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The Dynamics of Poverty and Vulnerability in Rural Ethiopia

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Abstract

This paper uses the Ethiopian Rural Household Survey (ERHS) panel data of a pool of 2495 households sampled from sedentary farming systems of the country. It investigates the dynamics and determinants of poverty and vulnerability and generates new empirical information on the national dynamics, determinants, and regional distribution of rural poverty and vulnerability. The poverty indices show that depth and severity of poverty were reduced, respectively, from 88.9% and 3.6% in 2004 to 39.2% and 0.7% in 2009, but with increasing poverty incidence. The estimation results from the random effects probit model suggest that determinants of poverty status in rural Ethiopia between 2004 and 2009 were household size, livestock holding, farming occupation, life status, social network, regional dummies, and other exogenous shocks. The marginal effects of these factors on poverty status point out that there were considerable differences in poverty situation among regional states, suggesting that poverty reduction was relatively more enhanced in Oromia followed by Amhara and SNNP regions. The likelihood of households to be poor was about 45.4%. Assuming a threshold of 50%, vulnerability of households in rural Ethiopia was about 43.4%, suggesting that households' vulnerable to poverty as recued between 2004 and 2009. While many households were escaping from poverty, others were descending into the poverty trap, indicating reduction of relative poverty among the poor and the nonpoor. In order to reduce overall poverty in rural Ethiopia, integrated poverty reduction efforts should be enhanced and spatial differences in welfare effects need to be accounted for.

Key words: Poverty, vulnerability, panel probit, Ethiopia.

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1. Introduction

Ethiopia has been implementing different poverty reduction and food security policies, strategies and programs in the last two decades (FDRE, 2004; MoFED, 2006). The empirical literature on the effectiveness of these initiatives is, however, suffocated by a number of diverging arguments. The first view is that there are positive developments of poverty reduction in Ethiopia (MEDAC, 1999; Dercon, 2004; Naschold, 2005). A large majority of scholars argue that these positive developments are the effects of methodological and sampling problems arising from less representative data, resulting in incorrect implications. The divergences are created for the fact that the appropriate methods and the data requirements for poverty measurements are not met by most developing countries (Devereux and Sharp, 2003; Kitaw and Woldemichael, 2008; Krishna, 2007).

In 1999, 50% of the Ethiopian population were living below the food poverty line and could not meet their daily minimum nutritional requirement of 2200 calories (MEDAC, 1999). However, there is evidence on substantial consumption growth in 1989–1997 with diverse experiences across villages and individuals (Dercon, 2004). Other pieces of evidence fully supporting this scenario verify that households in rural Ethiopia do not face asset poverty traps, but instead would be expected to gravitate towards longrun equilibrium (Naschold, 2005).

There are arguments against the belief that poverty in rural Ethiopia has fallen since the early 1990s mainly due to problems related to methodological limitations, the measures of welfare used, and counter arguments attributed to other qualitative studies (Devereux and Sharp, 2003). It is also reported that households in rural Ethiopia move frequently in and out of poverty but the difficulty of exiting poverty increases with the time spent under the poverty trap (Bigsten and Shimeles, 2007)]. This nature of poverty in Ethiopia is supported by other pieces of evidence verifying that poverty is inherently dynamic whereby large numbers of people were

escaping from poverty at any given time, while equally large numbers were also falling into poverty simultaneously (Krishna, 2007; Awel, 2007). In relative terms, while the number of households in persistent poverty was relatively low, a very high majority in rural areas were poor at least once during the period (Kitaw and Woldemichael, 2008). However, the assertion that shocks have different and more durable effects on the less well-off households is partially disproved since drought shocks were less significant in determining the dynamics of poverty status in the last decade (Carter et al., 2007). There was also high risk aversion with implications for long-term poverty and links between risk aversion and poverty traps in the highlands of Ethiopia (Yesuf and Bluffstone, 2009).

To address these diverging arguments, it is important to define the concepts of both poverty and vulnerability addressed in this study. Poverty can be defined as the human condition characterized by the sustained deprivation of resources, capabilities, choices, power, and security necessary for an adequate standard of living, and other rights. Extreme poverty refers to people who live on or less than US \$1 a day, whereas poverty is living on or less than \$2 a day (WB, 2001). Absolute poverty refers to subsistence below minimum, socially acceptable living conditions. Poverty analysis can be approached from objective or subjective perspectives. The objective perspective involves normative judgments as to what constitutes poverty and what is required to move people out of their impoverished state. The subjective approach places a premium on peoples' preferences, on how much they value goods and services. This paper uses the objective approach for its relative advantage of objectivity (Philip and Rayhna, 2004). Similarly, vulnerability can be defined as the human conditions determined by physical, social, economic, and environmental factors and processes, which increase the susceptibility or the likelihood of a community to the impact of hazards (UN/ISDR, 2004; UNDP, 2004). What distinguishes poverty and vulnerability is the presence of risk or uncertainty about the future well-being of households (Chaudhuri, 2003).

As evidenced, all the above arguments on the analysis of poverty dynamics and vulnerability in rural Ethiopia are generally associated with methodological approach and data coverage. Although several measurements and techniques of analyzing dynamics of poverty and vulnerability have recently been proposed, empirical studies are still rare in Ethiopia. This departure of views would be converged if more relevant estimation techniques and representative data coverage are used. Thus, this paper was designed to estimate the dynamics of poverty and vulnerability and to identify their determinants and correlates by employing panel data estimators.

2. Methodology

2.1 Dataset and variables

The paper uses the Ethiopian Rural Household Survey (ERHS) panel data, which is a multi-topic national representative survey on rural households conducted for seven rounds from 1989 to 2009. It covers the four major regional states (Amhara, Oromia, Tigray, and Southern Nations, Nationalities and Peoples regional state or SNNP)) and more than 1346 households (Dercon and Hoddinott, 2009). In this paper, poverty status was determined by the level of households' real consumption per capita in 1994 prices in reference to the poverty line of Ethiopian Birr (ETB) 50. Households with real consumption per capita below ETB 50 were considered poor and those above this threshold as nonpoor. To examine the predictors of poverty and vulnerability, standard univariate panel probit model was employed.

The hypothesized determinants of poverty and correlates of vulnerability include age, educational level, household size, marital status, livestock holding, and primary occupation of farming, occurrence of drought shocks, different levels of living status, regional dummies, and social network. Welfare effects of time, household characteristics, and other variables were captured by testing all the variables for the presence of significant mean

difference between survey years and poverty status (Table 1). The mean/proportion-comparison test results show that mean real per capita consumption of households was reduced over time, possibly verifying the negative impact of production, market and other economic shocks between 2004 and 2009. Except for household size and the three ladders of life status, the mean values/proportions of all other variables were significantly different between 2004 and 2009. Again, with the exception of age and farming occupation, the mean values of all other variables were considerably different between the poor and the nonpoor.

Table 1: Definition of variables and mean/proportion comparison tests by survey year and poverty status

Variable definition	Measurement level	Survey year			Poverty status		
		2004	2009	t-(z) value	Non-poor	Poor	t-(z) value
Age of the household head	Continuous (years)	50.54	52.63	-3.444***	51.91	51.38	0.877
Education level of the household head	Continuous (years of schooling)	3.82	5.29	-5.329***	5.18	3.97	4.394***
Household size	Continuous	5.72	5.70	0.239	5.27	6.23	-9.520***
Livestock holding (TLU)	Continuous	2.89	4.89	-10.770***	4.68	3.14	8.233***
Real per capita consumption	Continuous, ETB	87.43	59.15	10.372***	107.32	30.60	33.002***
Marital status	Dummy (1 if married, 0 otherwise)	0.69	0.66	2.042**	0.65	0.70	-2.658***
Farming occupation	Dummy (1 if primary, 0 otherwise)	0.74	0.71	1.349*	0.72	0.72	0.219
Drought	Dummy (1 if drought occurred, 0 otherwise)	0.59	0.40	9.350***	0.42	0.57	-7.7256***
Worse-off living status	Dummy (1 if worse-off, 0 otherwise)	0.31	0.32	-0.546	0.25	0.39	-7.738***
Middle-level living status	Dummy (1 if middle-level, 0 otherwise)	0.63	0.61	0.708	0.66	0.57	4.490***
Better-off living status	Dummy (1 if better-off, 0 otherwise)	0.06	0.06	-0.406	0.09	0.03	6.135***
Tigray	Dummy (1 if Tigray, 0 otherwise)	0.09	0.11	-1.628**	0.05	0.16	-9.275***
Oromia	Dummy (1 if Oromia, 0 otherwise)	0.22	0.27	-3.245***	0.30	0.18	6.938***
Amhara	Dummy (1 if Amhara, 0 otherwise)	0.35	0.31	2.107**	0.42	0.21	11.062***
SNNP	Dummy (1 if SNNP, 0 otherwise)	0.34	0.31	1.931**	0.23	0.44	-11.492***
Social network	Dummy (1 if Socially networked, 0 otherwise)	0.57	0.73	-7.974***	0.72	0.59	6.803***

Notes: ***, ** and * is significant at 1%, 5%, and 10% level, respectively.

2.2 Estimation methods

A popular model for binary outcomes with panel data, poor or nonpoor in this case, is the unobserved effects probit model. The specification of unobserved effects (or panel) probit model is (Maddala, 1987; Bertschek and Lechner, 1998; Wooldridge, 2002; Greene, 2012)

$$\Pr(y_{it} = 1 | \mathbf{x}_{it}, \alpha_i) = \Phi(\mathbf{x}'_{it} \boldsymbol{\beta} + \alpha_i) \quad t = 1, \dots, T \quad (1)$$

$$y_{it} = \begin{cases} 1 & \text{if } \text{poor}, y_{it} > 0 \\ 0 & \text{otherwise}, y_{it} \leq 0 \end{cases} \quad (2)$$

where \Pr is the probability of a household to be poor, y_{it} is poverty status of household i in year t , \mathbf{x}_i is a vector of explanatory variables (\mathbf{x}_i contains \mathbf{x}_{it} for all t), Φ is the standard normal (probit) distribution function, $\boldsymbol{\beta}_i$ is a vector of parameters, and α_i is the unobserved effect.

The expected consumption dynamics was predicted by a linear panel data estimator (RE model) and household's expected poverty status was determined from this estimate. Accordingly, vulnerability as expected poverty (V) and its correlates were identified as (Dutta et al., 2010; Pritchett et al., 2000; Philip and Rayhna, 2004)

$$V_{it} = \Pr(c_{i,t+1} < z | \mathbf{x}_i, \boldsymbol{\beta}_t, \alpha_i, \varepsilon_{it}) \quad (3)$$

where $c_{i,t+1}$ is the household's real consumption per capita at time $t + 1$, z is the poverty line, α_i and ε_{it} , respectively, are unobservable time-invariant household-level effects and idiosyncratic factors that contribute to differential welfare outcomes, and other notations as explained before.

A household is then considered as vulnerable to poverty if its expected vulnerability is larger than a probability threshold level assumed, p :

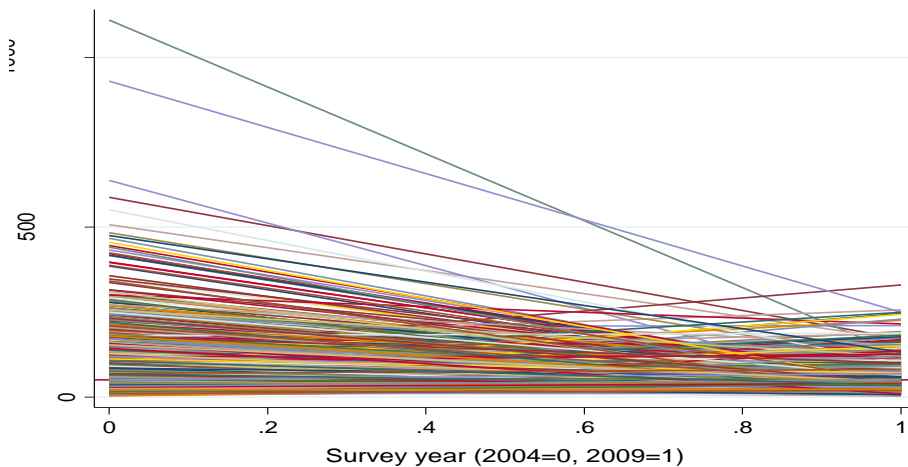
$$V_i = \begin{cases} 1 & \text{if } V_i > p \\ 0 & \text{if } V_i \leq 0. \end{cases} \quad (4)$$

3. Results and Discussion

3.1 Consumption Patterns

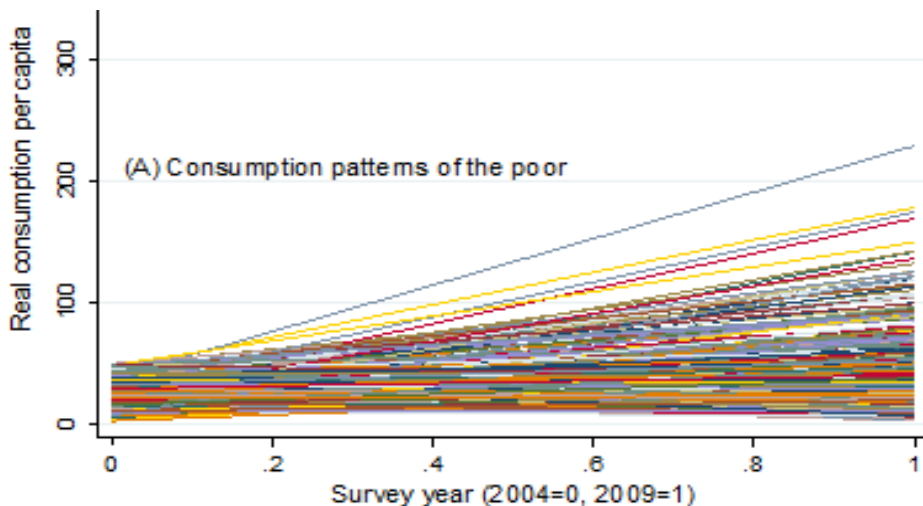
Descriptive and econometric analyses can explain the expected dynamics of poverty and vulnerability at an aggregate level. However, because these measures are highly aggregated, it is hard to distinguish whether consumption is decreasing or increasing between 2004 and 2009. Figure 1 demonstrates the patterns of real consumption per capita which enables to easily visualize overall consumption trends in rural Ethiopia between 2004 and 2009. As illustrated, the pattern of real consumption was clearly declining until 2007 but trendless thereafter. According to this consumption pattern, is poverty really decreasing in rural Ethiopia?

Figure 1: Panel plot of patterns of real consumption per capita in rural Ethiopia (2004-2009)



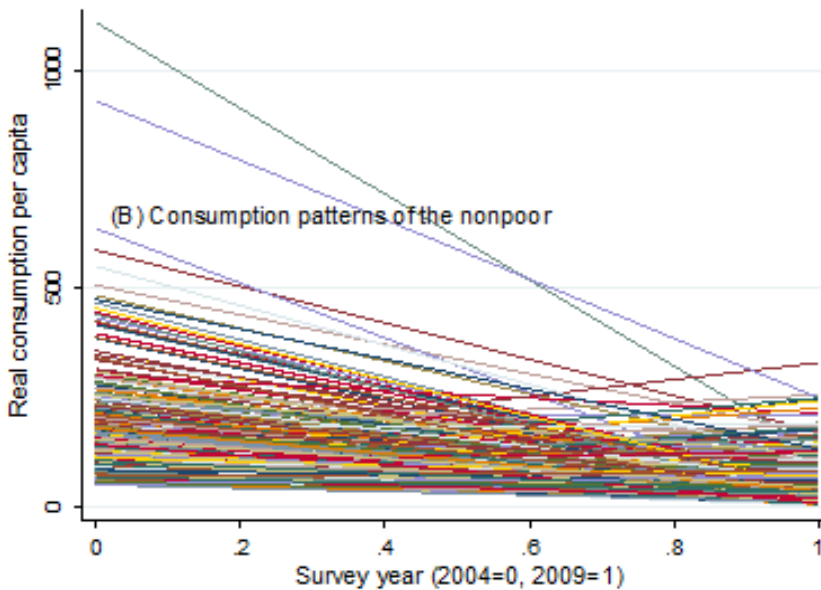
To illuminate the grey areas of the overall trends, patterns of real consumption per capita of the poor and the nonpoor in 2004 were illustrated. Figure 2 decomposes the overall consumption trend depicted in Figure 1 into consumption patterns of different groups of sample households: the poor and the nonpoor in 2004. Their consumption patterns were separately plotted to visualize the dynamic nature of absolute and relative poverty between 2004 and 2009. The panel data line plots of real consumption per capita for the poor indicated in panel A of the figure clearly depict the observed positive consumption trends of the absolutely poor households. A general upward trend is observed though the majority of the poor are still under persistent poverty trap. These results are partly in line with some previous studies like Naschold (2005) in that households would be expected to gravitate towards one longrun equilibrium. However, a great majority of the poor households didn't exhibit an upward trend to escape from poverty.

Figure 2: Panel plots of the dynamics of absolute and relative poverty between 2004 and 2009



Unlike the general positive trends of consumption by the poor households, the pattern of real consumption per capita by the nonpoor was generally declining until 2007 (Panel B of the figure). Many households have descended while the

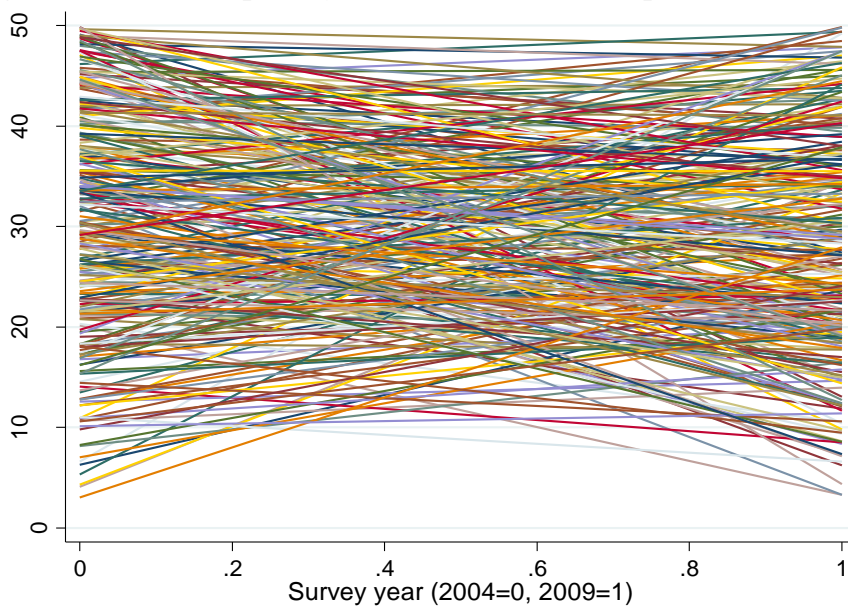
absolutely poor households have started to escape from poverty. In other words, many nonpoor households have descended while the poor escaped from poverty. This leads to increased incidences of overall poverty but reduced absolute and relative poverty. It is also the critical source of various arguments on whether poverty is really decreasing in rural Ethiopia. The general rise in real consumption per capita after 2007 is an indication of reduced depth and severity of poverty while the increased number of descents before 2007 is an evidence of increased poverty incidence.



However, achieving faster poverty reduction requires speeding up the pace of escapes while concurrently slowing down the rate of descents into poverty as supported by Krishna (2007). The symmetry of descents into and escapes from poverty is illustrated in Figure 3. The symmetry is demonstrated by selecting poor households in the two survey years and plotting their real consumption dynamics under the poverty trap between 2004 and 2009. If the speed at which households are descending into poverty is greater than the speed of households escaping from poverty, most households generally

remain trapped into poverty. This evidence is supported by the results from previous studies by Bigsten and Shimeles (2007), and Kitaw and Woldemichael (2008). The majority of poor households in 2004 had slowly moved upward to reduce their poverty gap and eventually to escape from the poverty trap. On the other hand, households identified as poor in 2009 had been descending into the poverty trap since 2004 or before.

Figure 3: Patterns of poverty incidence in rural Ethiopia (2004-2009)



As depicted by the figure, the concept that escaping from poverty in rural Ethiopia is a longrun phenomenon while descending into poverty was a shortrun event is partly supported. Many households descend to poverty while many others are escaping; ultimately leading to diluted net welfare effects of poverty reduction efforts. These mixed patterns of poverty dynamics for the poor and the nonpoor are the major sources of differentiated conclusions and recommendations on the effects of poverty reduction policies in rural Ethiopia.

3.2 Regional Distribution of Poverty

Table 2 reports the regional mean consumption levels of households between 2004 and 2009. With the exception of Oromia regional state, the regional mean household real consumption per capita had exhibited deteriorating trends in all other regions within the five-year period. The decline was more severe in Tigray and Amhara regional states. This is an evidence to demonstrate as to how regional differences are relevant to capture spatial distribution of poverty dynamics. However, it would be misleading to interpret the regional welfare effects as indicators of efficiency of regional policy implementation because regions are considerably different in terms of their resource endowments or livelihoods (physical, natural, social, and even human and financial capital) in the base year.

Table 2: Regional trends of real consumption per capita between 2004 and 2009

Regional state	Survey year			Changes in real consumption per capita
	2004	2009	Both	
Tigray	66.9	27.5	43.8	-39.4
Amhara	119.8	64.7	91.7	-55.1
Oromia	78.0	85.4	82.4	7.4
SNNP	66.3	41.58	53.7	-24.7
Country level	87.4	59.2	72.2	-28.3

Table 3 reports the regional distribution of incidence of rural poverty. Incidence of poverty was considerably reduced in Oromia and SNNP regions whereas it was rather aggravated in Tigray and Amhara. At national level, poverty incidence was raised by about 15.4%. This is in line with the rising real consumption per capita observed in Oromia region.

Table 3: Regional distribution of poverty incidence between 2004 and 2009

Survey year and poverty status	Tigray	Amhara	Oromia	SNNP	Total
2004					
Poor	46	73	105	207	431
Nonpoor	58	325	145	190	718
Total	104	398	250	397	1149
Poverty incidence (%)	44.2	18.3	42.0	52.1	37.5
2009					
Poor	139	170	104	299	712
Nonpoor	9	244	265	116	634
Total	148	414	369	415	1346
Poverty incidence (%)	48.4	29.1	22.0	41.9	52.9
Changes in poverty incidence (%)	4.2	10.8	-20.0	-10.2	15.4

Table 4 combines and reports the poverty indices: the head count index, the poverty gap index, and the squared poverty gap index (Foster et al., 1984). As explained by the poverty indices, incidence of rural poverty was increased from 37.5% in 2004 to 52.9% in 2009, which is considerably higher than the 30.4% incidence of poverty estimated by the government in 2010/11(FDRE, 2012). However, the poverty gap index was reduced from 88.8% in 2004 to 39.2% in 2009, suggesting the presence of accelerated reduction of depth or intensity of poverty. Severity of poverty was also reduced from 3.6% in 2004 to 0.7% in 2009. The results generally point out that the depth and severity of poverty were reduced; supporting the results of previous studies by Dercon (2004), Naschold (2005) and FDRE (2012) and the implications of the consumption patterns depicted by the graphic illustrations in this paper.

Table 4: Incidence, intensity, and severity of poverty in rural Ethiopia

Measures of poverty	Survey year		Changes in poverty measures
	2004	2009	
Head count index (%)	37.5	52.9	15.4
Mean poverty gap (ETB)	44.4	19.6	-24.8
Poverty gap index (%)	88.8	39.2	-49.6
Squared poverty gap (%)	3.56	0.7	-2.86

3.3 Sources of Poverty and Vulnerability

The panel probit model estimation results of poverty and vulnerability status are reported in Table 5. The parameter estimation results are consistent in terms of signs and levels of significance. Out of the hypothesized determinants of poverty in rural Ethiopia, ten of them were significant.

The determinants of poverty dynamics and status contributing to poverty reduction in rural Ethiopia were livestock holding, farming occupation (weakly), social capital (the ability of a household to get an emergency financial access as a proxy for social network or capital), regional state, and other exogenous shocks, most of which are supported by previous studies including Devereux and Sharp (2003), Carter et al. (2007) and Woolard and Klasen (2004). With different effects in magnitude, regions (not just states) had their own role on poverty reduction. Household size, marital status (weakly) and the lower levels of living status can be considered as sources of poverty aggravating the likelihood of households to be poor by reinforcing poverty. As expected, households living at the lower level of the ladder of life were more vulnerable to poverty. The results suggest that the likelihood of households to be poor between 2004 and 2009 was 45.4%.

Table 5: Determinants and correlates of poverty and vulnerability in rural Ethiopia

Variables	Coefficients (poverty)	Marginal effects	
		Poverty	Vulnerability
Age	0.000	0.054	-0.001*
Educational level	-0.001	-0.001	-0.006***
Household size	0.135***	0.054***	0.083***
Marital status	0.126*	0.050*	0.040
Livestock holding	-0.027***	-0.011***	-0.028***
Farming occupation	-0.140*	-0.055*	-0.008
Drought	0.028	-0.008	0.038**
Worse-off living status	0.780***	0.303***	0.364***
Middle-level living status	0.464***	0.180***	0.185***
Oromia	-0.998***	-0.358***	-0.415***
Amhara	-0.865***	-0.323***	-0.352***
SNNP	-0.297**	-0.116**	-0.136***
Social network	-0.233***	0.093***	-0.214***
Constant	-0.508**		
Poverty index	0.454		
Vulnerability index	0.434		
Observations	2408		

Note: ***, ** and * is significant at 1% , 5% , and 10% level, respectively.

This study has shown that, for a unit change in household size across time and between households, the probability of a household to be poor increases by about 5.4%, showing the effort required to enhance poverty reduction through promotion of family planning. The same unit change in livestock holding results in a decreasing probability of 1.1%, emphasizing the need to enhance livestock production and productivity as an entry to poverty reduction. As compared to Tigray, the probability of poverty by decreases by about 35.8% in Oromia, 32.3% in Amhara, and 11.6% in SNNP region. This clearly shows that poverty reduction was relatively more enhanced in Oromia followed by Amhara and SNNP regions. This might be the result of differences in natural capital (land, agroecology and other resource bases)

endowed to the regions, or regionally differentiated poverty reduction policies and strategies, or a combination of both. Social network of households had a role to reduce the probability to be poor by about 9.3%. For the same discrete change in marital status, worse-off living status, and middle-level living status, the likelihood of households to be poor increases, respectively, by about 5.0%, 30.3%, and 18.0%.

Unlike the results in poverty analysis, the estimation results of correlates of vulnerability to poverty had three different implications. Educational level was identified to be a strong correlate of reducing vulnerability of households, suggesting the need to produce educated farmers in the country. Occurrence of drought shock was also relevant correlate of vulnerability to poverty. Marital status and primary occupation of farming were uncorrelated variables with vulnerability. Compared to the results in poverty analysis, there were also improvements in the marginal effects of many correlates. Assuming vulnerability threshold of 50%, the estimated vulnerability index of 43.4% verifies that vulnerability of households in rural Ethiopia was fairly reduced. They are expected to escape from poverty and gravitate to better wellbeing, which supports the results of some previous studies by Dercon (2004) and Naschold (2005).

4. Conclusion and Recommendation

This study investigates the dynamics of poverty and vulnerability and identifies the sources of poverty and correlates of vulnerability to poverty in rural Ethiopia. The results clearly point out that depth and severity of poverty were considerably reduced between 2004 and 2009, leading to reduction of relative poverty between the poor and the nonpoor. The likelihood of households to be poor was reduced suggesting that they were escaping from poverty. Determinants of poverty status in rural Ethiopia between 2004 and 2009 were household size, marital status, livestock holding, farming occupation, life status, social network, regional dummies, and other omitted idiosyncratic and covariate shocks. The estimated

marginal effects show that there were considerable divergences among regional states in terms of poverty reduction effects.

In their desire to bring about accelerated poverty reduction effects, policy makers need to design relevant policies accounting for the shortrun and longrun dynamics of poverty and vulnerability in rural Ethiopia. The regional differences in poverty reduction effects could be optimized by adopting area-specific poverty reduction strategies so that more households would escape out of the poverty trap and move to long-term welfare effects. Some sources of poverty associated with the positive effects of idiosyncratic features of households, like family size, on poverty should be reversed by relevant policy interventions including family planning. Further study is important to empirically verify the sources of regional differences in terms of poverty reduction which will assist in designing and implementing area-specific poverty reduction intervention to bring about overall development in rural Ethiopia.

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