412	0.542
- National	0.296	0.300	0.277
- Oromia region	0.287	n.a	n.a
Poverty gap index (P_1)			
- Borana sample	0.190	0.163	0.309
- National	0.078	0.080	0.074
- Oromia region	0.075	n.a	n.a
Squared poverty gap index (P_2)			
- Borana sample	0.107	0.090	0.193
- National	0.031	0.031	0.029
- Oromia region	0.029	n.a	n.a

Source: Survey data and MoFED (2013)

Table 2 provides estimated vulnerability rates of pastoralist households' probability of falling into both consumption and asset poverty in the future. It reports incidence of vulnerability, which refers to a fraction of sampled pastoral households with vulnerability levels (or

estimated probability of being poor) higher than the selected alternative thresholds of 50, 55 and 60 per cent. Taking 50 per cent vulnerability threshold, i.e. considering that a pastoralist household has 50 per cent or more chance of falling into poverty in the future, the rate of vulnerability in terms of risk of exposure to both asset and consumption poverty is generally found to be considerable. It is found that an estimated 78 per cent of the sampled pastoralist population is vulnerable to future poverty as compared to the observed consumption poverty incidence of about 45 percent¹ This is apparently consistent with the notion that observed poverty incidence underestimates the proportion of the population that is likely to be poor in the future (Chaudhuri *et al.*, 2002). Moreover, since by construction an increased threshold implies a decline in incidence of vulnerability (see Chaudhuri *et al.*, 2002), Table 2 shows that the estimated incidence of vulnerability is lower (55.6%) at the more stringent threshold of 60 per cent. Vulnerability to poverty here essentially refers to households which would remain in poverty plus those which are expected to fall into poverty in the future. This is a general tendency of the likelihood of being poor than an actual case of falling into or remaining in poverty. It is an inference of whether a pastoralist household is currently exposed to future poverty rather than direct observation of vulnerability levels. The identification of the “future” period, however, is in essence a general one because vulnerability could be considered as the likelihood of being poor next year or in 10 years time (Christiaensen and Subbarao, 2004; Hoddinott Quisumbing, 2008). Therefore, taking the 60 per cent threshold in Table 2, one possible line of interpretation is that, over a period of

¹ The last column in Table 2 provides estimated values by using the more stringent 60 per cent threshold, which is around the average value of the currently observed asset poverty rates computed based on the upper and lower bound traditional asset poverty lines.

10 years, keeping the current pastoralist socio-economic conditions unchanged, about 56 per cent of the households would be poor in at least 6 out of the 10 years. The prevailing general poverty trend is fairly explained in section 3.2 below.

Table 2: Pastoralist household vulnerability to consumption and asset poverty (headcount percentage)

Threshold Indicator	Vulnerability rate		
	50% vulnerability threshold	55% vulnerability threshold	60% vulnerability threshold
1. Consumption poverty	78.0%	61.5%	55.6
2. Asset poverty			
a) Traditional threshold (lower bound)	97.0%	91.4	87.1
b) Traditional threshold (upper bound)	97.3%	94.8	92.7
c) Suggested poverty trap threshold (lower bound)	97.7%	95.1	93.6

Source: survey data

Table 3 indicates that a considerable segment of those that are vulnerable under different assessment thresholds are the non-poor. As indicated, of the 55 per cent of sampled households currently observed to be non-poor, an estimated 75 per cent of them are found to be vulnerable to poverty. A close look at individual household records fairly signifies that there is a considerable indication of female-headed households being exposed to consumption and asset poverty. Moreover, from further exploration of the

dataset, nearly 80 per cent of the households which are vulnerable in terms of both consumption and asset poverty are those which have generally lost resilience due to consecutive failures to survive past shocks. Similarly, asset poor households of less adaptation experience in terms of extensive and regular engagement in non-pastoral income generating activities are also more likely to be vulnerable in terms of consumption/income poverty. In general, however, both threshold indicators measure different poverty dimensions and have differing implications. The aggregate national poverty line is based on the cost of basic needs computed by considering the bundle food (typically consumed by the poor) required to supply the predetermined minimum calorie intake plus specific allowance for non-food goods consistent with the spending pattern of the poor (MOFED, 2013). The distinction is that, in contrast with the aggregate national consumption poverty line, the asset poverty threshold is remarkably associated with the case of sustainable wealth accumulation potential in the pastoral rangelands. Vulnerability to asset poverty is fairly an expected feature of this region of increasing difficulty of recurrent exposure to asset shocks primarily resulting from frequent droughts in the area.

Table 3: Disaggregated poverty-vulnerability matrix of respondent pastoralist households (50% vulnerability threshold)

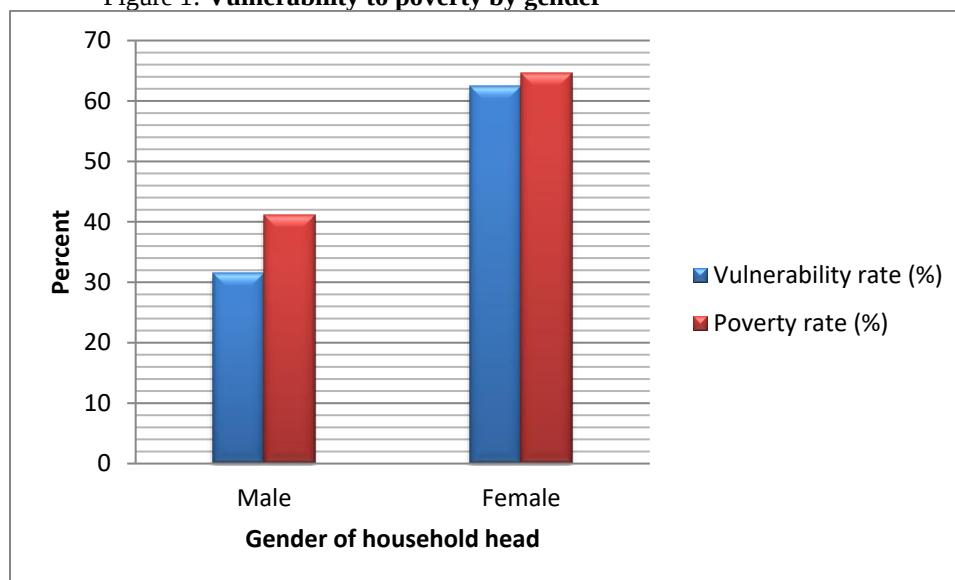
Threshold indicator & status category	Vulnerability Status		Overall % Total
	Vulnerable	Non-Vulnerable	
Based on consumption Poverty line	78.0%	22.0%	100%
- Poor	81.5%	8.2%	44.7%
- Non-poor	75.1%	13.8%	55.3%
Based on asset Poverty line			
Traditional threshold (lower bound)	97.3%	5.5%	100%
- Poor	100.0%	0.0%	44.3%
- Non-poor	94.5%	5.5%	55.7%
Traditional threshold (upper bound)	97.6%	4.9%	100%
- Poor	100.0%	0.0%	68.8%
- Non-poor	95.1%	4.9%	31.2%
Suggested poverty trap threshold (lower bound)	97.7%	4.7%	100%
- Poor	100.0%	0.0%	73.7%
- Non-poor	95.3%	4.7%	26.3%

Source: survey data

Figure 1 shows the gender dimension of poverty and vulnerability to poverty among the sampled pastoralist households. As it can be seen, the risk of falling into consumption poverty is far higher for female-headed household respondents, which is almost two times that of their male counterparts. This problem is quite a structural one of local socio-cultural underpinnings where, unlike current family land inheritance laws which fairly consider women in the farming cultures, the custom of the common property extensive system of pastoralism is differently designed. A Borana female household head, especially when she is widowed at young age with little children (traditionally with much lost chance of being remarried), and family livestock herds customarily put under a caretaker

manager, can usually be reduced to a state of being permanently poor.

Figure 1: **Vulnerability to poverty by gender**



Source: survey data

The Correlates of Household Vulnerability to Poverty

Probit regression results of the correlates of household vulnerability² to consumption poverty are reported in Table 4. The dependent variable is a binary indicator, whether the household is vulnerable or not. Here, the reported results are based on alternative model specifications and vulnerability thresholds. Model 2 is estimated for the two vulnerability thresholds (50 and 60%) using core variables of household socio-economic

² The correlates of poverty are also briefly examined by taking current poverty status (=1 if poor) regressed on the right-hand side variables listed in Table 4. It is found that, in the majority of the cases, socio-economic factors that influence current poverty status would similarly tend to affect the probability of being poor in the future.

characteristics while model 1 is an extended version that includes other variables such as age squared and distance. It is found that, except for the 50% threshold, the probability of being vulnerable decreases with age of household head, which indicates that the likelihood of exposure to future poverty tends to be higher among young herders. The estimated results show that being a female-headed household generally increases the likelihood of exposure to future poverty. As portrayed above, female-headed pastoralist households exhibit higher level of vulnerability to poverty as compared to the male-headed ones. We further tested the significance of this apparent high vulnerability differential by estimating the model separately for the two groups of households, and the null hypothesis of no vulnerability difference between male and female-headed households is rejected. Concerning household size, the relationship is statistically insignificant at 50% threshold though, in both model specifications, it is significantly positive at 60% threshold where vulnerability tends to increase with family size. In all alternative specifications and threshold levels, the education variable is statistically insignificant in this marginal setting where almost all household heads are illiterate. In all specifications, the risk of falling into poverty is strongly and negatively associated with increasing livestock asset holding, which indicates that asset-poor households are always likely to stay in poverty in the future.

The relationship between household participation in dryland farming and vulnerability to poverty is significantly negative though this is not always consistently the case in all specifications, which perhaps partly tends to indicate the controversial nature of dryland farming in the area³. Our

³ The Borana rangelands are rather suited to mobile pastoralism than crop-based livelihoods, albeit one may recognize that many pastoral households since the last few decades have tried to participate in the often unreliable and controversial practice of opportunistic dryland farming.

present exercise does not provide a clear-cut result on the relationship between vulnerability and pastoralist risk management diversified portfolio adoption (wealth portfolio status) at its current very low level of practice in the area. Vulnerability to poverty is strongly and negatively associated with distance at both thresholds. This may indicate the better carrying capacity of remote locations than nearby peri-urban localities which are apparently degraded partly as a result of higher prevalence of opportunistic dryland farming.

Table 4: Probit regression results of determinants of vulnerability to consumption poverty

	Model 1		Model 2	
	50% vulnerability threshold	60% vulnerability threshold	50% vulnerability threshold	60% vulnerability threshold
	Coefficients	Coefficients	Coefficients	Coefficients
Age of household head	0.0842** (0.0362)	-0.0212 (0.0372)	-0.0126** (0.0050)	-0.0329*** (0.0050)
Age squared	-0.0009*** (0.0003)	-0.0001 (0.0003)		
Gender of household head(male=1)	-0.004 (0.2383)	-1.8678*** (0.3451)	-0.1791 (0.2289)	-1.9128*** (0.3413)
Household size	-0.0398 (0.0391)	0.1492*** (0.0460)	-0.0068 (0.0361)	0.1456*** (0.0418)
Education	-0.0367 (0.0624)	0.0749 (0.0679)	-0.0094 (0.0609)	0.0922 (0.0671)
Livestock size	-0.0195*** (0.0061)	-0.0346*** (0.0079)	- 0.0176*** (0.0047)	-0.0348*** (0.0072)
Participation in dryland farming	-0.5947** (0.2704)	-0.8869*** (0.2620)	0.0563 (0.1672)	-0.4038** (0.1721)
Wealth portfolio status	0.1581 (0.3213)	-0.0029 (0.324)		
Distance	-0.0132*** (0.0038)	-0.0093*** (0.0034)		

Constant	0.4957 (0.9799)	3.925 (0.9980)	1.8259*** (0.3893)	3.437*** (0.4694)
Wald $\chi^2(10)$	39.81	81.37	26.15	74.79
N	327	327	327	327
Pseudo R ²	0.1418	0.2760	0.0892	0.2487

Note: Numbers in parenthesis are robust standard errors; *** significant at 1 per cent level; **significant at 5 per cent level; * significant at 10 per cent level.

Source: computed from survey data.

Exploring Trends in Vulnerability to Asset Poverty: Results of the Panel Data Sub-Sample

Here we explore the sub-sample longitudinal data of 2003 and 2013 in order to reveal some illustrative results. We caution the reader to exercise some care in interpreting the results due to the small size of the panel sub-sample. The fairly simple illustrative instance of the dynamics of shift in wealth status between 2003 and 2013 among our sub-sample of surveyed pastoralist households is provided in Table 5. It is an important demonstrative evidence of the often claimed increasing difficulty of asset accumulation and problems of escaping poverty that have been experienced in the Borana pastoralist system in recent decades. It is found that, after three drought shocks (2006, 2008, 2011) between our survey periods (2003 and 2013), a great majority of the tracked households have remained trapped in poverty over the decade, in that 91.2 per cent of the previously poor and very poor wealth status have remained stuck in their unfavourable positions. On the other hand, it is found that a significant proportion (44%) of previously middle and rich status stock owners have lost their positions (Table 5). A close examination of the dataset shows that some of these households appear to have generally lost resilience due to old age and inability to recover from the hard-hitting blows of consecutive shocks during the period. A notable point here refers to those previously better-off households which,

due to lack of other skills, have purely focused on keeping their wealth in terms of livestock alone. A further exploration of our survey records indicates that non-poor stock owners who lack diversified wealth/activity portfolios (expressed in terms of high return activity engagements such as livestock trade, urban-based rental housing investments and other small business activities), especially in the prevailing state of recurrent natural shocks, are found to be susceptible to the risk of falling into poverty.

Table 5: Trends in shift of household wealth status between 2002/2003 and 2012/2013 (N=78)

Current	Previous very poor	Previous poor	Previous middle	Previous rich
Very poor	14	5	5	1
Poor	3	12	4	3
Middle	0	3	4	5
Rich	0	0	0	19
TOTAL	17	20	13	28
Slightly gained position	3	3	None	-
Number lost position	Not applicable	5	9	9

Source: Survey data

Estimated results of trends in asset poverty rates and vulnerability to asset poverty over the survey period are presented in Table 6. Using all the asset poverty threshold indicators, it is demonstrated that (though with some degree of caution due to the size of the sub-sample) vulnerability to asset poverty among the sampled households is very high and has increased over time. The asset poverty rate has also substantially increased. Government interventions in the last two decades have focused on those less comprehensive conventional efforts of water development (for livestock and humans), animal health services, social protection programmes of intermittent direct support and income

generating public works and, more recently, natural resource management initiatives of limited scope and coverage. These initiatives, above all, appear to have been too small to halt or reverse the apparent long-term downward spiral of the pastoralist production system due to recurrent shocks that have ravaged the region in the last 40 years (see Berhanu, 2011; Berhanu & Beyene, 2015).

Table 6: Vulnerability to Asset Poverty in 2003 and 2013

Threshold Indicator	Vulnerability rate (%)		Poverty rate (%)		Ratio of Δ in vulnerability to Δ in poverty rate
	2003	2013	2003	2013	
Traditional threshold (lower bound)	73.1	91.0	24.4	38.5	1.30
Traditional threshold (upper bound)	89.0	94.0	50.0	62.8	0.39
Suggested poverty trap threshold (lower bound)	92.3	95.0	57.7	66.7	0.3

Source: survey data

CONCLUDING REMARKS

The dryland pastoralist areas of Ethiopia are currently exposed to a critical difficulty of massive pastoralist destitution resulting from complex factors of natural and socio-political origins. The fragility of the system is fundamentally explained by the prevailing pastoralist poor adaptive capacity exacerbated by the complex socio-political pressures of the present system of governance. This paper has examined the extent of pastoralist vulnerability to poverty based on survey data generated from southern Ethiopia. The present state of deprivation and very high vulnerability to asset poverty in the study area signifies an underlying difficulty of poverty eradication in this peripheral lowland of distinct production and ecological features. The results of both consumption and asset-based assessment approaches indicate that a

considerable segment of those vulnerable households are the non-poor. This implies that intervention efforts which ignore the non-poor, by following the conventional stance of only targeting the currently poor, are not enough. The risk of pervasive future poverty would likely embrace middle wealth and wealthy stock owners who periodically slip into poverty. This would definitely worsen the already daunting task of fighting poverty in the marginal environments. The profound immiserizing effect of the vulnerability of the non-poor in the context of the traditional pastoralist community of massive social capital is that it could even potentially further undermine the existing indigenous social welfare mechanism of protecting the poor.

The exploratory results of the dynamics of shifts in wealth status and vulnerability to asset poverty demonstrated by the longitudinal sub-sample fairly convey a clear message to rangeland development planners both at the regional and national levels. It is not only that the poor appear to have become poorer but a considerable proportion of the non-poor have also slipped into poverty. This fairly implies that the peripheral pastoralist community may have rather remained too remote to enjoy the benefits of Ethiopia's reported spectacular growth performance in recent years. Therefore, in addition to the required concerted effort of improving the status of the trapped destitute, the need to defend the position of the non-poor has also become inevitably more important, given the existing condition of recurrent asset shock exposures, than the prevailing instance of merely targeting the poor alone. This requires investment in sustained and effective human development efforts, which vitally include skill training and other relevant interventions in order to support large stock owners to adopt risk management diverse wealth portfolios through a gradual shift to high return non-pastoral activity investments. The needed special attention and very careful stance of planned interventions in the rangelands may include the adoption of comprehensive and

participatory range rehabilitation programmes directed to reclaim the natural capital base of the pastoralist system. In all this, however, the required additional resource commitment efforts should not imply designs in which substantially improving the status of the currently poor is compromised. All in all, successfully transformative interventions in Ethiopia's pastoralist territories primarily entail a better informed genuine policy commitment that is compatible with the will and dire development needs of the people.

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Appendix Tables

Table A1: Definition and descriptive statistics of selected variables

Variable	Observations	Description	Mean	SD
Cattle size	327	Size of cattle owned by the household	12.0	20.7
Per capita consumption	327	Per capita consumption expenditure in adult equivalent measure (Eth. Birr)	6433.5	5930.1
Age of household head	327	Age of household head	55	16.9
Gender of household head	327	Dummy for gender of household head, 1 if male; 0 otherwise	0.85	0.4
Household size	327	Household size	6.1	2.7
Education	327	Household head level of education in years	0.3	1.3
Livestock size	327	Livestock size in a standardized unit (TLU)	13.7	20.1
Shock survival index	327	Shock survival index (see text for explanation)	1.18	1.1
Participation in dryland farming	327	Adoption of cereal cultivation, 1 if yes; 0 otherwise	0.65	0.5
Low-return activity participation	327	Low-return non-pastoral activity participation such as casual labour, 1 if yes; 0 otherwise	0.39	0.5
Wealth portfolio status	327	Conversion of livestock assets to relatively high return non-pastoral activities such as trade & real estate investments in rangeland towns, 1 if yes; 0 otherwise	0.11	0.3
Distance	327	Distance from main market centre (km)	45.3	34.0

Table A2: The underlying regressions for consumption and household asset holdings

	Log consumption per capita	P-values	Log cattle holding	P-values
Age of household head	-0.0328* (0.0170)	0.055	-0.0577* (0.0308)	0.063
Age squared	0.0002 (0.0001)	0.189	0.0004 (0.0003)	0.105
Gender of household head (male=1)	0.3159*** (0.1147)	0.006	0.4389** (0.2057)	0.034
Household size	-0.0647*** (0.0180)	0.000	0.1632*** (0.0304)	0.000
Education	-0.0123 (0.0309)	0.691	0.0434 (0.055)	0.433
Livestock size	0.0253*** (0.0022)	0.000		
Shock survival index			0.4311 (0.0698)	0.000
Participation in dryland farming	0.2252* (0.1192)	0.060		
Low-return activity participation	-0.0947 (0.0861)	0.272	-0.6618*** (0.1531)	0.000
Distance	0.0029* (.0017)	0.077	0.0008 (0.0021)	0.724
Constant	9.133*** (0.4625)	0.000	1.725** (0.8161)	0.035
F(9, 317)	22.05	0.000	18.04	
N	327		327	
R ²	0.39		0.31	

Note: Numbers in parenthesis are standard errors; *** significant at 1 per cent level; **significant at 5 per cent level; * significant at 10 per cent level.