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Dynamics of Poverty among Smallholder Farmers in Ethiopia

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Abstract
Wide spread poverty is perhaps the single most serious challenge facing Ethiopia. The country is one of the poorest in the world with high level of poverty incidence, and low level of percapita income and human development. This study employed the Jallan and Ravallion approach of modeling transient and chronic poverty components and separately estimated their respective correlates using Tobit model. The results from the Tobit model regressions show that households with relatively large number of younger children and those headed by heads with low formal educational attainment are more likely to fall in to transient and chronic poverty. Households headed by female also tend to be chronically and transiently poor. Other factors contributing to chronic and transient poverty include small farm sizes, lower value of total livestock owned, and occurrence of drought, episode of catastrophic disaster and absence of irrigation schemes. On the other hand, while use of modern agricultural inputs and access to credit are associated with lower chronic poverty, off farm income, higher value of crops sold, informal education received by the head of the household and cultivation of chat and teff significantly reduce transient poverty. Sorghum cultivation is inversely related with chronic and transient poverty. Coffee is related with higher chronic poverty whereas enset is associated with higher transient poverty. The policy implications based on the findings of the study includes: expansion of education, creating access to modern inputs, provision of credit, promoting birth control, promoting cultivation of high yield crops and expansion of off-farm employment opportunities for the rural poor.
Keywords: transient poverty, chronic poverty, Tobit, components approach

1. INTRODUCTION

The problem of poverty as distinct from economic growth has been an issue of development agenda mainly since the liberalization of developing countries from colonial rule. Before the 19707s, economic development was seen merely as an increase in the growth of GNP/GDP per capita (Ahluwalia, 1978). The problems of poverty, unemployment, and income distribution were given secondary importance. It was believed that the gains from the growth of GNP would automatically trickle down to the poor in the form of increased employment and earning opportunities in the long run (Prebisch, 1953; Myrdal, 1957). However, contrary to this thinking, economic growth in many new developing countries was being accompanied by rising disparities in personal as well as regional incomes, rising unemployment, worsening social services and increasing absolute and relative poverty. Development failed to improve the living of the masses (Adelman and Morris, 1973; Ahluwalia, 1978; ILO, 1977). This condition sparked the need to reconsider the development process.

A number of reformist strategies which pay varying attention to the problem of poverty and various related issues have been suggested since the early seventies. Yet the stubborn persistence of poverty is conceivably the most serious challenge facing the people, governments and development practitioners in contemporary developing countries. It is only in countries of East and South East Asia that real success in poverty reduction has been achieved. Outside this region, the improvement is rather disappointing. Sub-Saharan Africa and South Asia, particularly, are the major heavens of poverty (Islam, 2004).

Ethiopia, being a sub Saharan country, is one of the poorest countries in the world by any standard. According to the Population Census Commission of the Federal Democratic Republic of Ethiopia (2008), around 83% the population is concentrated in the rural areas. In the face of traditional technology, sever environmental degradation, frequent incidence of drought and growing number of population, however, agricultural productivity of the country has been deteriorating (Markos, 2001; Getahun, 2003). The increased incidence and severity of drought have caused major fluctuations in agricultural and economic growth and many people have suffered from protracted famine.

Despite the track record of double digit economic growth reported by the government in recent years, low levels of income, savings and agricultural productivity, limited implementation capacity, and high level of unemployment remained serious challenges of the economy and perpetuate the widespread poverty in the country (MoFED, 2008). Similarly, according to Islam (2004), the “moderate economic growth” achieved in

Ethiopia in the 1990s did not have any significant impact on poverty reduction in the country.
The low levels of development indexes of the country disclosed by national and international organizations and researchers confirm the poor condition of the country. According to the study of the Welfare Monitoring Unit (WMU) of the Ministry of Finance and Economic Development (MoFED, 2002), in 199/00, 45.5% of the population of Ethiopia was under absolute poverty. The study also showed that, for the same period, more than 2/3 of the children appeared stunted (low height to age ratio) and close to one in ten showed signs of wasting (low weight to height ratio). The 2000 and 2009 UNDP Human Development Reports ranked Ethiopia 171st out of 174 and 182 countries, respectively (UNDP, 2000, 2009). Moreover, according to the UNDP (2009), life expectancy at birth is 54.7 years, adult literacy rate is 35.9% and primary school enrolment gross rate is 49%. The Human Development Report also ranks the country 130th out of the 135 developing countries. Likewise, WHO (2010) pointed out that while 38% of the population has access to safe water, only 12% of the population has adequate sanitation in 2010. In the same year, 48.5 % of the rural population and 23.9% the urban population suffered from chronic malnutrition. These low development records are reflections of the high level of poverty status in the country.
There are a number of studies conducted on incidence, and determinants of poverty in ethiopia. For instance: Swanepoel (2005), Dercon (2002), Dercon (2001), Bogale and Korf (2009), Hagos and Holden (2003), Brown and Teshome (2007), Asmamaw (2004), (Bigsten and Abebe, 2004) and Dercon (1999), among others, can be mentioned among others. However these studies, except Swanepoel (2005) and (Bigsten and Abebe, 2004), did not provide a separate analysis of transient and chronic/permanent poverty in the country, while the determinants and policy requirements of such componenets of poverty may be quite different. Swanepol (20005) analyzed the dynamics of poverty in Ethiopia using the1994, 1995 and 1997 rounds of the Ethiopian Rural Household survey and Bigsten and Abebe (2004) carried out similar study by adding one more round data (2004) of ERHS. Beyond this, the available literature provides information on total poverty. Given the changing nature of poverty and its determinants with changes in the social, economic and political arena of the country, studies should be continuous with the utilization of recent data. The purpose of this study, therefore, is to analyze the determinants of chronic and transient components of poverty in Ethiopia and scrutinize whether the current generalist view of poverty research hegemony in Ethiopia provides the right information for policy formulation using relatively the recent using recent data.

2. DATA AND METHODOLOGY

2.1. Data

This study uses a household panel survey dataset from the Ethiopian Rural Household Survey (ERHS) that covers a total of 1569 households in 18 peasant associations in Ethiopia conducted in 1999, 2004 and 2009. The data was collected by the Department of Economics at the Addis Ababa University in collaboration with Center for the Study of African Economics at Oxford University and the International Food Policy Research Institute, Washington. This is the only panel data available so far on the rural population of Ethiopia.
The survey includes three main sedentary farming system agro ecological zones – the plough-based cereals farming systems of the Northern and Central Highlands, mixed plough/hoe cereals farming systems, and farming systems based around enset (a root crop also called false banana) that is grown in southern parts of the country. The sample is collected so that it can be representative of the small holder sedentary farming system of the country.
The sampling technique used was stratified sampling to take into account of diversities in agro-ecological factors in the small scale agricultural areas of the country and to include landless labourers and females in each Peasant Associations (PAs). The attrition rate was as low as 3% mainly because land is immobile and acquiring new one in the area of arrival is difficult too (Dercon and Krishnan, 1998).
The data cover households' living conditions, including income, expenditure, occupation, demographic aspects, health and education status, occupation, production activities, asset ownership and several other important aspects of the household economy.
The major source of price to compute the monetary value of commodities is the separate price survey conducted simultaneously with the ERHS in each PAs or the nearby tow. Whenever prices for some commodities in some PAs are missing from the ERHS, the price data collected by the Central Statistical Agency (CSA) at zone level are used. The CSA reports the prices of food and non-food items for each zone and major towns in Ethiopia both quarterly and every year.

2.2. Method of Analysis

This study uses consumption expenditure as a measure of welfare/poverty. Consumption is a generally preferred measures of welfare compared to other measures such as income (Ravallion, 1992; Lipton and Ravallion, 1995; Deaton, 1997; Kanbur and Squire, 1999; Atkinson, 1989).

Once the measurement index of poverty and the poverty line have been chosen, the various characteristics of the sample can be modeled to identify the determinants of rural poverty. Poverty status and changes are affected by both microeconomic and macroeconomic variables. Within a microeconomic context, as prime concern of the present study, the simplest method of analyzing the determinants of poverty is the econometric technique, in terms of regression analysis.

Consumption has long lasting or chronic and temporary or transient components, decomposition of which is possible with the use of longitudinal data. Failure to separate the two components of poverty in any poverty analysis may result in misunderstanding of the poverty state and reduces the effectiveness of anti-poverty policies (Jallan and Ravallion, 1998). There is widespread chronic poverty in Ethiopia, but along with that households also suffer spells of transient poverty (Bigsten and Abebe, 2004). Hence, this study decomposes total (intertemporal) poverty into chronic and transient components and attempts to identify their respective determinants in the case of the small holder agricultural regions of Ethiopia. To this end, the components approach of chronic-transient poverty decomposition is used.

Model Specification

The procedure for examining poverty determinants involves two steps. The first is measuring aggregate poverty and its chronic and transient components. Based on the measures, the study then investigates their causes through estimating econometric models.

According to Jallan and Ravallion (1998), the poverty measure in the components approach should be additive over time and across individuals, strictly convex and decreasing up to the poverty line (and taking a value of zero thereafter). The convexity assumption rules out the use of the headcount and poverty gap measures. Hence, we use the squared poverty gap index as a measure of poverty.

The squared poverty gap index is a class of the Foster-Greer- Thorbecke class of poverty measures given by the general formula: $P_a(x,z) = \frac{1}{n}\sum_{i=1}^{n}(\frac{g_i}{z})^a$

Where, x represents income, z is the poverty line, q is the number of the poor; g^i is shortfall in chosen indicator of standard of living, say per adult equivalent consumption expenditure shortfall of the i^{th} household. That is, let x^i denote the per capita expenditure of household i, then $g^i = z - x^i$ if $x^i < z$;

$= 0$, if $x^i \geq z$.

α represents poverty aversion parameter (measures with larger α are more sensitive to the poorest of the poor). For α = 0, Pα will be equal to the poverty headcount ratio; for α = 1, Pα will be equal to the normalized poverty gap and for α = 2, Pα will be equal to the squared normalized poverty gap ratio (Foster et al., 1984).

In this study, the squared poverty gap for each household is computed from the per-adult-equivalent consumption expenditure of the household. The dependant variables used in this components approach- chronic poverty measure and transient poverty measure- are poverty gap indices derived from different types of consumption expenditures of the household. The derivation process for these dependant variables is shown below.

The poverty gap of individual i at the time t normalized by poverty line is defined as

$g_{it} = (1 - \frac{Y_{it}}{Z})$, if $Y^{it} < Z$ and,

$= 0$, if $Y^{it} \geq Z$

Where Y^{it} is an indicator of well-being (per adult equivalent level of consumption for the present study) and Z refers to the poverty line. Based on the poverty gap, the total poverty index of individual i over time can be defined in the following equation:

$P_i = \frac{1}{N}\sum_{t=1}^{N} g^2{}_i$, where N is the number of time periods observed.

Similarly, the chronic poverty index is defined in the following equation based on permanent consumption of individual i:

$$C_i = \begin{cases} (1 - \frac{\hat{Y}_i}{Z})^2 \ if \ \hat{Y}_i < Z \\ 0 \ if \ \hat{Y}_i \geq Z \end{cases}$$

Where $\hat{Y}^i$ denotes permanent consumption of individual i which, in practice, is usually estimated as mean consumption of the individual over time.

$$\hat{Y}^i = \frac{1}{n}\sum_{t=1}^{n} m_{it}$$

Where, $\hat{Y}^i$ is average or permanent consumption of individual i, m_{it} is the consumption level of individual i at time t and n is the number of years or time periods over which the average consumption is computed.
Transient poverty is then defined as the difference between the total poverty index and its chronic component as follows:

$$T_i = P_i - C_i$$

It is clear from the two equations above that the measure of transient poverty is constructed to reflect the variation in household consumption during the years observed, while the measure of chronic poverty is compiled based on consumption averages over time.

For the analysis of chronic and transient poverty, regression techniques are used. Let us denote the explanatory variables by the vector X, and random disturbances by ε, we estimate the following models:

$$C_i = \alpha_{ci} + \beta'_{ci} X + \varepsilon_{ci}$$

$$T_i = \alpha_{ti} + \beta'_{ti} X + \varepsilon_{ti}$$

Where, C^i and T^i are the chronic and transitory components of poverty for each household, respectively. The dependent variables are zero for the level of consumption greater than the poverty line, i.e the poverty measures are censored at zero as we don't have negative poverty index. The Tobit model is used to estimate the slope coefficients.
Statistically, the tobit model can be express as

$$Y_i = \beta_0 + \beta_j X_{ij} + \mu_i, \text{ if } Y_i > 0$$

$$= 0, \text{ otherwise}$$

Where the X_{ij} s are explanatory variables and μ_i s are the error terms which are assumed to be independent and normally distributed with mean 0 and variance σ^2. The estimation of the tobit model involves the use of maximum likelihood method.

Let F (.) is and P (.) denote the cumulative distribution function (cdf) and the probability density function (pdf) of the N(0, 1) distribution. For the Tobit model, the probability of a zero response is:

$$P(Y=0) = P(\beta_0 + \beta_j X_{ij} + \mu_i \le 0)$$

$$= P(-\beta_0 - \beta_j X_{ij} \le \mu_i)$$

$$= F((-\beta_0 - \beta_j X_{ij})\sigma^{-1})$$

$$= 1 - F((\beta_0 + \beta_j X_{ij})\sigma^{-1})$$

For $Y_i > 0$, the probability density function is $\sigma^{-1} F((Y_i - \beta_0 - \beta_j X_{ij})\sigma^{-1})$. Thus, the likelihood function for a sample of n independent observations is

$$\phi(\beta, \sigma) = [\prod_{Y_i=0} \{1 - F(\sigma^{-1}(-\beta_0 - \beta_j X_{ij}))\}][\prod_{Y_i>0} \sigma^{-1} F(\sigma^{-1}(Y_i - \beta_0 - \beta_j X_{ij}))]$$

This likelihood function is estimated using STATA statistical software.

3. RESULTS AND DISCUSSION

3.1. Derivation of the poverty Line

The poverty line used in the preset study is derived based on the cost of basic needs approach. The food poverty line is constructed using basket of food items of the half poor of the sample population in the Ethiopian Rural Household survey (ERHS) following Dercon and Krishnan (1998), which is also used by Swanepoel (2005). The amount of each food item in the basket is determined so that the total per adult daily energy intake will be the

2300 kcal recommended by the World Health Organization (WHO) (1985). Accordingly the poverty line is found to be 1023 per adult equivalent per year. The detailed calculation of the poverty line is presented in appendix C.

3.2. Diagnostic tests

The highly significant F-test statistics of the Tobit model analyses of chronic as well as transient poverty and the chi-square test statistics of the ordered probit model shows a good fit of the models. Moreover, the good fit is also confirmed by the high level of consistency of the result of the two models. Further, the necessary diagnostic tests are conducted to check the validity of the Tobit model used in this study. The data is tested for the existence of the problem of hetrocedasticity is using the Breusch-Pagan/Cook-Weisberg test and successfully passed. The existence of Multicolienarity is also tested using variance inflation factor (VIF) test and the correlates are found not to be highly colienar with an overall VIF value of 5.7. Moreover, the dataset has also passed the test of normality using The Jarque–Bera normality test.

3.3. Results and Discussion

The result of this study shows that there is high incidence of both chronic and transient poverty among the sample households. Based on the headcount index, 43% and 63% of the population is chronically and transiently poor, respectively.

The result of the Tobit Regression is reported in Table 1 of the appendix. The two measures of physical asset considered in this study, land holding and money value of livestock, are important determinants of both chronic and transient poverty. The value of the indices of both types of household poverty are found to significantly and inversely vary with the size of holding and the total monetary value of livestock owned by the household, though the impact gradient of these determinants, especially of size of land, is steeper for chronic poverty. This result confirms the findings of many other similar studies. For example, Jallan and Ravallion (1998) found that greater command on physical asset reduces both the chronic and transient components of poverty in rural china. Other studies based on aggregate poverty, such as Brown and Teshome (2007), Dercon (1999) and Hagos and Holden (2003) also found inverse relationship between land and physical asset ownership.

Land and livestock provide owner households with means of consumption as well as security. It is apparent that rural households heavily depend on agricultural production as a source of livelihood. The amount of agricultural output, however, highly depends on the size of the land owned by the household, cetrus paribus. Livestock can be direct source of food; it can be sold to generate cash to settle non consumption payments and to purchase household consumables in bad periods. Land and livestock ownerships are also a basis of empowerment among the rural people, which, in turn, determines the self esteem and bargaining competences of individuals. In addition, ownership of assets also increases creditworthiness and eases access to credit, which then could be used either for investment or to level current consumptions. The psychological sentiments and economic opportunities provided by asset ownership cumulate to less risk aversion and higher investment potentialities of the households. Hence, asset ownership has both far-reaching as well as short term benefits to rural households.

The result of this study, however, seemingly contradicts with that of Alemayehu et al. (2005) and Bogale and Korf (2009). The former study, which is carried out on Kenya, argues that number of livestock owned and size of land holding are significantly related with poverty status. And according to the later study, which is conducted on the Eastern Hararghe highlands; it is the size of the irrigated land that determines household poverty not the mere size of land. The result that size of land holding does not help to reduce poverty would be due to aridity and/or serious soil degradation in the study areas. In such regions, no matter how large holdings are, output would be scanty unless modern inputs and irrigation schemes are used. Once these supplementary inputs are in order, land size still matters.

The use of irrigation is associated with lower level of both chronic and transient household poverty. Bogale and Korf (2009) also found similar result. It is generally believed that irrigation infrastructure development provides large benefits to the production activities in agriculture. The development of irrigation infrastructure contributes to increased productivity, and raises long-term production and income levels. Availability of irrigation facilities, especially in arid and semi arid agricultural areas, significantly raises land as well as labour productivity and thereby reduces chronic poverty. Access to irrigation water also enables small and poor households to better manage risks and reduce income fluctuations caused by drought or other seasonal climatic fluctuations. This income stabilization and smoothing effect of irrigation infrastructure contributes to transient poverty reduction by helping in consumption smoothing.

The use of modern agricultural inputs on the other hand, significantly reduces chronic poverty but its negative impact on transient poverty is insignificant. Modern agricultural inputs help increase grain yields per hectare of plot and thereby improve household well being. The classical study of Jallan and Ravallion(1998) found that higher crop yield reduces chronic as well as transient poverty. However, in Ethiopia the major causes of lower crop yield are frequent and protracted drought, and soil degradation; and the use of inputs is thus mainly oriented towards mitigating these problems, which have long term impacts. Managing the problem of drought requires the use of irrigation or appropriate water harvesting system, as explained above, and the later problem requires the

use of fertilizer among others. The use of fertilizer for example helps increase output but not-using-it does not result in sudden complete loss of harvest. Some other catastrophes, such as flood, frost and wind which are also common in Ethiopia cannot be tackled by the use of modern inputs. Generally, the modern agricultural input use in Ethiopia is related to augmenting land fertility and drought aversion; and infrequent for protecting loss of harvest. Therefore, use of modern input helps significantly reduce chronic poverty but little of transient poverty. This explanation is also supported by the finding of Jallan and Ravallion (2000).

Similarly, the amount of loan taken by the household is strongly inversely related with chronic poverty but its impact on transient poverty, though negative, is insignificant. One possible explanation of this result is that obtaining loan might be difficult for the poor who would have used it for direct consumption in the same period to smooth their consumption because they do not have collateral. Obtaining loan is instead relatively easier for those households who intend to invest on their land and/or acquire additional assets which could have long term welfare impacts. Moreover, households with their own resources will need less credit to smooth consumption. The limited use of fertilizer and other high-productivity inputs in Ethiopia is partly due to limited availability of credit to smallholders.

The episode of disaster increases household chronic poverty marginally but transient poverty significantly. The types of shocks included in this category include damages caused by flood, frost, wind, animal and plant pests. Shocks, unless they are recurring, are likely to increase transient poverty but not chronic poverty. In Ethiopia, these types of shocks are lees recurrent. The major problems causing rather widespread rural poverty in the country are drought and loss of soil fertility (Markos, 2001).

Good rainfall condition (sufficient amount and good distribution over the last major cropping season, ("Meher"), though it is inversely related with both chronic and transient poverty, seems to be a trivial factor at the first glance. When it is combined with the incidence of disaster, however, is a strong determinant of rural poverty. Good rainfall condition strongly reduces both chronic and transient poverty in times when there is no disaster. The incidence of sever disaster, indeed, would result in loss of harvest, no matter how the rainfall is favourable and the growth of the crop is promising.

Labour participation rate on own farm is negatively related with chronic poverty but varies less with transient poverty. On the other hand, off-farm income reduces transient poverty but not chronic poverty. Mentewab et al. (2010) argued that in Ethiopia, people participate in off farm employment to generate income to smooth their consumption when there is considerable fluctuation in rain fall which would consequently result in fluctuation of agricultural produce. It is the availability of idle labour which depends on the condition of rainfall and the shortage of cash that control the decision to work on off-farm activities. Muyanga (2007) also found that off-farm income generating activities, such as safety net programmes, can help only reduce transient poverty. Moreover, it is likely that the landless laboureres spend most of their time in off-farm activities while the landed farmers are usually busy on their own farms.

Households headed by a person who have received some formal education are less likely to be both chronically and temporarily poor. Informal education received by the household head, tends to increases the chance of falling in to chronic poverty, though statistically insignificant, but reduces the likelihood of being temporarily poor. The category of informal education includes adult literacy and religious teachings. The result that this category of education does not help reduce household chronic poverty might be due to less devotion of the head to farm activities. Religious persons usually spend more time in community services and off farm income generating activities rather than the formal farm activities.

Educational achievement of the head of the household, particularly formal education has been strongly praised by almost all poverty literatures for it reduces poverty. The majority of empirical studies converged on that formal education by the head of the household or any member in the household is strongly and negatively related with chronic poverty. However there are variations regarding the role of education on transient poverty reduction. For instance, Jallan and Ravallion(1998, 2000) and Muyanga et al. (2007) found that households with formal educational achievement tend to be less chronically and transiently poor. In Ethiopia, all the total poverty studies such as Dercon (1999), Asmamamw (2004), Hagos and Holden (3003) and Bogale and Korf (2009), asserted that educational is an important tool of reducing poverty. Generally, educated heads have higher income earning potential and more alternative income earning opportunities, and are thus better able to improve the quality of their respective households' welfare.

Coming to the effect of some demographic variables, household size, age of the household head, dependency ratio, the number of children below 7, the number of male children 7 to14 years old and number of female children aged 7-14 are all positively related with both chronic and transient poverty. Nonetheless, only the number of children less than 7 years old is significant for both chronic and transient poverty. On the other hand, dependency ratio and age of the household head are significantly related with chronic poverty and transiently poverty, respectively. The result that households with larger number of children are likely to be chronically and transiently poor is similar with the finding of Jallan and Ravallion (1998). According to the study, households with more number of children aged less than six years are more likely to be both chronically and transiently poor

while households with children aged above 12 years are less likely to be both transient and chronic poor.
Nonetheless, the result for the effect of house hold size and dependency ratio falls short of confirming the common view that house hold size is strongly positively related with poverty in developing countries. However, the addition of children to the household does not add only eating hands but also inspires the household to work more hours and to seek new ways of generating income. Since the downfall of the imperial regime, the size of the household's land holding in Ethiopia is also determined based on its size which counters the negative effect of large household size. Moreover, children also start to provide additional family labour since their early years. Though not as significant as the magnitude in rich countries, households in poor countries also benefit from economies of size. On this regard, Lanjouw and Ravallion (1994) argues that the "Widely cited evidence of a strong negative correlation between household size and consumption per person [in developing countries] is unconvincing, given that even poor households face economies of size" . Nevertheless, the negative impact of population growth on welfare at community or higher levels would be sizable through its impact on environmental degradation (Angelsen and Kaimowitz, 1999) and on public budget.
Female headed households tend to be both chronically and transiently poorer than their male headed counterparts. Women poverty is largely a result of deprivation- that they lack physical as well as human capital. Women in many societies are usually excluded from their social, political and economic rights which translate in to illiteracy, landlessness and voicelessness. Thus, women in many rural societies relatively lack the productive assets and bargaining skills to improve their livelihoods. The absence of infrastructure like health services and clean water sources also adds to the misery of women. Moreover, women are sometimes physically and sexually harassed by men, which distort their psychological as well as physical development and well being. A number of studies have found that women share a disproportionate burden of poverty relative to men.
Poverty also varies with some type of major crops cultivated by the household. Cultivation of sorghum is inversely related with both chronic and transient poverty. The same result if found in Swanepoel (2005). This might be due to the high yield and drought resistant nature of the crop. Coffee, on the other hand, is related with higher level of chronic poverty which might be due to low price of coffee in the international market and the disproportionately low share of farmers in the total value of coffee. For instance, international coffee prices declined by more than 50% in the period 1998 – 2001 and reached their historic low level (Teferi and Dejene, 2002; World Bank, 2001). As result coffee farmers in developing countries, the majority of whom are poor small holders, have been selling their product for much less than they incurred to produce and have suffered from poverty. Moreover, teff and chat are related with lower level of transient poverty, while enset cultivation is associated with higher level of transient poverty. Teff is a short term crop which can be produced two times in a year and such frequency halves the period between two harvests and helps households smoothing their consumption. The waiting period is even much shorter for chat. Contrarily, enset is a perennial crop and its cultivation involves several waiting years between two harvests. Enset farmers try to smooth their harvest by dividing their land planting enset crops at different times so that they can be harvested at different periods. However, given the acute shortage of land in the enset growing regions of the country, it is not possible to totally smooth-out enset production.

Table1: Result of the Tobit model regression; determinants of chronic and transient poverty

Explanatory variable	Chronic poverty		Transient poverty	
	Coefficient	p-value	Coefficient	p-value
HHSIZE	0.0032402	0.380	0.0020967	0.67
AGE	0 .0004718	0.154	0.0002958*	0.009
LS	-0.0391793*	0.00	-0.006207**	0.023
VTLO	-0.0000213*	0.00	-5.84e-06*	0.000
OFFINC	-0.0000228	0.185	-0.000011**	0.029
CREDIT	-0.00988*	0.002	-9.28e-06	0.268
VCS	-0.0002669	0.309	-0.0222**	0.022
LPR	-0.001105*	0.002	-0.000113	0.224
CH7	0.0238382*	0.003	0.0008286	0.740
CHM	0.0101185	0.254	0.0005327	0.848
CHF	0.0084663	0.313	0.0001115	0.967
EDUINF	0.0059555	0.754	-0.011072***	0.083
EDUF1	-0.0469963**	0.024	-0.023594*	0.001
EDUF2	-0.0905268 *	0.00	-0.024699*	0.00
UMAI	-0.0396859*	0.007	-0.0012997	0.12
DISASTER	0.0226848***	0.076	0.0202889*	0.00
GRFC	-0.055754*	0.008	-0.007464	0.158
GRFCND	-0.0669078*	0.006	-0.015035*	0.003
TEFFF	0.0009805	0.946	-0.019955*	0.00
WHTBRLY	-0.0036612	0.815	0.0064644	0.198
SGHM	-0.0425688**	0.028	0.0165917*	0.007
MAIZE	0.0214167	0.152	0.0014345	0.771
COFFEE	0.0799031*	0.001	0.0079189	0.304
CHAT	0.0077036	0.723	-0.036104*	0.00
ENSET	-0.0070123	0.778	0.0212079*	0.008
OC	-0.068582*	0.00	0.0041096	0.375
IRRIG	-0.1017945*	0.00	-0.028029*	0.00
SEX	0.0407473*	0.006	0.009917**	0.046
Constant	0.1264383*	0.00	0.052954*	0.00
Log likelihood ratio = -294.9994			799.32759	
Pseudo -R2 = 0.3824			-0.2064	
F(29, 1540) = 9.67			9.02	
Prob > F = 0.0000			0.0000	
/sigma | .182336 .0059063 .1707507 .1939213 --- Obs. summary: 894 left-censored observations at chronicpoverty 675 uncensored observations 0 right-censored observations			Obs summary 581 left-censored observations at transientpoverty 988 uncensored observations 0 right-censored observations	
* significant at 1% degree of freedom ** significant at 5% degree of freedom *** significan at 10% degree of freedom				

5. Conclusion and Policy Implications

Ethiopia has passed through different macroeconomic reforms and development strategies adopted by the government since the last two decades. The introduction of a relatively liberal economic policy and the prevalence of peace have initiated the involvement of the private sector in the economy. As response of these changes, the country has experienced high level of economic growth in recent years. Nevertheless, this economic growth has not improved the livelihoods of the majority of poor, particularly the rural population. According to the result of the study, though chronic and transient poverty are largely determined by the same set of explanatory variables, there are still significant differences demanding the chronic-transient decomposition for a separate analysis and distinctive policy recommendations.

The following policy implications are drawn based on the findings of the study.

- Human capital formation through education, particularly formal education, is an important determinant of

poverty reduction-both chronic and transient. Expansion of formal educational opportunities to the rural children is a vital investment in the future families. Therefore, the current effort of the government and civil societies to increase the enrollment rate of the rural people should be sustained. Educational quality improvement should also been given equal concern for a maximum result.

- Female headed households were found to be likely both chronically and transiently poor. Women poverty is largely a result of lack physical as well as human capital and social exclusion. Thus, policies aimed at empowering women through increased participation in social, political and economic affairs of their family as well as community, promoting women access to financial resources and property ownership, such as land would be appropriate. Also, the absence of health services and clean water sources usually translate into added burdens for women. Hence, provision of maternal health services and clean water help in relieving the disproportionate burden on women. Often, women are also physically and sexually harassed by men. A combination of strategies ranging from awareness creation to opportunity equalization, legal protection and affirmative actions are vital to alleviate women-specific poverty.
- Land-intensification technologies such as the use of fertilizer, high yield and drought resistance varieties, pesticides and insecticides are found important determinants of chronic poverty reduction, where as development of irrigation schemes reduces both chronic and transient components. Thus, policies that increase the provision of such technologies and the rate of adoption by the farmers should be promoted. The capacity of the agricultural research centers and universities should be strengthened. The work of these institutions should not be confined only to their laboratories; they should work based on need assessment and more closely with farmers. Farmers also need institutional support such as access to credit and extension services. Expansion of irrigation schemes in the arid and semi-arid areas would also produce new arable lands and helps to relive the problem of land fragmentation in wet fertile areas.
- Creating access to credit is important to increase the capacity of farmers to afford modern inputs. Strengthening and widening the breadth and depth of the current micro finance credit would be a great help for the poor farmers who do not have access to formal banks. The capacity of the microfinance institutions can be strengthened, for example, by helping them to borrow from formal commercial banks through government guarantee. The expansion of rural road infrastructure also helps significantly reduce cost of input transportation.
- Irrigation is one of the most important determinants of chronic and transient poverty reduction. Hence, development of irrigation schemes and water harvesting systems is essential for poverty alleviation among the small holder farmers in Ethiopia.
- There is strong positive relation between the number of children under the age of 7 years and the chronic and transient components of poverty. Hence, family planning programmes that educate households about the merits of having small number of children and birth control supports to households are essential. However, the cost of birth control efforts should not be excessive as implied by many literatures of poverty. It is already mentioned that the common view that household size is strongly positive related with household poverty is exaggerated and needs be reconsidered. The optimal cost of birth control implied by this view would be higher than what it really should be.
- The value of crops sold by households is strongly and inversely related with transient poverty. The rural households usually sale their high value crops, such as teff and wheat , to purchase either more quantity of low value crops or spend the surplus in the purchase of non food consumables. Such mechanism s would enable the producers of high value crop producers to smooth their consumption during bad spells of poverty. Hence, policies that promote the production of high value crops can reduce transient poverty.
- Off/non farm income also strongly reduces transient poverty. Off/non farm income generating schemes such as safety net programmes, and expansion of small scale industries and rural business activities would help farmers to relieve their temporary problems. Households who has no land and cattle, female headed households, households who have large number of children, households headed by old aged heads, etc are identified as transiently poor and the safety net progrrrame should target such households. The worrying danger of safety net progrranmes is that they kill the incentive for on farm work and creativity, which in turn would perpetuate chronic poverty.

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Annexes

Annex A: description of measurement of variables and abbreviations

Variables	Measurement	Abreviations
Adult equivalent consumption	Monetary value of percapita consumption adjusted for age of household members using appropriate scales	
Household size	Number of household members in adult equivalent terms	HHSIZE
Age of the household head	Number of years	AGE
Number of children less than 7 years old	Number	CH7
Number of male children between 7 and 14 years old	Number	CHM
Number of female children between 7 and 14 years old	Number	CHF
Sex of household head	Dummy: value =1 if head is female and 0 if Male	SEX
informal education received by the head of the household	Value=1 , if the head of the household attended some religious teaching and/or adult literacy program-me and 0 other wise.	EDUINF
Educational achievement up to grade 4 by the head of the household	Dummy: Value =1 if maximum grade achieved by the head of the household is not greater than 4 and 0 otherwise wise	EDUF1
Educational achievement up to grade 4 by the head of the household	Dummy: Value=1 if Maximum grade achieved by the head of the household is greater than 4 and 0 otherwise	EDUF2
Land size	Amount of land holding in hectare units	LS
Value of total livestock owned	Monetary value of total livestock owned	VTLO
Labour participation rate	Male adult equivalent hours worked	LPR

Continued

Off/non farm income	Monetary value of all non farm incomes.	OFFINC
Value of crops sold	Monetary value of all crops sold in the last four months	VCS
Credit	Monetary value of Loan taken in the last four months greater than Birr 20	CREDIT
Use of modern agricultural inputs	Dummy: Value=1 is the household uses any modern agricultural inputs in the last one year	UMAI
Disaster	Dummy:Value=1 if the household encounters sever levels of any of flood, frost, wind, insect damage and plant disease in the last one year and 0 otherwise	DISASTER
Good rainfall condititon	Dummy: Value=1 if rain fall is sufficient for plant growth and it is also well distributed over the cropping period in the last "Meher season" and 0 otherwise.	GRFC
Good rainfall condition and no catastrophic disaster	Dummy: Value=1 if rain fall condition is good and no disaster has been encountered in the last "Meher" season and 0 otherwise.	GRFCND
Use of irrigation	Dummy: Value=1 if the household uses irrigation scheme and 0 otherwise	IRRG
Teff	Dummy: Value=1 if the major crop grown by a household in the last 3 years is teff and 0 zero otherwise	TEFF
Maize	Dummy: Value=1 if the major crop grown by a household in the last 3 years is maize and 0 zero otherwise	MAIZE
Sorghum	Dummy: Value=1 if the major crop grown by a household in the last 3 years is sorghum and 0 zero otherwise	SGHM
Wheat and barley	Dummy: Value=1 if the major crop grown by a household in the last 3 years is whet and/barley and 0 zero otherwise	WHTBRLY
Chat	Dummy: Value=1 if the major crop grown by a household in the last 3 years is chat and 0 zero otherwise	CHAT
Enset	Dummy: Value=1 if the major crop grown by a household in the last 3 years is enset and 0 zero otherwise	ENSET
Other crops	Dummy: Value=1 if the major crop grown by a household in the last 3 years is other than listed above and 0 zero otherwise	OC

Annex B: Diagnostic Tests

B1: Jacque-Bera test for normality of continuous variables

Variables	Prob>chi2
HHSIZE	0.6627
AGE	0.9422
CH7	0.5963
CHM	0.7902
CHF	0.9286
LS	0.5082
VTLO	0.2238
LPR	0.7307
OFFINC	0.7429
VCS	0.4183
CREDIT	0. 7166
Permanent consumption	0.9436
Index of chronic poverty	0.5652
Index of transient poverty	0.6481
All	0.7156

B2: VIF test for multicolinearity

Variable	VIF
AGE	1.38
CH7	1.29
CHAT	0.58
CHF	1.21
CHM	1.25
CREDIT	3.86
DISASTER	1.341
EDUF1	1.07
EDUF2	1.02
EDUINF	1.12
ENSET	6.35
GRFC	1.46
GRFCND	2.01
HHSIZE	1.58
IRRG	4.16
LPR	2.59
LPR	2. 46
LS	1.2
MAIZE	1.79
OFFINC	5.59
SEX	1.2
SGHM	1.64
TEFF	2.51
UMAI	3.29
VCS	4.54
VTLO	1.24
WHTBRLY	4.16
Mean VIF	2.74

Appendix C

Note on the Derivation of the poverty Line

Given an appropriate measure of welfare, the identification of the poor necessitates that a poverty line be determined below which individuals or households are considered poor. The poverty line for a given individual is the money that the individual needs to achieve the minimum level of welfare not to be judged poor. Poverty lines may be objective or subjective (Ravallion, 2008).

In this study the cost of basic needs (CBN) approach is employed to derive the poverty line. In this approach the poverty line is derived in two stages. In the first stage, the food poverty line is derived. The food poverty line is the cost of a food consumption bundle which is deemed to be sufficient to provide a minimum energy requirement for a person to keep up normal activities, such as the 2,300 Kcal per day threshold set by the World Health Organization (1985). Once the food poverty line is determined, then an allowance for non-food commodities and services will be added, in the second stage, to arrive at the total poverty line. This is done by dividing the food poverty line by the share of food in total expenditure of individuals whose food consumption is in the 10 % vicinity (5% above and 5% below) of the food poverty line (Ravallion, 1992; Ravallion and Bidani, 1994).

The Mathematical Derivation of poverty line derivation is as follows:

Suppose q_{ij} is the amount of food item i consumed by individual j in the half poor of the sample. The total amount of commodity i consumed by half poor of the sample population, say Q_i, can be given as: $Q_i = \sum_{j=1}^{N} q_{ij}$; where N is the number of half poor of the population.

Suppose now c_i is the caloric content of a standard unit of food item i. Then, the total caloric intake by half poor of the population from food item i, say W_i, can be given as: $W_i = c_i Q_i$. Similarly, the total caloric intake

of the population from all food items, say T_W, can be given as: $T_W = \sum_{i=1}^{m} W_i$; where m is the number of food items consumed by half poor of the sample population.

The actual caloric share of commodity i in the total caloric intake of half poor of the population is $\frac{W_i}{T_w}$. The caloric share of food item i in the 2300 kcal per adult per day, which forms the poverty line, should be proportional to its share in the actual caloric intake. Hence, the weighted caloric share of food item i in the 2300 kcal is 2300($\frac{W_i}{T_w}$) kcal. The amount of commodity i that meets this caloric content is 2300($\frac{W_i}{c_i T_W}$) units, which can be reduced to 2300($\frac{Q_i}{T_W}$) units.

Suppose the spatial average price of food item i is P_i, then the monetary poverty line can be given by the formula 2300 $\sum_{i=1}^{m} \frac{P_i Q_I}{T_W}$.

The food poverty, which is Birr 716 per adult equivalent per year, is computed by multiplying the amount of each food item by its respective spatial average prices. The allowance for the non food consumption is computed by averaging the non-food consumption of individuals whose food consumption is 5% above and below the food poverty line. In order to account for the possibility of change in the consumption pattern of households, the non food consumption expenditure is averaged over time for each household and then averaged across households.
Finally, the total poverty line, which is Birr 1023 per adult equivalent per year, is derived by dividing the food poverty line by the share of food in total consumption.

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