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ABSTRACT

Poverty in rural Ethiopia is vast by any standard. Using the Ethiopian Rural Household Survey (ERHS), which is a panel data set consisting of four rounds between 1994 and 1997, this analysis aims to examine the broad trends in poverty by calculating and decomposing poverty measures of the Foster-Greer-Thorbecke class, as well as to analyse the correlates of poverty by means of regression trees. Furthermore, in an attempt to determine how and why some households experience changes in their poverty status over time, the poverty dynamics of households is studied according to both the spells and the components approaches. Here the distinction is made between transient and chronic poor, and regression analysis is employed to determine whether the endowments and characteristics of these groups differ.

JEL Classification: I32, C2

Poverty and Poverty Dynamics in Rural Ethiopia

Christelle Swanepoel, University of Stellenbosch, April 2005

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Abstract:

Poverty in rural Ethiopia is vast by any standard. Using the Ethiopian Rural Household Survey (ERHS), which is a panel data set consisting of four rounds between 1994 and 1997, this analysis aims to examine the broad trends in poverty by calculating and decomposing poverty measures of the Foster-Greer-Thorbecke class, as well as to analyse the correlates of poverty by means of regression trees. Furthermore, in an attempt to determine how and why some households experience changes in their poverty status over time, the poverty dynamics of households is studied according to both the spells and the components approaches. Here the distinction is made between transient and chronic poor, and regression analysis is employed to determine whether the endowments and characteristics of these groups differ.

1. INTRODUCTION

The Ethiopian economy experienced some recovery between 1994 and 1997. Gross domestic product (GDP) increased by 4%, 8.4% and 3% per capita for 1994-95, 1995-96 and 1996-97, respectively (Bigsten *et al* 2003: 89). This period is therefore well suited for an analysis of poverty in rural Ethiopia as one might draw some conclusions regarding the success of government initiatives, reform programmes and economic growth in alleviating poverty. The emphasis here is however exclusively on examining broad trends in poverty, in an attempt to provide a sound basis from which policymakers with the necessary knowledge of the Ethiopian economy may draw some policy proposals. Employing a four round panel data set collected between 1994 and 1997, a static picture of poverty changes is firstly sketched by reporting poverty measures of the Foster-Greer-Thorbecke class for each period. This is complemented by an analysis of the correlates of poverty by means of regression trees – a powerful non-parametric data mining technique. Secondly, the short

run economic mobility of households in rural Ethiopia, or poverty dynamics, is studied according to the spells and components approaches in an attempt to determine how and why some households experience changes in their poverty status. This is a necessary part of any study aimed at uncovering the foundations of poverty in a society, as "measures of living conditions at a point in time do not necessarily provide a good indicator of their likely stability over time" (McKay & Lawson 2003: 425). Also, the distinction between the transiently and the chronically poor have important implications for the design of policies aimed at poverty alleviation.

The analysis is structured as follows. Sections 2 and 3 illustrate the methods that will be used to investigate poverty and the dynamics of poverty, respectively. Section 4 describes the data set and sampling methods. The results of the static and dynamic studies of poverty are then reported in sections 5 and 6, respectively. Lastly, section 7 provides the main conclusions.

2. MEASURING POVERTY

2.1 Poverty levels and changes

It is generally acknowledged that poverty is a multidimensional fuzzy[1] phenomenon, more complex than just having a level of income, consumption or expenditure below some minimum level. However, conceptualizing poverty as material deprivation by studying the distribution of a welfare indicator permits investigation regarding the magnitude of the problem, and allows comparisons over time (Hulme & Shepherd 2003: 406). To summarize the lower end of the distribution of a material welfare indicator, one needs a poverty index. A general poverty index can be defined as: $P = P(\mu, L)$, where z is an exogenously determined poverty line, μ is the population mean value of the welfare indicator and L is a parameter that characterizes the distribution of the welfare indicator (Bigsten *et al* 2003: 89). The advantage of specifying a poverty index in this form, thus

[1] The fuzziness and complexity associated with 'poverty' arise from the fact that it is a "socially constructed, 'essentially contested', concept, with rhetorical power and political implications" (Bevan & Joireman 1997: 316).

treating it as a sample statistic, is that the statistical significance of changes in the index can be computed[2].

The specific form of the poverty index that will be reported in this analysis, the FGT-index, was suggested by Foster, Greer, and Thorbecke. For a sample of n households with a discrete distribution this is given by: $P_\alpha = (1/n)\sum_{i=1}^{q}\left((z - y_i)/z\right)^\alpha$. Here y_i denotes the value of the welfare index per capita, in increasing order for all households, z is the poverty line, and q indicates the number of households below the poverty line (Dercon & Krishnan 1998: 11). If α = 0 it represents the head count ratio of poverty, which is merely the number of households classified as being poor. If α = 1 one calculates the poverty gap, this takes into account the 'distance' households classified as poor are from the poverty line. Lastly, if α = 2 the squared poverty gap is calculated which takes into account the 'distance' from the poverty line, and the distribution amongst the poor households. The values of these indexes for rural Ethiopia between 1994 and 1997 will be presented in section 5.2.

3. ANALYSING POVERTY DYNAMICS

3.1 Definitions

"A small peasant and a landless labourer may both be poor, but their fortunes are not tied together. In understanding the proneness to starvation of either we have to view them not as members of the huge army of the 'poor', but as members of particular classes, belonging to particular occupational

[2] Kakwani (1990) showed that if P_1 and P_2 are two estimates of a poverty measure, based on independently drawn random samples of size n_1 and n_2 respectively, then the standard error or SE is $(P_1 - P_2) = \left(\frac{\delta_1^2}{n_1} + \frac{\delta_2^2}{n_2}\right)^{\frac{1}{2}}$ and the t-statistic is: $t = (P_1 - P_2)/SE(P_1 - P_2)$. δ_1^2 and δ_2^2 are the variances of the asymptotic distributions of $n_1^{\frac{1}{2}}$ and $n_2^{\frac{1}{2}}$ respectively, calculated as: $\delta_i^2 = P_{2\alpha} - P_\alpha^2$, if P is from the FGT- family of poverty indexes. Most researchers use Kakwani's method when analysing panel data, as is done here, but a note of caution should be made as different rounds of a panel are not "independently drawn" samples.

groups, having different endowments, being governed by rather different entitlement relations. The category of the poor is not merely inadequate for evaluative exercises and a nuisance for causal analysis, it can also have distorting effects on policy matters" (Sen 1982: 156, 157).

When one accepts the hypothesis that the poor are a heterogeneous group, with different endowments and different characteristics, then one has to acknowledge the fact that some households observed as being poor at a certain point in time may only be temporarily poor, whilst others are always poor. The temporary or transient poor, experience movements into and out of poverty, termed poverty spells. Households trapped in protracted poverty are labelled the chronic poor[3]. One expects these groups of 'the poor' to have different endowments and characteristics and there is ample evidence in the literature that the determinants of transient poverty differ from the determinants of persistent or chronic poverty (Oduro 2002: 2). Clearly this is important to consider when designing policies aimed at reducing poverty. To achieve the right mix of policies one needs to know the extent to which poverty is transient versus chronic (Jalan & Ravallion 2000: 83). Two approaches have been developed for the identification of these groups: the spells approach and the components approach, these will be discussed below. Both are sensitive to the choice of welfare measure and to where the poverty line is drawn (McKay & Lawson 2003: 427), but are still very useful techniques, as we cannot escape from the fact that all poverty measures are subjective. The persistence of poverty in rural Ethiopia will be analysed according to both these approaches.

3.2 Methods

3.2.1 Spells approach

This approach involves the identification of the poverty status of households in every period under investigation, for the purpose of detecting changes in the status of the household over time (Oduro 2002: 6). The transient and chronic poor are then identified based on the number of rounds spent in poverty. This is an arbitrary classification, as the available information is of a truncated nature with no observations before, after or between rounds, which necessarily results in some misclassification.

[3] Only household survey data of a panel nature can distinguish transient from chronic poverty. Panel data permits the tracing of dynamic behaviours firstly, through the influence of past behaviours on current behaviours and secondly, by controlling for unobservable fixed characteristics (Alderman *et al* 2000).

For example, a household that is poor in all rounds, but one, may not be classified as chronically poor. Hulme and Shepherd (2003) warn that the spells approach usually overestimates transient poverty (Hulme & Shepherd 2003: 406). Furthermore, small variations in method could lead to different results. Therefore, McKay and Lawson (2003) note that one should be very cautious when defining or interpreting these categories (McKay & Lawson 2003: 426, 429). Still, this approach is valuable, especially if used supplementary to the components approach that will be discussed below.

3.2.2 Components approach

The components approach attempts to isolate the permanent component of poverty from transitory shifts. For the purpose of measuring the extent of transient and chronic poverty in rural Ethiopia, the components approach methodology as per Jalan and Ravallion (2000) will be employed[4]. They define transient poverty as the contribution of the variability in a welfare indicator over time to the expected value of poverty, measured using this welfare indicator. The non-transient component, the poverty that remains when inter-temporal variability has been smoothed out, is labelled chronic poverty (Jalan & Ravallion 2000: 83).

Formally, assume the welfare indicator used is consumption and let $(y_{i1}, y_{i2},..., y_{iD})$ be household i's consumption over D dates. Total poverty (T_i) can then be exactly decomposed into transient and chronic poverty: $T_i = P(y_{i1}, y_{i2},..., y_{iD}) - P(y_i^*, y_i^*,..., y_i^*)$. Where $P(y_{i1}, y_{i2},..., y_{iD})$ is an aggregate inter-temporal poverty measure for household i, y_i^* is the time-mean consumption or expected value of consumption over time, and chronic poverty $C_i = P(y_i^*, y_i^*,..., y_i^*)$. Furthermore, the poverty measure should have the following characteristics: firstly, it must be additive across households and over time. Secondly, the function should be strictly decreasing and convex, to penalize inequality amongst the poor. Jalan and Ravallion (2000) employ the squared poverty gap which satisfies both these conditions, the same was done here. The value of this measure for household i, at date t, can be

[4] Oduro (2002) notes that Carter and May (1999) provide an alternative definition of chronic and transitory poverty. They define the transient poor as those who are poor because a stochastic shock caused their consumption to fall below the poverty line, but will be able to build up their assets, and escape poverty in future. The chronic poor are defined as households that suffer from structural limitations on upward mobility. Not only do they have a low level of assets, but they are also unable to build up their asset base and escape poverty (Oduro 2002: 5).

calculated as: $p(y_{it}) = (1 - y_{it})^2$ if $y_{it} < 1$, or $p(y_{it}) = 0$ if otherwise, with y_{it} as consumption normalized by the relevant poverty line. The household size weighted mean of this measure, for all households, is the usual aggregate squared poverty gap. Transient poverty for household i is: $p(y_{it}) - p(y_i^*)$, and the aggregate measure of transient poverty is obtained by taking the mean of the household specific measure over the whole population (Jalan & Ravallion 2000: 84, 85, 86).

The results of the analysis of poverty dynamics as per the spells and components approaches are presented in section 6.1.2 and 6.1.3, respectively.

4. THE DATA

4.1 Survey and sampling

A panel data set, the Ethiopian Rural Household Survey (ERHS), suitable for the analysis of poverty dynamics is employed. These data are jointly administrated by the Economics Department of Addis Ababa University, the Centre for the Study of African Economies of the University of Oxford, and the International Food Policy Research Institute[5], consists of about 1477 households, and are available for 1989, 1994a and 1994b (two rounds), 1995 and 1997. Data were also collected for 1999, but is not yet available, and fieldworkers are currently collecting another round of data. Unfortunately, changes in the questionnaire as well as the expansion of the panel between 1989 and 1994a, complicate the matter of comparing 1989 with the rest of the rounds. Therefore, only the 1994a, 1994b, 1995 and 1997 rounds will be considered in this analysis.

The sample consists of fifteen rural Peasant Associations (PAs), which is a collective term for one or more villages in a certain region. These PAs were established after the revolution of 1974, when a programme of land reform was started, and now holds a wide range of powers as a local authority. Land holding is crucial for survival in Ethiopia, and all land is owned by the Ethiopian government, therefore most households are registered with the PA as this is the only way to obtain land. This

[5] As was mentioned in the acknowledgement.

implies that with the help of the local PA officials, lists of households in target areas were available to use as a sampling frame (Dercon & Krishnan 1998: 34).

The survey can be considered to be a highly stratified two-stage sample. Firstly, the sampling frame to select PAs was stratified in the main agro-ecological zones and sub-zones. The second stage of stratification ensured that landless[6] and female headed households were not under-represented within each PA. Stratification leads to considerably lower standard errors compared to a sample that was drawn completely at random, but the small number of PAs selected could lead to an under-representation of all the agro-ecological zones, which results in incomplete stratification. A comment from Dercon and Krishnan (1998) provides some background: "The practical constraints of running a panel household survey had to be squared with the methodological problems related to sampling. Farming systems were considered a much more important stratification basis than administrative boundaries. Nevertheless, a division of the country into agro-ecological zones is not self-evident. A sample of 15 villages remains too small to be representative for all villages, although the actual choice of villages does cover some of the diversity of communities in each zone" (Dercon & Krishnan 1998: 33). Thus, even though great care was taken in designing the survey, results should still be extrapolated with caution. The lack of detailed census information makes it impossible to implement the necessary corrections for incomplete stratification. This necessitated the alternative route of designing a self-weighting sample, where each person approximately represents the same number of persons from each of the main farming systems, which was relatively successful as shown by Dercon and Krishnan (1998). This implies that sampling weights need not be employed when using the survey (Dercon & Krishnan 1998: 33).

Random sampling was used to select the households within each stratum, with the sample size in each PA determined by an attempt to obtain a self-weighting sample. The households chosen were then traced for each round of the survey, the tracing rule being that households are kept in the survey even if the household head has left or died[7] (Dercon & Hoddinott 2004: 6). When difficulties arise in tracing households over time, attrition will have an effect on the validity of the survey results through the presence of sampling errors, in particular selection bias. For the rounds of the ERHS

[6] Landlessness is increasing as there is no legal mechanism for young households to obtain land (Dercon 2004: 7).

[7] This refers to the "definition of a panel household" (Dercon & Hoddinott 2004: 6).

considered in this analysis, complete consumption data is available for 1362 households and the attrition rate is only 5% (Dercon 2000: 2). This low rate of attrition is mostly due to the fact that households are rather immobile[8] as land cannot easily be obtained when moving to a new PA (Dercon & Hoddinott 2004: 6).

4.2 Welfare indicator and related problems

Consumption is generally regarded as the best indicator of welfare in rural Ethiopia because most Ethiopians consume from their own produce and do not earn regular off-farm income. Usually an advantage of using consumption as welfare indicator is that it tends to exhibit less mobility than, for example, income. The use of income will generally overstate the extent of variability in living standards, thus the magnitude of transient poverty. This may not be the case in rural Ethiopia as mechanisms whereby to smooth consumption, like access to credit, is nearly non-existent. Here consumption may be just as volatile as other measures, but most researchers agree that it is the preferred measure in a rural setting (Dercon & Krishnan 2000: 28 and Baulch & Hoddinott 2000: 11).

Administrators constructed consumption data by valuing the quantities of every product consumed according to the nearest market's prices. Food consumption, also from own stock or gifts, and non-food consumption of direct consumables were included[9] (Dercon & Hoddinott 2004: 16). As in Bigsten *et al* (2003) these consumption aggregates are only adjusted by household size for further analysis.

Questionnaires for the four rounds between 1994 and 1997 are perfectly compatible, but this does not safeguard the survey against measurement error. Measurement error arises not only from the intrinsic difficulty of the measurement of prices and consumption quantities, but also from recall error, and it induces a downward bias in estimation (Dinkelman 2004: 502). Baulch and Hoddinott (2000) emphasise that measurement error is especially worrying in panel data sets as these errors are made in every round. This is particularly important for the measurement of poverty dynamics and

[8] This does not imply that individuals are immobile, migrant worker systems are an integral part of the Ethiopian economy.

[9] Food consumption includes food aid. Non-food consumption excludes, for example, expenditure on health or schooling but includes expenditure on soap, clothes, matches etc.

mobility because it inflates the variance of the welfare indicator, in this case consumption, which may cause misleading results (Baulch & Hoddinott 2000: 6). Furthermore, also the number of mobile households may be inflated. Then measures such as transition matrices may overstate the extent of mobility. Baulch and Hoddinott (2000) encourage the reinforcement of findings with other information. Dercon and Krishnan (1998), as quoted in Baulch and Hoddinott (2000), applied this suggestion to the ERHS by constructing an index of shocks including livestock illness and crops losses. They then found that these shocks had some explanatory power when estimating a fixed effects regression explaining the logarithm of consumption per adult equivalent (Baulch & Hoddinott 2000: 8). This indicated that their findings were not only as a result of measurement error. Dercon and Krishnan (2000) came to the same conclusion when again analysing the ERHS (Dercon & Krishnan 2000: 36), and therefore it is accepted that the results presented in this paper are not only as a result of measurement error.

Another possible problem when analysing the ERHS is that one cannot ignore the effect of seasonality. There are two harvesting seasons in Ethiopia, the Meher and the Belg, and these seasons vary between regions. Interviewing times differ across rounds and location. Thus, many of the observed changes in consumption and other variables reflects seasonal responses to relative prices and needs, and may not be purely as a result of other underlying forces (Dercon & Krishnan 2000: 32). This implies that caution should be taken when interpreting results. Table a (Appendix A) summarizes the harvesting seasons and interviewing times for all rounds. As the 1994a and 1995 surveys took place at approximately the same ‘out of harvest’ time in most of the areas, seasonal effects do not seriously contaminate results when comparing these rounds. However, section 5.2 indicates that poverty decreased significantly between 1995 and 1997, but in the 1997 round four of the fifteen PAs were interviewed during their harvesting seasons, this implies that some of the calculated decrease in poverty, may only be due to seasonality.

Because prices differ between PAs, the International Food Policy Research Institute calculated a different poverty line for each PA. Poverty lines were constructed according to the cost of basic needs approach and the recommended calorie intake was used as a guideline. This poverty line was then adjusted for inflation from round 1 (1994a) to round 2 (1994b) and also for all the subsequent rounds. Table b (Appendix A) shows the mean real consumption per capita and poverty lines for all

rounds, per PA. There is considerable variation in consumption between PAs, which is analogue to Table c (Appendix A), that summarizes the characteristics and background of each PA. The main crops of each region are also included because the type of crop often determines movements into and out of poverty (Bigsten & Shimeles 2003). This variability between regions appears to be influential when analysing movements into and out of poverty, or poverty dynamics, as will be discussed in section 6. But first consider the results of a static analysis of poverty in rural Ethiopia, providing and comparing snapshots of the situation between 1994 and 1997.

5. RESULTS: MEASUREMENT OF POVERTY

5.1 Changes in consumption between 1994 and 1997

The mean level of real consumption per capita declined by 6% between 1994a and 1995, and then increased by 15% between 1995 and 1997[10]. Overall, the mean consumption increased by around 8.2% between 1994 and 1997. Table 2 describes the distribution of consumption for all rounds, by reporting certain percentiles of the distributions. The value of each percentile increased between 1994 and 1997, except for the 10th percentile in 1994b, which may be due to seasonality as more respondents were interviewed during their harvesting seasons in this round than in 1997.

Table 1: Changes in real consumption per capita between 1994 and 1997[11]

Real per capita consumption				*Growth in consumption*		
1994a	***1994b***	***1995***	***1997***	***94a-95***	***94a-97***	***95-97***
72.7	*72.5*	*68.3*	*78.6*	*-6.0%*	*8.2%*	*15.1%*

Source: ERHS

Table 2: Percentiles of the distribution of consumption for all rounds

Year	*10th*	*25th*	*50th*	*75h*	*90th*
1994a	*16.5*	*29.2*	*51.1*	*88.4*	*148.9*
1994b	*21.0*	*31.6*	*52.5*	*93.2*	*146.5*
1995	*16.6*	*28.5*	*48.9*	*81.4*	*132.1*
1997	*20.2*	*32.7*	*56.7*	*99.1*	*152.7*

Source: ERHS

[10] This may be an overestimation of the realized growth in consumption due to the effect of seasonality. The interviewing times of the 1997 round corresponded more with harvesting season that those of the 1995 round.

[11] Changes between 1994a and 1994b where not calculated as these would be mostly due to seasonality.

5.2 Poverty measures for 1994 - 1997

Dercon and Krishnan (1998) found that poverty "remained virtually unchanged" between 1994 and 1995 (Dercon & Krishnan 1998: 27). This is not in line with the poverty measures reported in Table 3 which indicates that poverty, as measured by all three FGT measures, was higher in 1995 than in 1994a or 1994b. Figures a(v) and a(vi) (Appendix A) provide an explanation for this asymmetry in results, by showing that there is no stochastic dominance in the concentration curves for real per capita consumption for 1994a and 1995, or for 1994b and 1995, respectively. This implies that poverty measures calculated for these periods will not be robust to where the poverty line is drawn.

Table 3: Changes in poverty measures between 1994 and 1997

Poverty measure	*Real per capita consumption*				*Growth in consumption*			
	1994a	*1994b*	*1995*	*1997*	*94a-95*	*94a-97*	*94b-97*	*95-97*
Head count ratio	*0.42*	*0.44*	*0.51*	*0.41*	*23%****	*-2%*	*-7%**	*-20%****
Poverty gap	*0.18*	*0.16*	*0.21*	*0.17*	*16%***	*-10%***	*4%*	*-23%****
Squared poverty gap	*0.11*	*0.08*	*0.12*	*0.09*	*11%**	*-16%***	*14%***	*-24%****

**Significant at 10% level **Significant at 5% level ***Significant at 1% level*
Source: ERHS

Bigsten and Shimeles (2003) reported that "poverty declined considerably" over the period from 1994 to 1997 (Bigsten & Shimeles 2003: 22). A similar picture arises from the above table showing that the head count ratio declined 1.8% between 1994a and 1997, 7.3% between 1994b and 1997, and 20.1% between 1995 and 1997. The fact that the squared poverty gap is significantly higher in 1997 than in 1994b can be attributed to seasonality, as explained before. Furthermore, Figure a(iv) (Appendix A) shows the concentration curves for real per capita consumption for these two rounds, and although the concentration curve for 1997 generally lies below that of 1994b, this is not true for very low values of consumption indicating a lack of stochastic dominance. Overall the greatest decline in poverty, it's depth and severity, took place between 1995 and 1997 with all measures decreasing by more than 20%. This finding is significant at a 1% level and robust to where the poverty line is drawn, as is evident from Figure a(ii) (Appendix A).

5.3 Determinants of Poverty

This section employs regression trees in an attempt to analyse the correlates of poverty. Regression trees are essentially a non-parametric data-mining technique, used to get an understanding of variables and their interactions that are important in driving a certain phenomenon (Yohannes & Hoddinott 1999: 2). Large data sets, like the ERHS, do not necessarily imply richness of structure as

high dimensionality and non-homogeneity[12] may complicate their analysis. Multivariate reduction tools might be suitable in these situations even though they have well known drawbacks (Steinberg & Colla 1995: 6, 7, 8). The strengths of a tree based approach are that it makes no distributional assumptions, can deal with a mixture of continuous, categorical and interval explanatory variables, has a built in algorithm to handle missing values, is not effected by outliers, collinearity or heteroskedasticity, is able to detect interactions within the data set and lastly, is invariant to monotone transformations. The major weakness of this approach is that it is not based on a probabilistic model but purely on historical accuracy, which implies that no confidence intervals can be constructed (Yohannes & Hoddinott 1999: 9, 11).

The prosedure begins by dividing the total heterogeneous sample, or root node, into binary more homogenous child nodes. To achieve this a 'splitting rule' is employed, this is a question of the form: is $X \leq d$, where X is the 'splitter' variable and d is a constant within the range of that variable. Different 'splitters' are evaluated according to a goodness of split criterion[13] to determine which 'splitting rule' will produce the most homogenous samples (Yohannes & Hoddinott 1999: 3, 12). These rules determine the path of each household through the tree until it comes to rest in a terminal node where no variable in the defined space of explanatory variables can be used as a 'splitter' to obtain more homogenous samples[14]. Thus, a regression tree is formed by iteratively splitting nodes as to maximize the homogeneity in samples, and the predicted values of the dependent variable is then the mean value of the dependent variable for the group of households within each terminal node[15] (Yohannes & Hoddinott 1999: 3, 6).

A regression tree, with the logarithm of real per capita monthly consumption as dependent variable, was built for each of the four rounds of the ERHS. The data was divided a test and a learning sample,

[12] Present when different relationships hold between variables in different parts of the measurement space (Steinberg & Colla 1995: 7).

[13] Usually this is the mean square error of prediction.

[14] However, if a node has less than ten observations it will also be considered terminal.

[15] Apart from exposing structural relationships between response and measured variables, regression trees can be used for prediction by using measured variables to guide one to a terminal node.

and the procedure described above was followed[16]. Since the interest is not to predict household consumption, the trees themselves are not shown here[17]. Rather the variables considered 'important' in the construction of all four trees are reported – thus, the robust correlates of poverty in rural Ethiopia. These variables were identified from the Variable Importance Tables for each round, since the groups of splitters chosen for tree construction only include the variables that produced the *most* homogenous samples, hence they may exclude key variables who's effect is masked by others. Variable Importance Tables however, score all explanatory variables based on the improvement they make as a surrogate to the 'splitter' variable, which implies that *all* 'important' variables can be detected (Yohannes & Hoddinott 1999: 25).

Table 4: Correlates of poverty in rural Ethiopia

Variables considered	***1994a***	***1994b***	***1995***	***1997***
Human capital variables				
Household size	●	●	●	●
Age of the household head	●	●	●	●
Squared age of the household head	●	●	●	●
Mean age of household members	●	●	●	●
Squared mean age of household members	●	●	●	●
Dependency ratio	●	●	●	●
Head or spouse could not name the prime minister of Ethiopia	●			●
Head or spouse do not know that man has walked on the moon	●			
Proxy for numeracy				●
Years of education completed by household head	●		●	●
Physical capital variables				
Total land available to the household	●	●	●	●
Value of assets	●	●	●	●
Number of rooms in dwelling			●	
Household owns a transporting cart	●			
Household does not own any oxen	●			●
Household does not own a horse or camel			●	●

[16] The statistical package CART was employed. Summary statistics for some of the explanatory variables used here and in sections 6.2.1 and 6.2.2, are provided in Table d (Appendix A). Notes to explanatory variables: (1) variables regarding the head or spouses knowledge about the prime minister of Ethiopia as well as the moon landing was included as it may serve as a proxy for political involvement or inaccessibility/remoteness of place of residence, and hence limited contact with the 'outside' world; (2) a household was classified as "owning at least one ox" even if the household owned a cross-breed ox or only had access to an ox or cross-breed ox - Dercon and Krishnan (1998) presented a higher percentage of households who does not own any oxen, this might be because they only considered pure-bred oxen and may not have included households who do not own, but does have access, to an ox. Including access to oxen is important because in rural Ethiopia share-agreements between kin groups are an important part of social capital (Bevan & Joireman 1997: 317).

[17] Trees are available from author on request.

Household owns at least one bull	●	●	●	●
Household owns at least one cow	●	●	●	
Household owns at least one donkey			●	●
Household owns at least one sheep or goat			●	●
Household owns at least one chicken		●		
Household owns at least one heifer		●		
Segmentation variables				
Resident of one of the poorer Peasant Associations	●		●	
Time needed to travel to medical facilities				●
Female household head	●			
Religion of household head	●			
One of household's main crops is chat				●
One of household's main crops is maize				●
One of household's main crops is sorghum				●
Productivity variables				
Value of livestock sold	●	●	●	●
Value of earnings from off-farm activities	●		●	●
Value of crops sold	●	●	●	●
Shock variables				
Experienced crop loss in last 20 years	●			

Source: ERHS

Even though these regression trees differ between rounds, as a result of seasonality and other factors, a broad pattern emerges showing that household demographics and physical capital endowments matter. Poorer households have more members[18], with a higher mean age, a higher dependency ratio, and an older household head. Furthermore, these households have less land to their disposal, own less assets and key livestock, such as bulls, and earn less from crop and livestock sales. These broad trends are in accordance with the findings of Bigsten *et al* (2003) who ran OLS and household fixed effects regressions on per capita expenditure for rural households in the same period (Bigsten *et al* 2003: 93, 94). As these correlates of poverty are only with respect to households that were poor in a certain period, one cannot make any conclusions regarding the characteristics of households that move out or remain in poverty over time. The next section explores these determinants of a household's poverty dynamics.

[18] Many studies of rural households have found household size to be significant in determining their poverty status, see Bigsten *et al* (2003) and Keller (2004).

6. RESULTS: MEASUREMENT OF POVERTY DYNAMICS

6.1 Short-term mobility of households between 1994 and 1997

6.1.1 Movements within the distribution of consumption between 1994 and 1997

Comparing distributions by their percentile, as is done in section 5.1, does not provide any information regarding the movements of certain households within that distribution. The panel nature of the data allows us to employ transition matrices in describing the mobility of households, by following the movements of these households between deciles for the period under consideration. The ijth element of a transition matrix represents the percentage of households that moved from state i to state j in the period under consideration. These matrices are useful in exploring the extent of transient and chronic poverty, as per the spells approach, because they indicate the percentages of households staying in each decile, moving up or down one decile etc. (Booysen 2003: 18).

Table 5: Transition matrix for quintiles of real consumption between 1994 and 1997

Quintiles	***1***	***2***	***3***	***4***	***5***
1	*41*	*24*	*15*	*10*	*10*
2	*27*	*22*	*20*	*17*	*15*
3	*11*	*21*	*23*	*25*	*20*
4	*17*	*19*	*22*	*23*	*19*
5	*5*	*15*	*19*	*24*	*37*

Source: ERHS

As expected in such a poor agriculture dependent population as rural Ethiopia, most households either stayed in the same quintile or moved only one quintile upwards or downwards. A useful way to summarize the extent of mobility in a population from a transition matrix is the Shorrocks Mobility Index (SMI). This is defined as: (n – trace of the matrix) / (n – 1), where n is the number of categories. The SMI is usually normalised by dividing it by (n / (n -1)). The closer the SMI is to one, the more mobility there is within the society (Shorrocks 1978a: 1017) [19]. The transition matrix above results in a SMI of 0.708, indicating relatively high mobility between 1994 and 1997. However, this

[19] This index does not give any information regarding the direction of mobility. Shorrocks warned that any attempt, like this one, to condense data into a single summary statistic necessarily results in the loss of information. "A single valued index of mobility will never, therefore, do justice to all the various aspects that warrant consideration. Nevertheless, such an index may provide a useful tool..." (Shorrocks 1978b: 383).

index gives no indication of the direction of the mobility. Table 6 provides some information on the nature of mobility in rural Ethiopia. Households were divided into three groups: the poor with consumption below the poverty line, the vulnerable with consumption between the poverty line and double this value, and lastly, the rich with consumption more than twice the value of the poverty line. 55% of households who were poor in 1994a are also classified as poor in 1997, whilst 43% are classified as rich in both periods. Upward mobility is generally lower than downward mobility. For example, 26% of households that were poor in 1994a are classified as vulnerable in 1997 and 32% of households classified as rich in 1994a are part of the vulnerable category in 1997.

Table 6: Transition matrix for consumption relative to the poverty line

1997 consumption → ***1994a consumption ↓***	***Below z***	***Between z and 2z***	***Above 2z***
Below z	*55*	*26*	*19*
Between z and 2z	*36*	*38*	*26*
Above 2z	*25*	*32*	*43*

z represents the poverty line as discussed earlier
Source: ERHS

6.1.2 Poverty dynamics as per the spells approach

The results of transition matrices, as described above, ignore movements between the first and last rounds of the survey. As mentioned in section 4.1 complete consumption data are available for 1362 households, Tables 7 and 8 summarize the classification of these households into groups based on the number of rounds spent in poverty.

Table 7: Percentage of households in each mobility category

	Into poverty		***Out of poverty***		***Deciles upwards***		***Deciles downwards***	
Movements	***Freqeuncy***	***Percentage***	***Freqeuncy***	***Percentage***	***Freqeuncy***	***Percentage***	***Freqeuncy***	***Percentage***
0	*711*	*52%*	*724*	*53%*	*162*	*12%*	*165*	*12%*
1	*627*	*46%*	*590*	*43%*	*729*	*54%*	*737*	*54%*
2	*25*	*2%*	*49*	*4%*	*451*	*33%*	*439*	*32%*
3	-	-	-	-	*21*	*1%*	*22*	*2%*
Total	*1363*	*100%*	*1363*	*100%*	*1363*	*100%*	*1363*	*100%*

Source: ERHS

Table 8: Poverty status of households as per the spells approach

Poverty status	***Frequency***	***Percentage***
Never poor	*305*	*22%*
Sometimes poor	*858*	*63%*
once poor	*318*	*23%*
twice poor	*297*	*22%*

thrice poor	*243*	*18%*
Always poor	*200*	*15%*
Total	*1363*	*100%*

Source: ERHS

Around 53% of households made no movements into or out of poverty. This group includes the 'always poor' and the 'never poor', as presented in Table 8. 22% of households in rural Ethiopia were never classified as poor in the four rounds under consideration[20]. The sometimes poor category, where households spent between one and three rounds in poverty, includes the highest percentage of households (63%) indicating a high level of transient poverty in rural Ethiopia. The chronic poor, households that were classified as poor in every round, include only 15% of all rural households. As expected, this figure is lower than the corresponding value calculated according to the components approach, see section 6.1.3. If households who were classified as poor in three of the four rounds are also included in the 'always poor' category, the results are more similar to that of the components approach.

46% of rural households moved into poverty at least once during the four rounds, and the percentage of households that moved out of poverty at least once is 43%. The number of deciles moved downwards and upwards shows a similar picture, indicating that in each category more than half of the households moved only one decile. These categories are regressed on certain household characteristics and endowments using a count data (poisson) model in the second set of regressions in section 6.2. The first set of regressions employ multinomial logistic regression models to determine the correlates of transient and chronic poverty, as defined according to the spells approach.

6.1.3 Poverty dynamics as per the components approach

Baulch and Hoddinott (2000) warn that "one should not read too much into the categories" as defined by the spells approach and prefer the more systematic components approach (Baulch & Hoddinott 2000: 9). The spells and components approaches do not generally yield the same grouping

[20] Bigsten and Shimeles (2003) report a much higher figure (54%) for this category. The difference may be ascribed to the fact that they only considered three rounds: 1994a, 1995 and 1997. Furthermore, they may have used a lower level of consumption for the poverty line. Their figures for sometimes poor and always poor are 34% and 12% respectively (Bigsten & Shimeles 2003: 8).

(Oduro 2002: 16). When both approaches are employed, the components approach typically produce 5-25% more chronically poor people (Hulme & Shepherd 2003: 406). McKay and Lawson (2003) explain this by noting that with the components approach, chronic poverty does not necessarily correspond to "persistent poverty". Even if a household fall into and out of poverty throughout the period under consideration, but has permanent (average) consumption below the poverty line, that household will be considered chronically poor (McKay & Lawson 2003: 427). The poverty groupings according to this approach are given below (see Table 9). Even though this approach is more conservative in classifying a household as being transiently poor, this category still dominates.

Table 9: Decomposition of total poverty into chronic and transitory components

Total	***Percentage***	***Chronic***	***Percentage***	***Transient***	***Percentage***
0.096	*100%*	*0.047*	*49%*	*0.049*	*51%*

Poverty measure employed is the squared poverty gap as per Jalan and Ravallion (1998)
Source: ERHS

To identify the correlates of a household's poverty status, the above decomposition as per the components approach will be regressed on certain household characteristics and endowments in section 6.2.2, with the use of a tobit model.

6.2 Determinants of poverty dynamics

6.2.1 Spells approach

In the first set of regressions households were classified as non-poor (base/reference group), transiently poor (state 1) or chronically poor (state 2) according to the number of rounds they had spent in poverty. Two alternative specifications were employed to test the robustness of the findings. In model 1 households are chronically poor if they had spent three or four rounds in poverty, whilst only households who had spent all four rounds in poverty are included in this category for model 2. As discussed above, see Table 8, model 1 adds about 18% to the chronic poor. These specifications imply three unordered outcomes which should be modelled using a multinomial logistic or probit regression technique (Gujarati 2003: 624), the former will be employed here[21]. Table 10 provides the regression results.

[21] This model may be written as: $Y_i^* = X_i' \beta + \varepsilon_i$, where Y_i^* is the unobservable latent variable and Yi = state 1 or state 2 if Y_i^* acts as described above. The response probabilities for state 1 and state 2 are: $P(y_i = j \mid X_i) = (\exp (X_i' \beta_j)) / (1 +$

Firstly, as indicated by the significance of the Chi Squared test and the other diagnostics, both the models seem to be a reasonable specification. Furthermore, the results are robust to small changes in specification as models 1 and 2 generally give the same results. Factors that significantly increase a household's chance of being transiently poverty, as opposed to always non-poor, include a high dependency ratio[22], a low level of assets, a low level of livestock sales and experiencing losses due to crop failures. 21% of households have not experienced any crop losses in the last twenty years, of these households 61% were never, or only once, classified as poor. The cultivation of sorghum or barley seems to be a way out of transient poverty. Interestingly, the results indicate that it is more probable that households who do not own any farming equipment[23] is non-poor than transiently (or chronically) poor. This may indicate that households who engage in activities other than farming are more protected against poverty, but this is not in line with findings of Bigsten and Shimeles (2003), who conclude that other activities merely serve as survival strategies (Bigsten & Shimeles 2003: 19).

Households who are more likely to be chronically poor typically live in one of the poorer PAs and have more members. Bigsten *et al* (2003), also implementing a multinomial logistic regression model, reach the same conclusions (Bigsten *et al* 2003: 100). Furthermore, as with the transient poor, these households own fewer assets and earn less from the sale of livestock[24].

Table 10: Multinomial logistic regressions on the transient and chronic poor as per the spells approach

	Model 1		***Model 2***	
Dependent variable: Poverty status	***State 1 Transient***	***State 2 Chronic***	***State 1 Transient***	***State 2 Chronic***
Independent variables:				
Ln of real consumption	*-1.63****	*-3.60****	*-1.82****	*-3.62****
Human capital variables				
Household size	*0.05*	*0.13***	*0.06*	*0.21****
Age of the household head	*-0.0004*	*0.05*	*0.005*	*0.01*
Squared age of the household head	*0.0001*	*-0.0002*	*-0.00001*	*-0.00001*

exp (X_i' β_1) + exp (X_i' β_2)), where j = state 1, state 2. For the base category this value is: $P(y_i = 0 \mid X_i) = (1 / (1 + \exp (X_i' \beta_1) + \exp (X_i' \beta_2)$) as these should sum to 1 (Wooldridge 2002: 497).

[22] Defined as the ratio of the number of members below the age of 15 and above the age of 65, to the rest of the members.

[23] Items included in this category are: forks, ploughs, sickles and spades.

[24] The poisson and tobit regressions also indicates that higher earnings from livestock sales are correlated with the 'never poor' category, which leads one to conclude that livestock sales are not a survival mechanism, but an enterprise.

Literacy of the household head (1=illiterate)	*-0.07*	*0.15*	*-0.04*	*-0.22*
Mean age of household members	*0.01*	*-0.04*	*0.01*	*0.05*
Squared mean age of household members	*-0.0002*	*-0.0001*	*-0.0001*	*-0.001*
Household head completed primary school (1=not completed)	*0.15*	*-0.01*	*0.10*	*0.46*
Dependency ratio	*0.19***	*0.16*	*0.19***	*-0.003*
Head or spouse could not name the prime minister of Ethiopia	*0.31*	*0.42*	*0.34**	*0.13*
Head or spouse do not know that man has walked on the moon	*-0.01*	*-0.01*	*-0.02*	*0.26*
Proxy for numeracy (1=limited numeric ability)	*0.14*	*0.07*	*0.13*	*0.17*
Physical capital variables				
Total land available to the household	*-0.07*	*-0.13*	*-0.08*	*-0.11*
Value of assets	*-0.0004**	*-0.001****	*-0.0004***	*-0.001***
Household does not own farm equipment	*-0.62***	*-0.88***	*-0.68***	*-1.14***
Household does not own domestic equipment	*-0.70**	*-0.07*	*-0.64*	*-0.19*
Household does not own other equipment	*-0.68*	*-0.75*	*-0.70*	*-0.63*
Household does not own any oxen	*0.06*	*0.33*	*0.08*	*0.20*
Household does not own a horse or camel	*-0.08*	*0.07*	*-0.04*	*-0.15*
Segmentation variables				
Resident of one of the poorer Peasant Associations	*0.10*	*0.78***	*0.13*	*1.55****
Female household head	*0.001*	*0.15*	*0.01*	*0.07*
One of household's main crops is enset	*-0.34*	*0.41*	*-0.22*	*0.17*
One of household's main crops is teff	*-0.22*	*0.06*	*-0.20*	*0.36*
One of household's main crops is wheat	*-0.01*	*0.08*	*0.02*	*-0.20*
One of household's main crops is maize	*0.41*	*0.43*	*0.41*	*0.35*
One of household's main crops is sorghum	*-0.79****	*-0.45*	*-0.76****	*-0.59*
One of household's main crops is barely	*-0.45**	*-0.43*	*-0.44**	*-0.50*
Productivity variables				
Value of livestock sold	*-0.0002**	*-0.0004***	*-0.0002**	*-0.001***
Value of earnings from off-farm activities	*-0.00003*	*0.00004*	*0.00001*	*0.0002*
Value of crops sold	*-0.00001*	*-0.000004*	*-0.00001*	*-0.001***
Shock variables				
Experienced crop loss in last 20 years	*0.53***	*0.41*	*0.55**	*-0.20*
Lost a household member in last 20 years	*0.17*	*-0.05*	*0.13*	*0.20*
Other losses experienced in last 20 years	*-0.05*	*-0.02*	*-0.02*	*-0.46*
Constant	*8.21****	*12.78****	*9.05****	*11.77****
Number of observations	*1175*		*1175*	
Log Likelihood	*-832*		*-718*	
Test: Chi^2	*830*		*720*	
Probability > Chi^2	*0****		*0****	
Pseudo R^2	*0.33*		*0.33*	
Additional diagnostics:				
Deviance	*0.73*		*0.68*	
Scaled Deviance	*0.73*		*0.68*	
Pearson Chi^2	*1.31*		*1.26*	
Scaled Pearson Chi^2	*1.31*		*1.26*	

Note:

1) State 1 (transient poor); Model 1 - one or two waves spent in poverty and Model 2 - one, two or three waves spent in poverty. State 2 (chronic poor); Model 1 -three or four waves spent in poverty and Model 2 - four waves spent in poverty

*2) *Significant at 10% level **Significant at 5% level ***Significant at 1% level*

3) Independent variables take on first round (1994a) values

4) In both models the base category is literate male headed households that were never classified as poor, producing coffee and/or chat, who owns assets and is resident in one of the richer Peasant Associations

5) The additional diagnostics were ran in STATISTICA, and indicate that the models fit relatively well as these are close to one

In the second set of regressions as per the spells approach to poverty dynamics the dependent variables were the number of rounds spent in poverty, the number of movements into and out of poverty and lastly, the number of deciles moved upwards or downwards. It is evident that a count data specification had to be employed. The regressions were run using both the poisson and negative binomial specifications[25]. Results were nearly identical and the poisson specification turned out to be reasonable, as is evident from the Chi Squared test and the goodness of fit statistics. Therefore, Table 11 only reports the output as estimated by the poisson regressions.

Households who spent more rounds in poverty had less land, fewer assets and earned less from the sale of livestock. Households living in poorer PAs are more probable to be in this category, whilst the production of sorghum again safeguards households against extended poverty. Movements into poverty are positively correlated with the dependency ratio and crop losses, and negatively correlated with the cultivation of barely. Model 3 indicates that movements out of poverty are hampered by a large household size, the absence of domestic equipment and by the cultivation of teff[26]. Furthermore, households whose head completed primary school move out of poverty more easily. The regressions on the number of deciles were not very successful in exposing correlates of these movements, as indicated by the lack of significant explanatory variables in models 4 and 5. The only noteworthy result is that upward and downward movements are respectively, hampered and encouraged by a large household.

Table 11: Poisson regressions on movements into and out of poverty between 1994 and 1997

Dependent variable: Number of …	***Model 1 rounds spent in poverty***	***Model 2 movements into poverty***	***Model 3 movements out of poverty***	***Model 4 deciles moved downwards***	***Model 5 deciles moved upwards***
Independent variables:					
Ln of real consumption	*-0.05****	*0.29****	*-0.40****	*0.28****	*-0.28****
Human capital variables					
Household size	*0.01*	*0.004*	*-0.06***	*0.02****	*-0.03****
Age of the household head	*0.01*	*0.01*	*0.02*	*0.002*	*0.004*
Squared age of the household head	*-0.0001*	*-0.0001*	*-0.0002*	*-0.00004*	*-0.00002*
Literacy of the household head (1=illiterate)	*-0.07*	*0.01*	*-0.11*	*-0.03*	*-0.04*

[25] Let y be a discrete dependent variable and **x** = (x1, ... ,xk) the collection of explanatory variables. Then the probability distribution of y given **x** is: $f (y | \mathbf{x}) = (\exp (- \mu (\mathbf{x}))*(\mu (\mathbf{x}))^{y}) / (y!)$, y = 0, 1, 2, 3 and $\mu (\mathbf{x}) = \beta_1 + \beta_2 X_{2i} + ... + \beta_k X_{ki}$. Then if $V (y | \mathbf{x}) = E (y | \mathbf{x})$ the poisson specification is correct, but if $V (y | \mathbf{x}) = \delta^2 E (y | \mathbf{x})$ the negative binomial specification should be employed (Wooldridge 2002: 646, 647).

[26] Teff is mostly produced only for domestic markets (Bigsten *et al* 2003: 95).

Mean age of household members	*-0.003*	*0.02*	*-0.01*	*0.01*	*-0.01*
Squared mean age of household members	*-0.0001*	*-0.0002*	*0.0002*	*-0.0001*	*0.0001*
Household head completed primary school (1=not completed)	*0.11*	*0.20*	*0.36**	*-0.01*	*0.05*
Dependency ratio	*0.03*	*0.07**	*0.06*	*0.02*	*-0.01*
Head or spouse could not name the prime minister of Ethiopia	*0.03*	*0.12*	*0.02*	*0.05*	*-0.03*
Head or spouse do not know that man has walked on the moon	*-0.02*	*-0.16**	*-0.15*	*0.04*	*-0.02*
Proxy for numeracy (1=limited numeric ability)	*0.02*	*0.12*	*-0.06*	*0.04*	*-0.02*
Physical capital variables					
Total land available to the household	*-0.02*	*-0.02*	*-0.01*	*-0.01*	*0.01*
Value of assets	*-0.0002****	*-0.0001*	*0.00004*	*-0.0001*	*0.00002*
Household does not own farm equipment	*-0.19***	*-0.11*	*-0.39***	*0.01*	*0.02*
Household does not own domestic equipment	*-0.05*	*-0.20*	*-0.60***	*0.12*	*-0.15*
Household does not own other equipment	*-0.05*	*0.03*	*-0.26*	*0.11*	*0.04*
Household does not own any oxen	*0.07*	*0.09*	*-0.05*	*0.06*	*-0.002*
Household does not own a horse or camel	*0.01*	*-0.11*	*-0.10*	*0.01*	*-0.08*
Segmentation variables					
Resident of one of the poorer Peasant Associations	*0.22***	*-0.05*	*-0.11*	*0.10*	*-0.07*
Female household head	*0.02*	*-0.15*	*-0.01*	*-0.06*	*-0.09*
One of household's main crops is enset	*0.11*	*-0.10*	*-0.13*	*0.02*	*-0.04*
One of household's main crops is teff	*-0.02*	*-0.13*	*-0.26***	*0.02*	*-0.07*
One of household's main crops is wheat	*-0.01*	*-0.15*	*0.10*	*0.04*	*-0.02*
One of household's main crops is maize	*-0.04*	*-0.03*	*-0.12*	*0.03*	*-0.08*
One of household's main crops is sorghum	*-0.14**	*-0.19*	*-0.12*	*-0.02*	*0.05*
One of household's main crops is barely	*-0.07*	*-0.26***	*0.07*	*-0.06*	*0.07*
Productivity variables					
Value of livestock sold	*-0.0001***	*-0.0001*	*-0.00001*	*-0.00003*	*0.00003*
Value of earnings from off-farm activities	*0.0001*	*-0.00005*	*-0.00002*	*-0.0001*	*0.00003*
Value of crops sold	*-0.000004*	*-0.000004*	*-0.000001*	*-0.000001*	*0.000002*
Shock variables					
Experienced crop loss in last 20 years	*0.09*	*0.28***	*-0.02*	*0.05*	*-0.10*
Lost a household member in last 20 years	*-0.07*	*-0.09*	*0.02*	*-0.03*	*0.04*
Other losses experienced in last 20 years	*-0.04*	*-0.11*	*0.04*	*-0.02*	*0.02*
Constant	*1.99****	*-2.36****	*1.64****	*-1.46****	*1.76****
Number of observations	*1175*	*1175*	*1175*	*1175*	*1175*
Log Likelihood	*-1649*	*-969*	*-985*	*-1406*	*-1407*
Test: Chi^2	*665*	*55*	*89*	*71*	*73*
Probability > Chi^2	*0****	*0.01***	*0****	*0.001****	*0.001****
Pseudo R^2	*0.17*	*0.03*	*0.04*	*0.02*	*0.03*
Goodness of fit: Chi^2	*905*	*824*	*843*	*502*	*488*
Probability > Chi^2	*1****	*1****	*1****	*1****	*1****

Note:

1) Only difference when using negitive binomial regressions is that for model 1 land available to household is significant at 10% level

*2) *Significant at 10% level **Significant at 5% level ***Significant at 1% level*

3) Independent variables take on first round (1994a) values

4) In both models the base category is literate male headed households that were never classified as poor, producing coffee and/or chat, who owns assets and is resident in one of the richer Peasant Associations

6.2.2 Components approach

Regressions on transient and chronic poverty as calculated with the components approach imply that the dependent variables have zero values for the non-poor households. This results in a censored sample and should be modelled accordingly. In this analysis tobit specifications are employed[27]. The other values of the dependent variables are the squared poverty gap, the transient component thereof, and the chronic component for each household, for models 1, 2 and 3, respectively. Estimation results are given in Table 12.

According to the Chi Squared test all three models' specifications are reasonable. This indicates that heteroskedasticity was not as problematic as feared by Haddad and Ahmed (2002). The correlates of total poverty include a large household size, a small plot, less assets and fewer earnings from the sale of livestock. Poor households are more probable to be resident in one of the poorer PAs and cultivate crops other than chat, coffee or barely. Lastly, these households are likely to be ignorant with respect to political developments in their country and general global developments.

Model 2 indicates that a high dependency ratio, small plot for cultivation and the experiencing of crop losses, increases a household's chances of being transiently poor. However, if a household produces barely or teff as their main crop their chances of being in this group decreases. Model 3 of the poisson regressions indicated that the production of teff is negatively correlated with the number of movements out of poverty. This may be due to the fact that households who were non-poor in all rounds also made no movements out of poverty. Again chronic poverty is more evident amongst households with more members and households who are resident in one of the poorer PAs. Other correlates of chronic poverty, according to model 3, are a low level of assets and earnings from livestock sales.

[27] Haddad and Ahmed (2002) use quantile regression methods for this purpose. Their dependent variables are also (1) the squared poverty gap measure for each household, (2) the transitory component, and (3) the chronic component, with zero values for households above the poverty line. They argue that tobit estimators are too sensitive to the misspecification of the error term (Haddad & Ahmed 2002: 15).

Table 12: Tobit regressions on total, chronic and transient poverty defined as per the components approach

Dependent variable: Poverty status	***Model 1 Total***	***Model 2 Transient***	***Model 3 Chronic***
Independent variables:			
Ln of real consumption	*-0.11****	*-0.04****	*-0.18****
Human capital variables			
Household size	*0.01****	*-0.001*	*0.01****
Age of the household head	*-0.0003*	*0.001*	*0.003*
Squared age of the household head	*0.00001*	*-0.000002*	*-0.000002*
Literacy of the household head (1=illiterate)	*0.004*	*0.003*	*-0.01*
Mean age of household members	*-0.001*	*-0.00001*	*0.002*
Squared mean age of household members	*0.00001*	*-0.00002*	*-0.0001*
Household head completed primary school (1=not completed)	*-0.001*	*-0.001*	*0.02*
Dependency ratio	*-0.005**	*0.006***	*0.003*
Head or spouse could not name the prime minister of Ethiopia	*0.02***	*0.01**	*0.01*
Head or spouse do not know that man has walked on the moon	*0.02****	*0.002*	*0.03**
Proxy for numeracy (1=limited numeric ability)	*0.0004*	*0.002*	*-0.0003*
Physical capital variables			
Total land available to the household	*-0.01****	*-0.004***	*-0.01*
Value of assets	*-0.00002***	*-0.000005*	*-0.00004**
Household does not own farm equipment	*-0.03***	*-0.01***	*-0.04***
Household does not own domestic equipment	*-0.01*	*-0.02***	*0.03*
Household does not own other equipment	*-0.05****	*-0.01*	*-0.05*
Household does not own any oxen	*0.004*	*0.002*	*0.03*
Household does not own a horse or camel	*0.01*	*0.01*	*-0.002*
Segmentation variables			
Resident of one of the poorer Peasant Associations	*0.03****	*0.01*	*0.09****
Female household head	*-0.003*	*-0.005*	*0.01*
One of household's main crops is enset	*0.004*	*0.005*	*0.02*
One of household's main crops is teff	*-0.01*	*-0.01**	*-0.01*
One of household's main crops is wheat	*0.002*	*-0.002*	*0.02*
One of household's main crops is maize	*0.01*	*-0.0002*	*-0.005*
One of household's main crops is sorghum	*-0.01*	*-0.01**	*0.01*
One of household's main crops is barely	*-0.02***	*-0.001*	*-0.03*
Productivity variables			
Value of livestock sold	*-0.00001****	*-0.000004*	*-0.00003***
Value of earnings from off-farm activities	*0.00001*	*0.000003*	*0.00002*
Value of crops sold	*-0.0000005*	*-0.0000002*	*-0.0000004*
Shock variables			
Experienced crop loss in last 20 years	*0.03****	*0.02****	*-0.001*
Lost a household member in last 20 years	*0.01*	*-0.004*	*-0.01*
Other losses experienced in last 20 years	*-0.01*	*-0.01*	*-0.02*
Constant	*0.47****	*0.17****	*0.40****
Number of observations	*1175*	*1175*	*1175*
Log Likelihood	*744*	*1044*	*19*
Test: Chi2	*1119*	*411*	*838*
Probability > Chi2	*0****	*0****	*0****

Note:

*1) *Significant at 10% level **Significant at 5% level ***Significant at 1% level*

2) Independent variables take on first round (1994a) values

3) In both models the base category is literate male headed households that were never classified as poor, producing coffee and/or chat, who owns assets and is resident in one of the richer Peasant Associations

7. CONCLUSIONS

According to the findings of this analysis the period between 1994 and 1997, especially 1995 to 1997, showed a significant decline in poverty for rural Ethiopia[28], as measured by the head count ratio, poverty gap and squared poverty gap[29]. Although it is beyond the scope of this study to determine the exact causes of the perceived decline in poverty, one might conclude that economic growth, favourable weather, improved governance and the development policies implemented may have improved the fate of the poor[30]. However, it is evident that Ethiopia is still a desperately poor country.

Regression trees, multinomial logistic, poisson and tobit regressions were employed to expose the correlates of poverty. Generally poorer households are larger, own fewer assets, have less land to their disposal, cultivate crops other than sorghum, barely, coffee or chat, and earn less form the sale of livestock. Furthermore, movements into poverty are associated with a high dependency ratio and experiencing crop failures, whilst households who move out of poverty with more ease have fewer members.

But it should be acknowledged that the poor are a heterogeneous group. The 'army of the poor' include households who move into and out of poverty, the transient poor, as well as households that

[28] Devereux and Sharp (2003) are very critical of any study suggesting a fall poverty in rural Ethiopia. They argue that firstly, the initial sampling frame was not representative of rural Ethiopia as a whole, and secondly that consumption cannot be considered a good welfare indicator in rural Ethiopia since seasonality, weather patterns and food-aid distort it's distribution (Devereux & Sharp 2003: 1). Based on social indicators and studies aiming to determine how rural Ethiopians perceive their own situations they conclude that poverty reduction in rural Ethiopia is "not uniform, it is not universal and it is not linear" (Devereux & Sharp 2003: 28). Bevan and Joireman (1997) share their sentiment and also calculate other measures of poverty, like PWR (personal wealth ranking), alongside consumption poverty.

[29] This is in line with the findings of Bigsten and Shimeles (2003) who analysed both rural and urban data for the same period (Bigsten & Shimeles 2003: 22).

[30] Fields (2000) suggests employing regressions to determine whether growth in consumption was 'pro-poor'. For this purpose you regress the change/growth in consumption on the consumption of the previous period. Table e (appendix) presents the results for 1995 – 1997, and 1994a – 1997, respectively. Both coefficients are negative, indicating that the growth in consumption was indeed 'pro-poor'.

are trapped in poverty, the chronic poor. Clearly, this is important to consider when designing policies aimed at reducing poverty, to achieve the right mix of policies, one needs to know the extent to which poverty is transient versus chronic (Jalan & Ravallion 2000: 83). Furthermore, one expects these groups to have different endowments and characteristics, which would then guide policy proposals. Especially the correlates of transient poverty can be useful in designing policies aimed at protecting non-poor households vulnerable to poverty.

It is evident that transient poverty dominates chronic poverty in rural Ethiopia. Again employing the regression techniques mentioned above, it was found that transiently poor households have a higher dependency ratio than non-poor households, frequently experience crop failures and have a smaller area of land available for cultivation. The chronic poor usually live in one of the poorer PAs, this might sound trivial, but the immobility of households due to scarcity of land implies that these households are caught in a poverty trap and cannot escape by migrating to richer areas. Furthermore, chronically poor households also own fewer assets and earn less from the sale of livestock.

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9. APPENDIX A

Table a: ERHS Interview schedule

			Time of Interview:			
Peasant Association	*Location*	*Main Harvest*	*1994a*	*1994b*	*1995*	*1997*
Harresaw	Tigray	October-November	June-July	January	March	June
Geblen	Tigray	October-November	June-July	January	March	June
Dinki	North Shoa	December	March-April	November	January	October-November
Debre Birhan	North Shoa	November-December	March-April	October	March	June-August
Yetmen	Gojjam	November-December	March-April	October	March	September-October
Shumsheha	South Wollo	October-December	June-July	December-January	May	October-November
Sirbana Godeti	Shoa	November-December	March-April	November	March	June-July
Adele Keke	Hararghe	November-December	May-June	October	April	October-November
Korodegaga	Arssi	October-November	May-June	November-December	May-June	June-July
Turufe Kecheme	South Shoa	December	March-April	September-October	March-April	September-October
Imdibir	Shoa	October-December	March-April	October	March	June-July
Aze Debo'a	Shoa	October-November	March-April	September-October	March	September-October
Adado	Sidamo	December-January	March-April	January	March	June-July
Gara Godo	Sidamo	August-December	March-May	October	March	June-July
Do'oma	Gama Gofa	September-December	April-May	December-January	May-June	November

Source: Dercon (2004: 5, 10)

Table b: Mean real consumption per capita per month, and poverty lines per PA, for all rounds

	1994a		1994b		1995		1997	
Peasant Association	Consumption	Poverty Line	Consumption	Poverty Line	Consumption	Poverty Line	Consumption	Poverty Line
Harresaw	60.20	44.24	63.05	41.90	68.98	43.86	98.48	46.16
Geblen	31.82	55.37	39.41	50.37	34.99	54.60	88.20	53.39
Dinki	67.17	44.37	64.48	53.39	47.08	62.26	35.11	50.83
Debre Birhan	94.94	49.26	104.87	50.58	80.96	50.45	143.65	47.74
Yetmen	95.43	40.17	59.04	51.24	66.52	54.09	88.01	40.17
Shumsheha	98.97	42.17	102.55	51.63	96.85	59.24	93.91	51.01
Sirbana Godeti	107.63	37.72	93.75	46.03	85.51	50.65	70.64	42.48
Adele Keke	91.09	53.11	90.71	58.78	130.44	60.82	100.29	52.56
Korodegaga	33.51	43.78	37.83	40.87	42.96	46.29	43.13	48.21
Turufe Kecheme	104.28	36.04	90.84	45.20	74.62	43.44	55.44	49.48
Imdibir	44.14	37.71	35.43	44.57	30.41	50.92	47.17	44.40
Aze Debo'a	76.67	36.48	79.02	48.43	54.62	40.55	65.57	40.53
Adado	67.56	40.84	41.36	40.29	52.10	48.17	83.47	39.84
Gara Godo	26.68	49.18	50.09	46.93	27.44	41.46	34.83	45.86
Do'oma	38.40	57.59	77.05	35.24	96.01	43.71	60.74	56.27

Source: ERHS, poverty lines calculated by IFPRI

Table c: PA Background information

Peasant Association	Population Share	Background	Main Crops
Harresaw	5.69%	Poor and vulnerable area; used to be quite wealthy	Cereals
Geblen	4.47%	Poor and vulnerable area; used to be quite wealthy	Cereals
Dinki	5.89%	Poor and vulnerable area; not easily accessible	Millet, teff
Debre Birhan	12.47%	Highland site; near town	Teff, barley, beans
Yetmen	4.13%	Fertile area; low rates of migration	Teff, wheat, beans
Shumsheha	10.03%	Poor and vulnerable area; shortage of grazing land	Cereals
Sirbana Godeti	6.57%	Rich area; targeted by agricultural policy	Teff
Adele Keke	6.57%	Highland site; famine 1985/1986; land shortage	Millet, maize, coffee, chat
Korodegaga	7.39%	Poor and vulnerable area; in neighbourhood of rich valley	Cereals
Turufe Kecheme	6.91%	Rich area; highlands	Wheat, barley, teff, potatoes
Imdibir	4.54%	Favourable climate; densly populated; mountainous terrain	Enset, chat, coffee, maize
Aze Debo'a	5.08%	Land scarce area; substantial seasonal migration; densly populated	Enset, coffee, maize, teff, sorghum
Adado	8.81%	Rich fertile coffee producing area; densly populated	Coffee, enset
Gara Godo	6.50%	Densly populated; famine 1983/1984; malaria 1988	Barley, enset
Do'oma	4.95%	Remote poor resettlement (1985) area; famine 1985/1988/1989/1990	Enset, maize

Source: ERHS, Dercon & Krishnan (1998) and Bevan & Pankhurst (1996)

Table d: Sample statistics for variables used in the regressions

Variable	Sample mean	Sample standard deviation	Minimum	Maximum
Logarithm of real consumption p.c.	3.92	0.85	0.05	7.11
Household size	6.00	3.05	1	23
Age of household head (years)	46.41	16.28	15	100
Meanage of household (years)	24.41	11.30	9.15	90
Dependency ratio	1.83	1.26	0	8
Total land owned by household (hectares)	1.51	1.16	0	13.69
Value of assets owned (birr)	202.71	439.18	0	6000
Value of livestock sales (birr)	552.75	754.25	0	6000
Value of off-farm income earned (birr)	150.37	315.29	0	4825
Value of crop sales (birr)	819.54	14037.57	0	500960

Source: ERHS

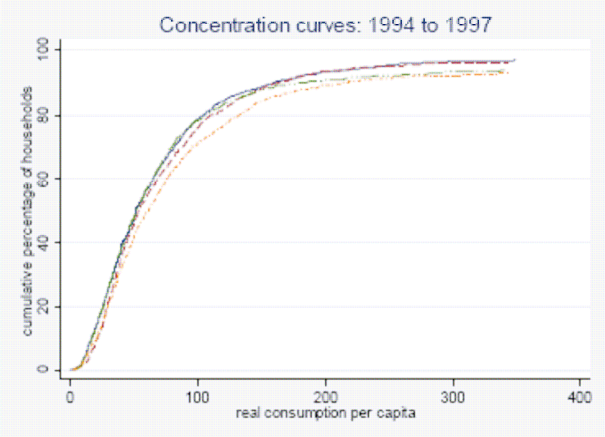
Table e: Pro-poor regressions

	Model 1		Model 2	
Dependent variable:	Change in consumption between 1997 and 1995		Change in consumption between 1997 and 1994a	
Independent variables:				
Ln of real consumption (Model 1 = 1995, Model 2 = 1994a)	-0.60	***	-0.62	***
Constatnt	2.49	***	2.55	***
Number of observations	1370		1403	

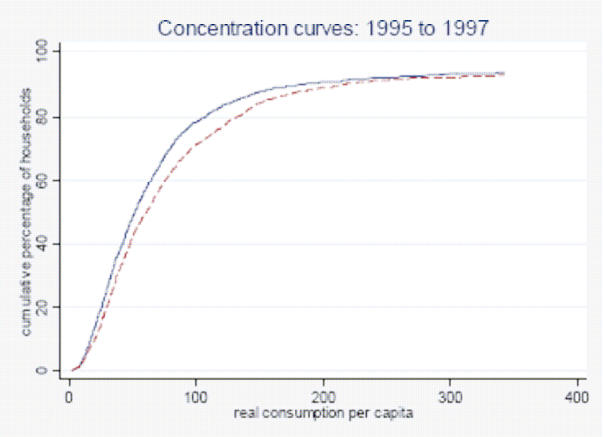
Source: ERHS

Figure a: Various concentration curves (in each case the solid line is the earlier period)

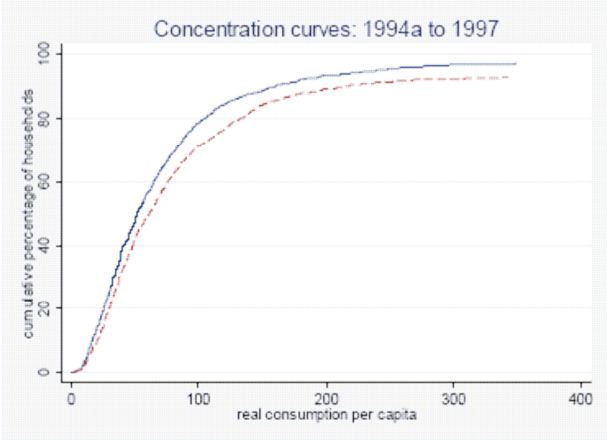
i)



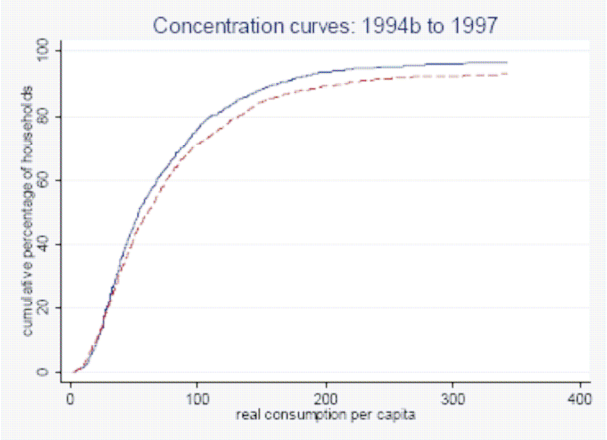
ii)



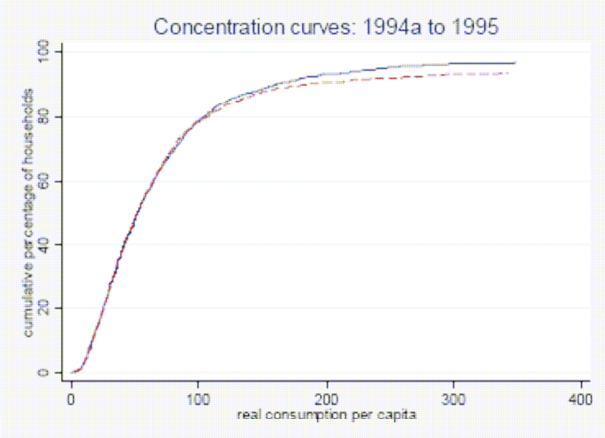
iii)



iv)



v)



vi)