FOOD SECURITY RESEARCH PROJECT

Factors Affecting Poverty Dynamics in Rural Zambia

by

**Antony Chapoto, Diana Banda,
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Chapoto and Haggblade are professors of International Development in the Department of Agricultural, Food, and Resource Economics at Michigan State University. Banda and Hamukwala are professor and lecturer, respectively in the Department of Agricultural Economics and Extension Education, School of Agricultural Sciences at the University of Zambia.

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FOOD SECURITY RESEARCH PROJECT TEAM MEMBERS

The Zambia Food Security Research Project (FSRP) field research team is comprised of Chance Kabaghe, Antony Chapoto, T.S. Jayne, William Burke, Munguzwe Hichaambwa, Solomon Tembo, Stephen Kabwe, Auckland Kuteya, Nicholas Sitko, Mary Lubungu, and Arthur Shipekesa. Michigan State University (MSU) based researchers in the Food Security Research Project are Chewe Nkonde, Philip Grabowski, Steven Haggblade, Nicole Mason, James Shaffer, Margaret Beaver, and David Tschirley.

EXECUTIVE SUMMARY

Rural poverty rates in Zambia have remained very high, at 80%, over the past decade and a half, whilst urban poverty rates have declined, from 49% in 1991 to 34% in 2006. Redressing this high rural poverty rate remains a government priority in the National Development Programs. However, solutions have proven elusive. Solid empirically based information on dynamics that have improved the welfare of small-scale farm households in Zambia, combined with an agenda for disseminating this information in public discourse, offer prospects for generating a more transparent and *pro-poor* policy orientation.

Using longitudinal data collected from 4,286 households which participated in three nationwide surveys conducted over seven years, in 2001, 2004, and 2008, we examine the factors associated with chronic and transient poverty and use the results to draw implications for designing policies and programs for alleviating rural poverty and promoting income growth for rural Zambia households.

The study highlights the following major findings:

1. Despite rapid growth of the Gross Domestic Product (GDP) in recent years, income inequality remains very high in Zambia. As a result, the gains from general economic growth in the country are not helping close the inequality gap in rural Zambia.

2. Comparison of households trapped in chronic poverty with those who maintain consistent high incomes suggests two major pathways out of poverty in rural Zambia. One pathway involves agricultural asset accumulation and commercialization. An alternate, though complementary path revolves around investment in secondary and post-secondary education of children which translates, in the next generation, into high-paying nonfarm employment. Household mobility – through temporary or permanent migration – appears to facilitate movement along both pathways.

3. In contrast, negative factors, which tend to trap households in chronic poverty, include health shocks to adult household members and mortality of prime-age adults. High dependency ratios, particularly young children and aging parents, likewise appear to limit upward economic mobility.

4. Key public investments that serve to accelerate these upward trajectories include investments in rural education, public health, feeder roads and improved market access, agricultural technology and management of human and livestock diseases. Policies that facilitate land consolidation, input supply, and market competition will also enhance these rural growth dynamics.

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ACRONYMS

CSAE	Centre for the Study of African Economies
CRE	Correlated Random Effects
FAO	Food and Agricultural Organization of the United Nations.
FSRP	Food Security Research Project
GDP	Gross Domestic Product
GISAMA	Sustainable Agricultural Markets in Africa
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
MACO	Ministry of Agriculture and Cooperatives
MSU	Michigan State University
PHS	Post Harvest Survey
PPS	probability proportional to size
SCAs	census supervisory areas
SEAs	standard enumeration areas
SS	Supplemental Survey

1. INTRODUCTION

Like many countries in Sub-Saharan Africa, the Zambian government is faced with a challenge of addressing widespread poverty. According to the latest Central Statistical Office (CSO) figures, rural poverty rates remain stubbornly high at 80% whilst urban poverty rates are reported to have declined from 49% in 1991 to 34% in 2006 (Figure 1). Redressing such high poverty rates in the rural Zambia has always been the government priority as outlined in the National Development Programs though the solutions have been elusive. Developing a viable investment and policy strategy for reducing poverty in Zambia, as in most African countries, has remained elusive in the country. Unfortunately, the main impediments are not simply a lack of technical knowledge concerning what needs to be done. Political economy and associated governance problems are increasingly recognized as crucial. Technical knowledge cannot be translated into action unless the policy process is capable of allocating scarce public resources in ways that reflect this technical knowledge. The ability of vested interests to maintain inordinate influence over public resource allocation is not unrelated to confusion over the real causes of poverty and a lack of widely available solid micro-level information about the kinds of policies and investments needed to achieve broad-based and equitable growth in rural living standards. Solid empirically based policy guidance on what it takes to improve the welfare of millions of impoverished small-scale farm households combined with an agenda for disseminating this information in public discourse is perhaps the best prospect for generating a more transparent and pro-poor policy orientation.

Toward this end, this paper uses longitudinal data collected from 4,286 households that participated in three nationwide surveys conducted over seven years, in 2001, 2004, and 2008. We examine the factors associated with chronic and transient poverty and use the results to draw implications for designing policies and programs for alleviating rural poverty and promoting income growth for rural Zambia households. An understanding of the factors

Figure 1. Trends in Rural and Urban Poverty Rates in Zambia
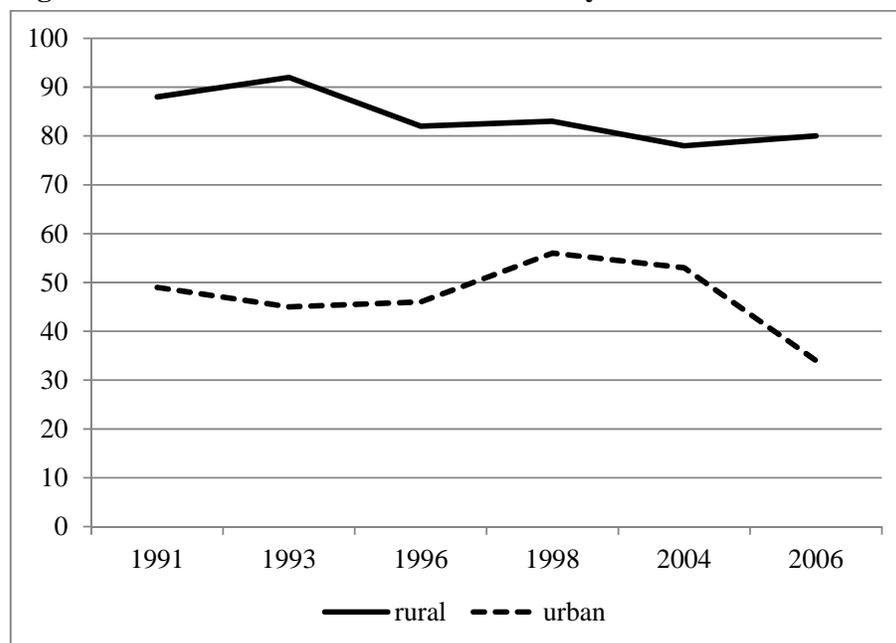
Source: Central Statistical Office, various years.

related to disparities in income and poverty of a given population is an important initial step towards formulating poverty reduction and mitigation strategies.

The paper is organized as follows: Section 2 presents a conceptual framework used in the study. Section 3 presents the data and methods used in the analysis. Section 4 summarizes the findings and considers their implications for policy.

2. CONCEPTUAL FRAMEWORK

Figure 2 describes the interaction of factors that affect rural household welfare in a low-income country such as Zambia. The farm household is a complex system dependent on human capital and remittances that interacts with the farm production unit and off-farm activities (FAO 1995). Households and individuals within them aim to achieve their objectives by allocating their time and resources to various farm and off-farm and consumption activities. The poor are highly constrained in their choices because the resources they have at their disposal are limited. Moreover, education (or lack thereof) influences individuals' perception of what their objectives and opportunities are. Biophysical factors (e.g., drought) and community factors (e.g., institutions and governance) also influence poverty outcomes.

The literature on welfare indicators considers that household income is a 'potential' welfare opportunity while consumption expenditures are a 'realized' welfare achievement. The latter is sometimes preferred because consumption typically fluctuates less over time than income where consumption-smoothing activities such as savings, loans, and non-market transfers exist (Case 1995; Rosenzweig and Binswanger 1993; Rosenzweig and Wolpin 1993). Although these welfare indicators fail to include leisure, the use of high exclusion costs goods (public goods and public sector services), common property resources, and the quality of life, both household income and consumption measure a household's ability to obtain goods and services (Datt and Jolliffe 1999; Ravallion 1996). Estimation using a number of indicators may be a good check on the robustness of the results since the determinants of income may not exactly equal the determinants of consumption expenditure or food consumption (Appleton 1995).

In this paper, we have used household income as a measure of welfare primarily because of the absence of comprehensive information to calculate any other welfare indicators from the survey. Although the use of income as a proxy of household welfare has been criticized because of the difficulty in obtaining complete coverage of all income generating activities (Deaton 1997), it is generally accepted that income is a key indicator of household economic activity and welfare for the rural majority. The poor may smooth income rather than consumption (Morduch 1994, 1995) and without access to credit, the poor households may consume all their current income, hence may be the best measure of welfare (Fafchamps 1999; Zeldes 1989). Also our income measure considered households net value of production rather than sales so in part captures some elements of consumption because a large percentage (65%+) of smallholder farm production is retained on the farm. Total household income used in this study was obtained from the summation of net value of crop production, income from the sale of fruits and vegetables, income from farm and off-farm wage employment, non-farm business profits, income from sale of live animals, meat, and products such as milk and eggs, and remittances.

Figure 2. The Household Farm System and Factors Explaining Variations in Farm and off-farm Income
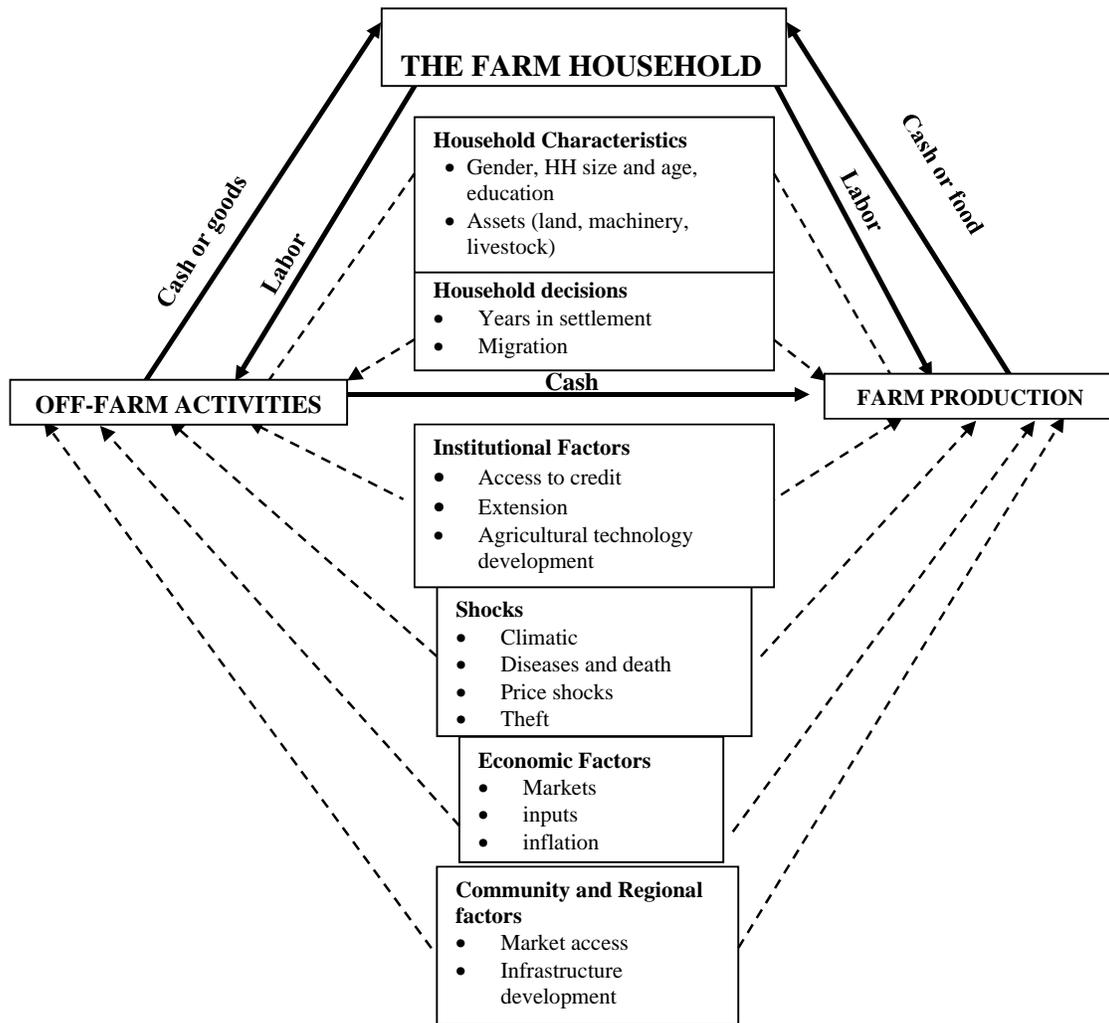
Key	
→────────→	Farm household system
- - - - - -→	Factors influencing variations in farm and off–farm income

Adapted from FAO 1995, with authors additions.

3. DATA AND METHODS

3.1. Data

The study used nationally representative longitudinal data on 4,284 households sampled in 393 standard enumeration areas (SEAs)[1] in Zambia surveyed in 2001, 2004, and 2008. The surveys were carried out by the CSO in conjunction with the Ministry of Agriculture and Cooperatives (MACO) and Michigan State University's Food Security Research Project. The surveys covered the 1999/00, 2002/03 and 2006/07 crop years, and collected information on households' income, cropping patterns, landholdings, other assets, crop and livestock production, as well as retrospective and current socio-demographic information on all resident household members.

The 1999/2000 nationally representative Post Harvest Survey (PHS), which surveyed about 7,500 households, was the base for the Supplemental Survey (SS) of May/June 2001. The SS covered the same reference period as the PHS of 1999/00 cropping and marketing years, but collected additional information on non-farm income, and basic socio-economic information on all individuals listed in the 1999/00 PHS demographic roster. Because of missing information on some households, the valid sample was reduced to 6,922 households. The 6,922 households surveyed in SS 2001 were revisited in May/June 2004 and 5,420 households were successfully re-interviewed. In 2008, the same households were revisited and 4,284 households were successfully re-interviewed.

The 1999/00 PHS sampling frame was based on information and cartographic data from the 1990 Zambia Census of Population and Households. The census questionnaire included a question on whether the household engaged in agricultural activities (crop growing, livestock and poultry raising, and fish farming), as well as check items to identify the specific crops grown and animals raised by the household. Households were included in the sample only if they were found to cultivate crops or raise livestock. The reason for excluding the non-agricultural households was to improve the efficiency of the sampling frame for crop and livestock production and other agricultural characteristics.[2]

Zambia is divided into nine provinces, which are further divided into 70 districts. For the Census enumeration, a cartographic operation was conducted to define census supervisory areas (CSAs), which were further divided into SEAs. A stratified three-stage sample design was used. The CSAs were primary sampling units selected with probability proportional to size (PPS) at the first stage, where the measure of size was based on the total number of households in the CSA. At the second sampling stage, one SEA was selected with PPS within each sample CSA. This resulted in a similar dispersion of the sample and probabilities of selection as if the SEAs had been selected directly at the first sampling stage. Within each selected SEA, all households were listed and stratified by size for selecting the sample households at the last sampling stage.

Households were classified into small- and medium-scale farming households, defined as those cultivating areas less than 5 hectares and between 5 and 20 hectares, respectively.

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[1] Standard enumeration areas (SEAs) are the lowest geographic sampling unit in the Central Statistical Office's sampling framework for its annual Post Harvest Surveys (PHSs) and most other surveys. Each SEA contains roughly 150 to 200 rural households from which 20 households are randomly selected.
[2] Although the rural households of landless farm laborers and those engaged in other economic activities are of analytical interest, they are best studied through other surveys, such as the Living Conditions Monitoring Survey (Megill 2004).

Households cultivating more than 20 hectares were classified as large-scale farmers and were not included in this survey. Initial village listings of all households were generated to prepare the sample frames. Since smaller households vastly outnumber the larger ones, the survey over-sampled the medium-scale farming households in order to ensure adequate inclusion of the larger households in the survey. Readers interested in more details about the survey design and sampling procedures of these surveys are invited to read Megill 2004.

3.2. Empirical Approach

3.2.1. Multinomial Logit

This study explores factors affecting poverty dynamics though the use of a multinomial logit model. Multinomial logit regressions are commonly used to model processes that involve a single outcome among several alternatives that cannot be ordered, in our case the poverty grouping over the survey period. Poverty dynamics between three periods can be divided into four mutually exclusive outcomes: (i) being poor in all the periods, (ii) being poor in two periods (iii) being poor in one periods and (iv) being non-poor in all the three periods. The multinomial logit model determines the probability that household i experiences one of the j outcomes above. This probability is given by:

$$P(Y_i = j) = \frac{e^{\beta'_j X_i}}{1 + \sum_{k=1}^{j} e^{\beta'_k X_i}}, \text{ for } j = 1, 2, \dots. J \text{ and } P(Y_i = 0) = \frac{1}{1 + \sum_{k=1}^{j} e^{\beta'_k X_i}} \tag{1}$$

where Y_i is the poverty outcome experienced by household i, β_k are the set of coefficients to be estimated and X_i is a set of exogenous explanatory variables which include structural features concerning household heads, household assets, participation in off-farm activities, shocks and community characteristics that are hypothesized to influence the poverty outcomes. $P(Y_{iJ})$ is the probability of being in each of the groups compared to the reference group. P_{i0} is the probability of being in the reference group. When estimating the model, the coefficients of the reference group are normalized to zero. This is because the probabilities for all the other groups must sum up to unity (Maddala 1990; Greene 1993).

In this study, we define four poverty outcomes: namely, consistently chronic poor (poor in all three years); consistently non-poor (non-poor in all three survey year); one period poor; and two periods poor. In order to identify the model, one of the outcome variables has to be omitted, so only three distinct sets of parameters can be identified and estimated. Thus, β_0 *is* set to zero and defined as the base category. All other β_k are estimated in relation to this benchmark.

In our case, we chose chronic poverty as the benchmark from which to compare all the other poverty groups. Instead of reporting the coefficients, we present the odd ratios, which simply correspond to the regression coefficient exponential (e^b).

$$Ln \frac{[P_{ij}]}{[P_{io}]} = \gamma_j X_i \tag{2}$$

The log-odds ratio (also referred to as the relative risk ratios) denotes the probability of each of the outcomes relative to the probability of the reference group. As opposed to marginal effects, the odds ratios have the advantage of not being dependent on the value of other variables in addition to the variable in question. Nonetheless, for completeness we present both marginal effects and odd ratios.

The estimated coefficients for each choice reflect the effects of X_i's on the likelihood of a household being in one poverty group relative to the reference group. For example, a statistically significant odds ratio greater than 1 on X_i for any specific comparison group indicates that increases in the variable are associated with a *higher* probability of being in that group relative to the reference group. In contrast, an odds ratio less than 1 indicates that an increase in X_i *decreases* the odds of the household being in the comparison group and instead increases their odds of falling in the reference group. In this study, odds ratios, positive or negative not statistically significant at the 10% level for any regressor (X_i) are assumed not to affect the probability of the poverty outcome to which it applies relative to the reference group.

The coefficients for the reference group, for any explanatory variable, can be recovered as the negative of the sum of its parameters for the non-reference groups. For example, if outcome 4 is the base, then the coefficient on the X_i is given by :

$$\gamma_{4i} = -(\gamma_{1i} + \gamma_{2i} + \gamma_{3i}) \tag{3}$$

The multinomial logit model is potentially constrained by a possible asymmetry in drivers in and out of poverty. That is, factors that are likely to drive a household into poverty may differ from the factors that enable it to move out of poverty. In such a case, the policies to be implemented to deal with each state would be different. However, in our analysis, the Wald tests rejected the hypothesis that different transition states could be combined. This suggests that all the factors included in the model adequately differentiate the four poverty states analyzed.

3.2.2. Correlated Random Effects (CRE) Model

To complement the results from multinomial model results, we also evaluate the determinants of household income changes using panel data models. We specify fixed effects model as follows:

$$y_{it} = \alpha_i + X_{it}\beta + \mu_{it} \tag{4}$$

where the variable α_i captures all the household unobserved, time-constant factors that affect y_{it}. The underlying assumption in the fixed effects specification is the existence of correlation between independent variables and unobserved heterogeneity. If the unobserved heterogeneity is uncorrelated with any of the explanatory variables in all time periods, then estimating equation (4) using fixed effect is not efficient. This calls for the estimation of the random effects model, which is specified as follows:

$$y_{it} = \beta_0 + X_{it}\beta + \varepsilon_{it} \tag{5}$$

where $\varepsilon_{it} = \alpha_i + \mu_{it}$. Even though the random effects specification allows the inclusion of time-constant variables, the assumption that the fixed effect factor is uncorrelated with the explanatory variables is often not plausible.

Similar to Muyanga, Jayne, and Burke (2010) we overcome the shortcomings of both fixed and random effects estimators by using the CRE or the Mundlak-Chamberlain device proposed by Mundlak (1978) and Chamberlain (1984), where we include time average

variables for all time variant explanatory variables. Using the CRE, α_i is modeled as follows:

$$\alpha_i = \delta + \overline{X}_i + \varsigma_i, \quad \varsigma_i \mid X_i \sim N(0, \sigma_\varsigma^2) \tag{6}$$

where $\overline{X}_i$ represents the time-averaged X_{it} over the various panel periods. This model allows for control of unobserved time-constant heterogeneity as with fixed effects as well as measure the effects of time-invariant independent variables. However, the CRE estimator requires the model to have a standard normal distribution, and strict exogeneity conditional on α_i.

3.3. Model Variables

In this study, it is hypothesized that the probability of the household falling into one of the four groups depends on household asset holdings, location and associated environmental factors, household demographic characteristics and a variety of household and community shocks. The selection of these variables is guided by the conceptual framework proposed in section 2 and previous studies dealing with the same problem (Barrett, Carter, and Little 2006; Muyanga, Jayne, and Burke 2010).

Household demographics included a set dummy variables capturing the gender of household head (1=female headed single, 0=otherwise and 1=female headed married, 0=otherwise); the household head's age (in years), household dependency ratio and an indicator variable whether the household is polygamous or not; household heads' educational status in terms of the number of years of education: (no education, lower primary (1-3 years), upper primary (4-7 years), secondary (8-12 years), and post-secondary education (greater than 12 years). For the multinomial logit models, we only include household initial conditions, whilst in the CRE models, we also include the respective variables averages over the various survey waves.

Unfortunately, we do not have data on household history and inheritance to account for human resources, land, and other assets inherited from the previous generation. Instead, we use 2001 assets as a baseline holding from which households manage to generate income, consumption, and savings over time. In addition, we use the number of years in the current settlement and whether the household is closely related with the headmen as proxies for social capital. Using qualitative interview results from a small subset of households interviewed in this survey, Banda and Hamukwala (2011) show that household history and inheritance play a very important role in determining the trajectory the household follow in terms of poverty status.

Household asset holdings constitute a stock of resources, which serve to generate income. They likewise serve to cushion the household from shocks. As physical asset measures, we include total landholdings as well as the number of animals (cattle, goats and pigs) the household owned at the start of the panel survey for multinomial logit models and lagged asset values in the CRE model. In addition, we capture the diversified income portfolio of households and impacts on poverty status by including the percentage of income from off-farm activities (salary and wage income, formal and informal business income activities) We test the hypothesis that households with more diversified income portfolio are more resilient than those who are not but rely mainly on farm income.

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In addition, we included some measure of household initial agricultural commercialization level in 2001. In particular, we define the level of household agricultural commercialization as the ratio of the total value of crop sales to the average value of total gross output (see von Braun and Kennedy, 1994). This variable is used to proxy for household market orientation and their links to the market economy.

The shock variables included in the models include variables to capture number of prime-age adults, children, and elderly who died and who were chronically ill before the start of the panel (2001). Similar to the Kenyan study by (Muyanga, Jayne, and Burke 2010), the CRE model includes mortality and morbidity variables that are separated into two time constant variables – shocks happening before and during the panel period. *A priori*, we expect mortality and morbidity shocks to increase the odds of a household to be chronically poor as well as to be in the transient group.

To account for geographical locations of the households, a set of dummy variables representing different agro ecological zones are included. Year dummies are also included to measure changes taking place in the broader economic environment that are not explicitly captured by the available covariates in the model. In addition, we also include distance to the motorable road and a dummy variable to indicate whether the household is located in a district on the line of rail as a proxy of market access.

3.4. Sample Size and Attrition

Of the 6,922 households interviewed in 2001, 5,420 were successfully re-interviewed in May 2004 (78.0% of the original sample) and only 4,286 in May 2008 (66%) of the original sample). Table 1 shows attrition by year and province. The results show that over the seven-year period, the highest attrition rates were recorded in Luapula (48.4%), Lusaka (45.3%), North Western (40.5%), and Western Provinces (39.1%). Such high rates of attrition are a cause for concern but not rare in longitudinal panel surveys data.

To test for possible bias in results due to household attrition, the mean levels of control variables measured in May 2001 are compared for households that were re-interviewed versus those that attrited. The means of many variables differ statistically between re-interviewed and attrited households as shown in Table 2 except those indicated with # at the end. Systematic differences between attritors and non-attritors, coupled with a high attrition rate, may cause concern about inference with these data. To deal with potential attrition bias, for both descriptive and econometric analysis, we adjust the household weights by the inverse probability weighting (IPW). For a detailed description of this approach see Chapoto and Jayne (2008) who used a similar approach in their study of the impact of prime-age mortality on rural farm households in Zambia using the same panel survey data (for other examples Fitzgerald, Gottschalk, and Moffitt 1998; Wooldridge 2002).

Table 1. Sample, Re-interview Rates and Attrition by Province

Province	Survey years			--------------------Rates of attrition------------------		
	2001	2004	2008	2001-2004 (%)	2004-2008 (%)	2001-2008 (%)
Central	714	573	504	19.75	12.04	29.41
Copperbelt	393	312	269	20.61	13.78	31.55
Eastern	1,331	1,126	987	15.40	12.34	25.85
Luapula	777	619	401	20.33	35.22	48.39
Lusaka	214	161	117	24.77	27.33	45.33
Northern	1,363	1,027	918	24.65	10.61	32.65
Northwestern	472	324	281	31.36	13.27	40.47
Southern	872	689	614	20.99	10.89	29.59
Western	786	588	479	25.19	18.54	39.06
Total	6,922	5,419	4,570	21.71	15.67	33.98

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

Table 2. Mean Levels of 2001 Household Attributes by Attrition Status

	Households			
	Interviewed all 3 years	Interviewed in 2001 and 2004	Attrited in 2004	Attrited in 2008 but were in 2001 and 2004
Attributes	(A)	(B)	(C)	(F)
Female headed, single (%)	16.31	16.96	20.29	.20
Female headed, married (%)	3.99	3.99	4.92*	.04*
Age of household head (years)	46.96	46.63	43.79	44.43*
HH headed by a person age 60 & above	23.03	22.66	17.1	.19
Polygamous household (%)	11.83	10.98	8.52	.07
Level of education household head (years)	5.22	5.3	5.56*	5.60
Adult equivalents	5.06	4.97	4.24	4.37
Adult mortality due to cause (%)	14.63	14.28	14.5	.18
Household with head/spouse death (%)	2.26	2.31	2.73	.04
Landholding size-cultivated plus fallow (ha)	2.81	2.7	2.05*	2.04
Land cultivated (ha)	2.02	1.92	1.5	1.49
Total net household income ('000 ZMK)	1,384	1,348	1,238	1,223
Total net off farm income (000 ZMK)	608	617	733	703*
Net income shares from:				
Field crops	61.68	60.86	56.88	57.01
Fruits and vegetables	4.27	4.23	3.15	3.53
Livestock sales	4.79	4.56	3.46	3.46
Non-farm income	28.89	29.95	36.04	35.49
Formal and informal business	17.2	17.31	18.37	17.93
Remittances	3.67	3.93	4.8	4.77
Formal and informal employment	8.01	8.71	12.87	12.79
District on line of rail (%)	34	33	34*	.31
Distance to nearest tarred/main road (km)	25.2	24.5	24	22.54
Distance to nearest district town (km)	33.8	34.1	35.3	34.80
Number of households	4,286	5,419	1,503	2,352.00

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.
Notes: * mean difference not statistically different.

4. RESULTS AND DISCUSSION

As a prelude to the econometric analysis, we present the descriptive results first to see if we can discern any trends over the panel. We first present a summary of the poverty rates and distribution over the sample period and then examine the bivariate differences in various characteristics as outlined in the conceptual framework and data sections. Finally, we present results from the econometric models.

4.1. Poverty Rates and Income Distribution in Rural Zambia

4.1.1. Poverty Headcount

Figure 3 shows the rural poverty overall incidence, and transition into and out of poverty for the survey years 2001, 2004, and 2008. Over the survey period 2001-2008, the number of poor households went up by about 1%, from 88.7% to 89.6%. These results indicate the

Figure 3. Zambia Rural Poverty Overall Incidence by Year of Survey

2001	2004	2008	Total in 2008

Poor [88.7%]
Poor [84.6%]
Poor [78.9%]
Non-poor [5.5%]
Poor [3.0%]
Non-poor [4.1%]
Non-poor [1.1%]
Non-poor [11.3%]
Poor [8.2%]
Poor [6.4%]
Non-poor [1.8%]
Non-poor [3.1%]
Poor [1.3%]
Non-poor [1.8%]
Poor [89.6%]
Non-poor [10.4%]
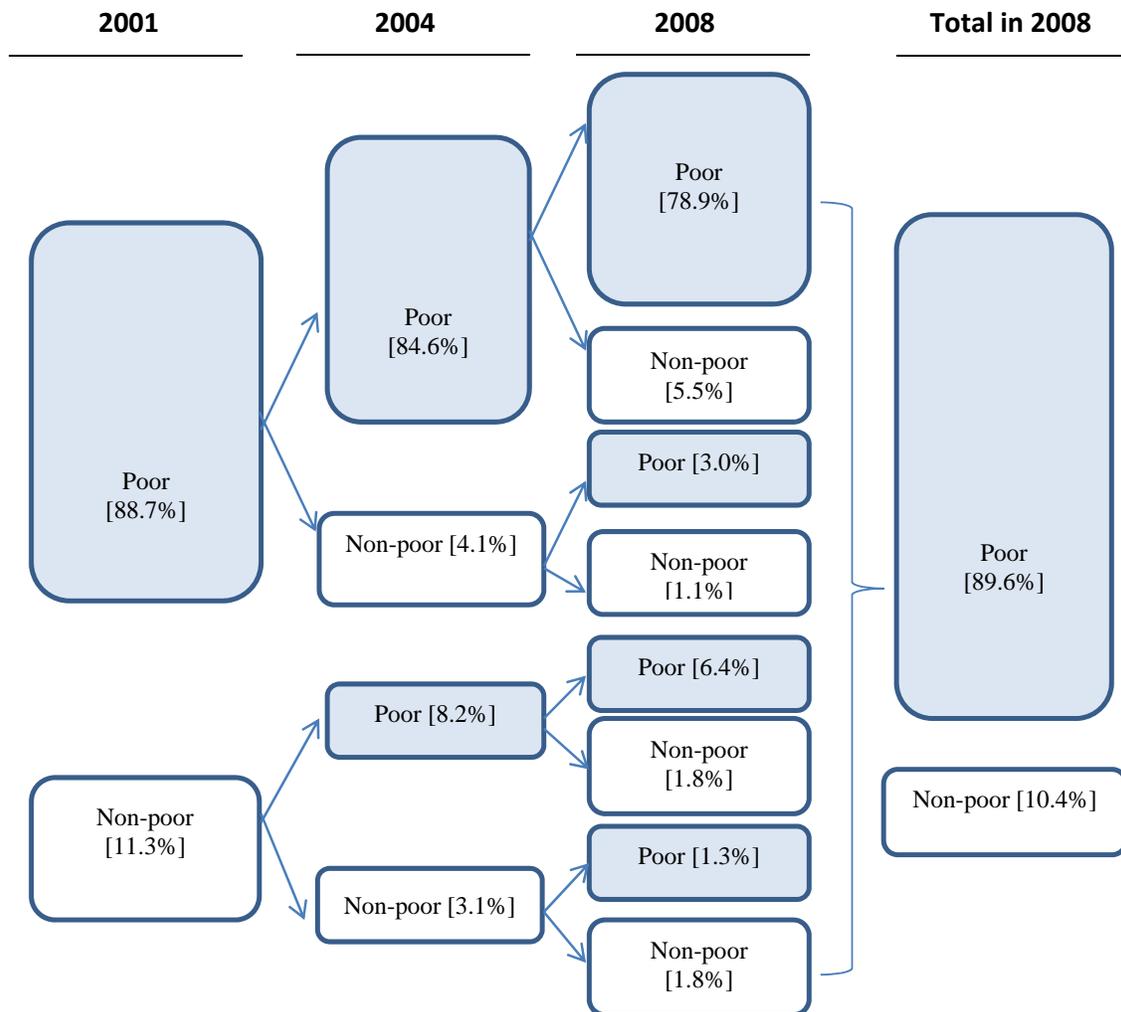
challenges that Zambia faces in her poverty reduction quest recording very minimal poverty reduction over the seven years period.

While the poverty incidence marginally increased between 2001 and 2008, a number of households moved in and out of poverty. For example, of the 88.7% households that started out poor in 2001, 4.1% moved out of poverty in 2004 with a further 5.5% moving out of poverty in 2008. On the other hand, of 11.3% that started off in the non-poor category in 2001, 8.2% declined into poverty in 2004 of which 6.4% of them remained poor in 2008. Over the seven year period, 78.9 % of the households remained chronically poor, whilst only 1.8% was consistently non-poor. The remainder (19.3%) were transient, moving in and out of poverty. These results reinforce the need for further analysis to understand the reasons behind such stubbornly high chronic poverty and the limited poverty mobility in Zambia.

4.1.2. Income Distribution

Figure 4 shows the cumulative distribution of real net income per adult equivalent for the survey years 2001, 2004, and 2008, whilst Figure 5 shows the kernel density curve of the concentration or skewness of households' real net income per adult equivalent. In general, more than 50% of the rural smallholder farmers earn less than 500, 000 Kwacha per adult equivalent per annum with about 80% of all households earning less than 1 million Kwacha ($275) per adult equivalent per annum. Using the $1.25/day per adult equivalent (approx US$456.25 per year, or 1.7 million Kwacha using the 2008 exchange rate of Kwacha 3,636 per dollar) nearly 90% of the rural population fall below the poverty line. As discussed above, the majority of these households are likely to be chronically poor. The results also show very infinitesimal improvments in income distribution pattern over the three year period. Figure 4 shows that less that 20% of the housheolds earn more than 1 million Kwacha ($275) per adult equivalent per annum.

Figure 4. Income Distribution per Adult Equivalent, 2001-2008
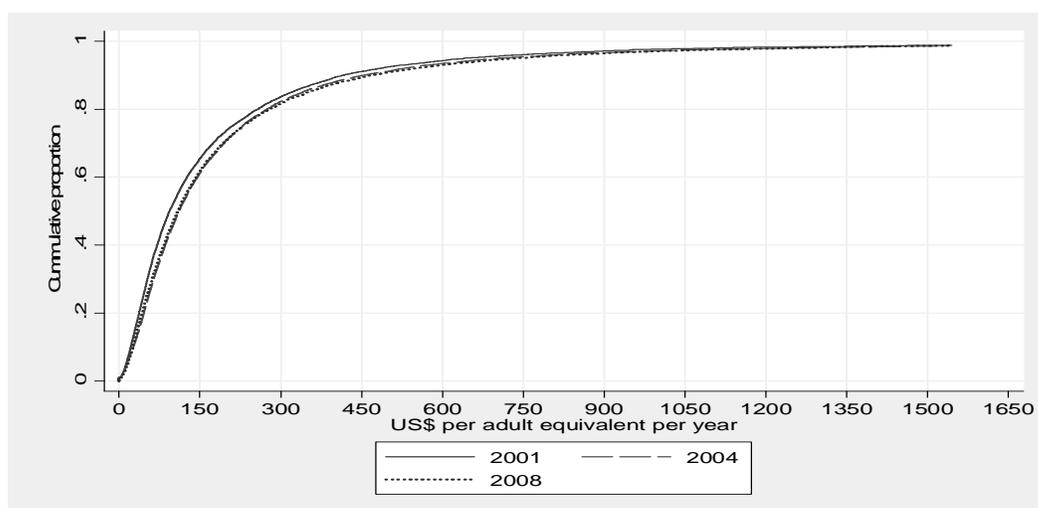
Source: CSO/MACO/FSRP SS2001, SS2004, and SS2008.

Figure 5. Kernel Densities of Real Net Income per Adult Equivalent, 2001-2008
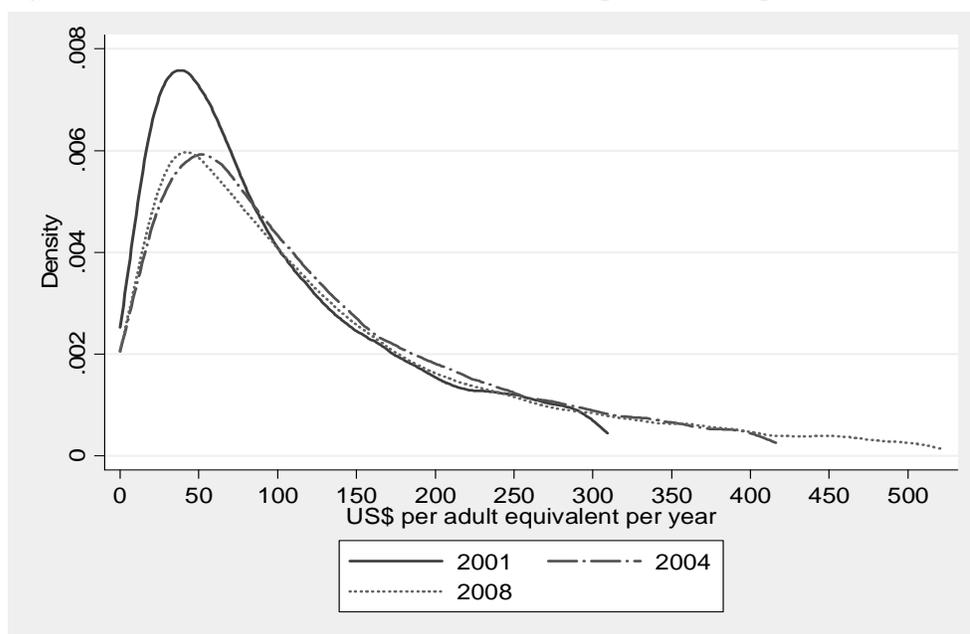
Source: CSO/MACO/FSRP SS2001, SS2004, and SS2008.

4.1.3. Income Inequality

Despite the growth of GDP over the past five or so years, income inequality remains very high in Zambia (Figure 6). Levels of inequality were slightly higher in 2008 as compared to the other two years. Income inequality slightly increased over time, based on the Gini coefficient, which increased from 0.64 in 2001 and 2004 to 0.67 in 2008. Therefore, the gains from general economic growth in the country are not helping close the inequality gap. If these findings are corroborated by other studies then they have very important policy implications. The question remains, what kind of investments are required to close the inequality gap and raise the majority of rural Zambians out of poverty.

4.2. Household Poverty Dynamics between 2001 and 2008

Table 3 shows the proportion of households by poverty mobility group and survey year. Using the US$1.25 per adult equivalent per day poverty line, the results show that more than 78% of the households fall below the poverty line, compared to 71% if we reduce the poverty line to US$1 per adult equivalent per day. Only 1.9% (3.1%) stayed above the $1.25 ($1) poverty line. From here on, we will only report results from the US$1.25 poverty, as this is now the new internationally agreed poverty line (IFAD 2011); Chen and Ravallion, 2010.). Figure 7 displays these results visually.

Figure 6. Inequality Comparisons for Net Panel Income, 2001-2008
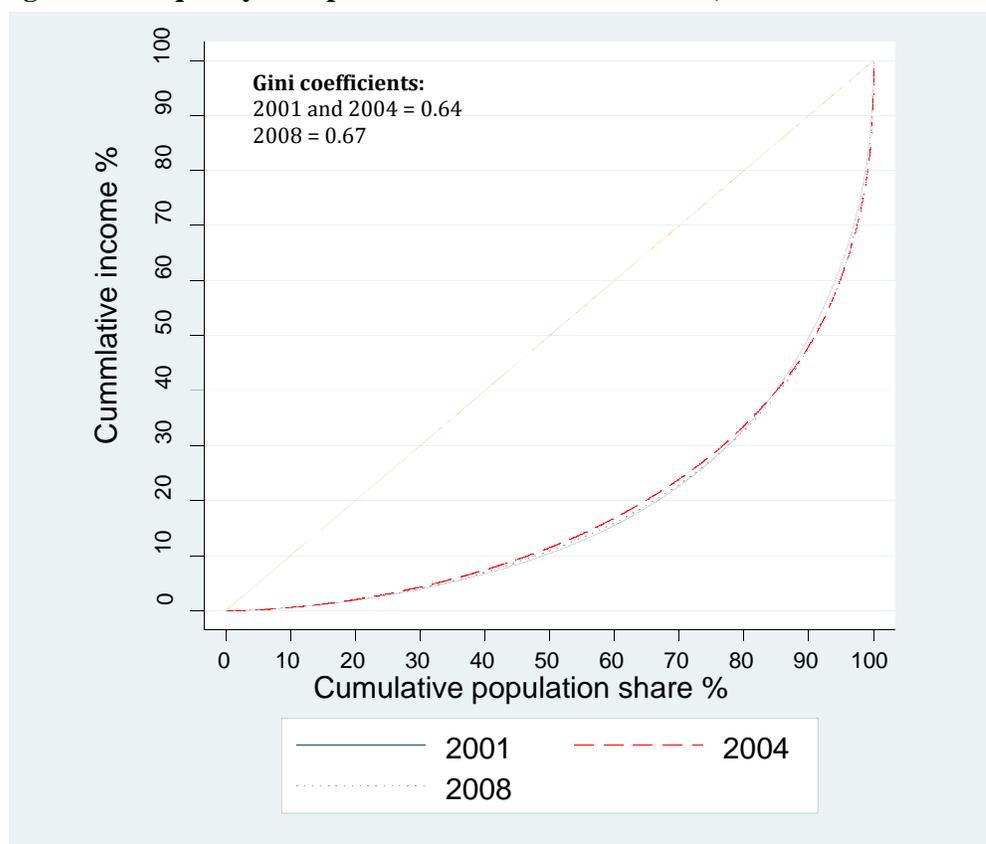
Source: CSO/MACO/FSRP SS2001, SS2004, and SS2008.

Table 3. Household Poverty Movements over the Survey Periods: Population Parameters

Poverty Mobility Group	Households rank in terms of welfare tercile			Number and percent of household			
	2001	2004	2008	Using US$1.25 per day		Using US$1.00 per day	
				count	%	count	%
Consistently Poor	Poor	Poor	Poor	1,134,869	78.9	1,029,437	71.5
Consistently Non-Poor	Non-poor	Non-poor	Non-poor	27,176	1.9	44,598	3.1
One Year Poor	Non-poor	Poor	Non-poor	24,603	1.7	37,506	2.6
	Non-poor	Non-poor	poor	18,120	1.3	27,576	1.9
	Poor	Non-poor	Non-poor	14,730	1.0	22,823	1.6
Two years Poor	Poor	Non-poor	Poor	43,570	3.0	49,241	3.4
	Poor	Poor	Non-poor	82,788	5.8	102,765	7.1
	Non-poor	Poor	Poor	93,182	6.5	125,093	8.7
Full Sample				1,439,039	100.0	1,439,039	100.0

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

Figure 7. Household Poverty Dynamics, 2001, 2004, and 2008
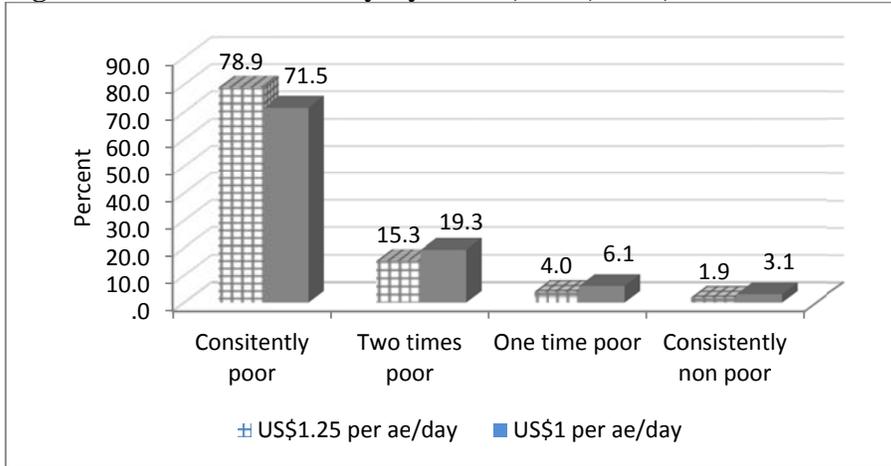
Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

Figure 8. Household Poverty Dynamics by Province, 2001, 2004, and 2008.
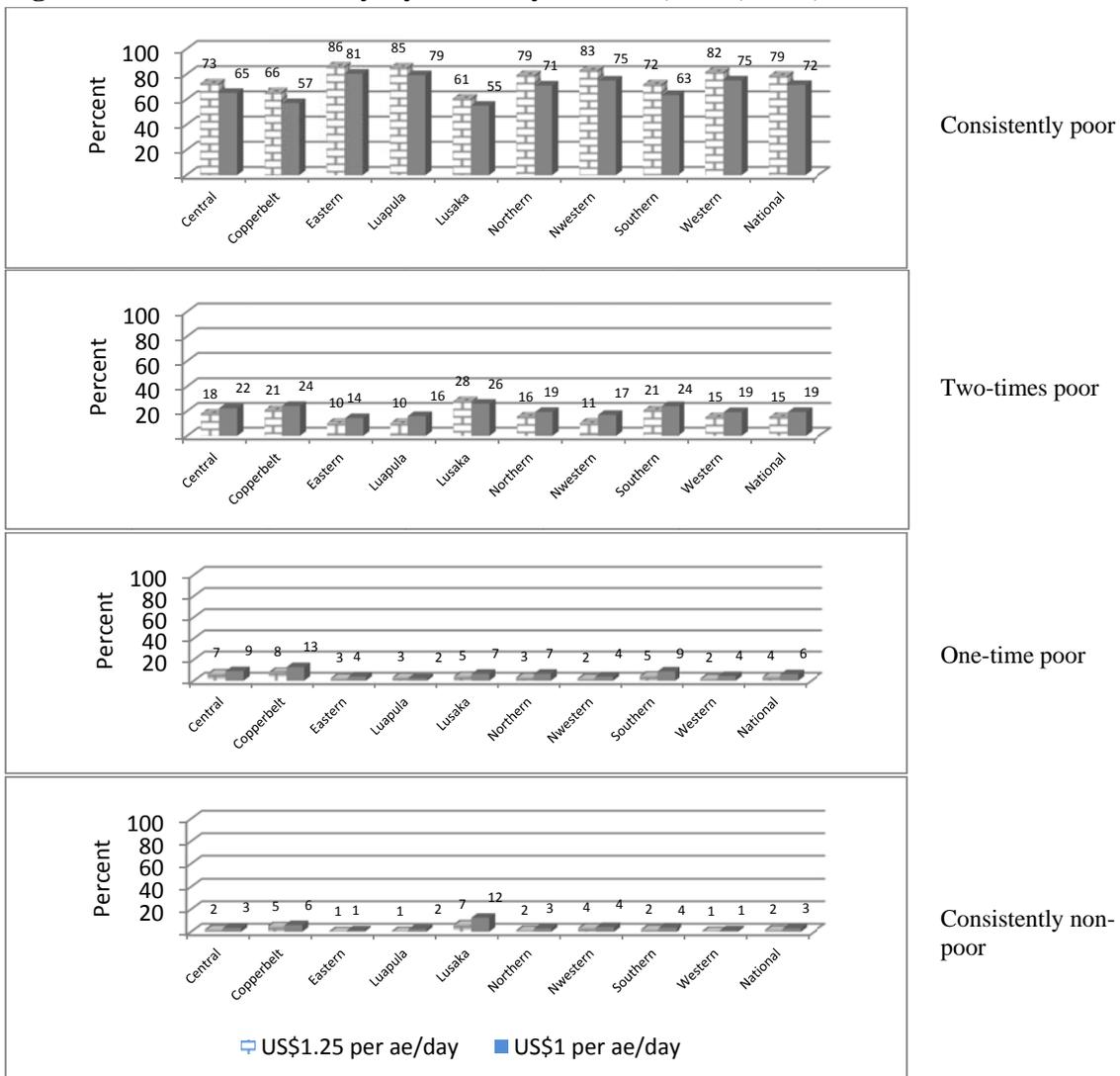
Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

In order to examine if there are any geographic differences of the distribution by poverty status, we present the results by province. Irrespective of the poverty line selected, Figure 8 shows a similar distribution pattern across the four poverty groups and province. The proportion of households that remained consistently poor is highest in Eastern Province (81-88%) followed by Luapula with (79-85%), Northwestern with (75-83%) and Western (75-82%). Although, Lusaka Province has the least proportion of chronically poor households (55-61%), the province has the highest proportion of households who were two-times poor over the seven-year period. Other provinces with slightly higher proportion of two-times poor households are Copperbelt and Southern Provinces with 21-24%. Using the US$1.25 poverty line, Lusaka, Copperbelt, and Northwestern Provinces have the highest proportion of households who stayed consistently above the poverty line (non-poor), 12%, 6%, and 4% respectively. This may be due to the off-farm opportunities available for households living closer to the capital, and mining activities in Copperbelt and Northwestern. If we lower the poverty line to US$1 per day, Southern Province joins the list with 4%.

4.3. Income Levels and Income Sources by Poverty Group

Results in Table 4, show that on average, consistently non-poor households earn nine times more income per adult equivalents compared to chronically poor households. This underscores earlier findings of high-income inequality amongst rural smallholder farmers in Zambia over the seven-year period. The results in Table 5 reinforce the finding in Figure 8 and Table 4, of high inequality across groups. For example, 50% of the consistently poor have income below the mean and those in the top five percentile have double the income per adult equivalent (Table 5).

In order to examine more closely why there is a huge difference in income between households in the two groups as well as the transient poor, we examine the sources of income. On average, non-poor households earn 74-77% of their income from off-farm activities compared to only 26-34% amongst the chronically poor households. In particular, income from wage and salary employment is more important than income from informal or formal businesses and remittances. These findings suggest that having access to off-farm opportunities may provide an escape route out of poverty. These results are consistent findings by Bigsten and Tegnstam (2008), who found that availability of off-farm opportunities for smallholder farmers provides a pathway out of poverty.

Table 4. Changes in Income Level over Time by Poverty Group

Attributes		Consistently poor	Two-times poor	One-time poor	Consistently non-poor	National
		N=1,134,869	N=219,541	N=57,453	N=27,177	N=1,439,039
Total household income per AE in Kwacha-08 value	2001	407,224	1,682,382	2,703,724	4,150,252	764,137
	2004	497,908	1,439,357	3,521,656	7,238,201	889,550
	2008	461,031	1,657,811	2,866,742	6,481,327	853,353
Income Sources						
Field crops (%)	2001	64.47	45.30	31.16	19.12	59.36
	2004	70.12	52.34	37.76	16.34	65.10
	2008	55.91	39.84	32.70	15.34	51.76
Livestock sales (%)	2001	4.50	4.62	2.32	2.28	4.39
	2004	5.53	6.03	3.37	4.78	5.51
	2008	5.90	5.90	3.63	3.53	5.77
Fruits and vegetables (%)	2001	4.03	4.60	5.60	4.56	4.19
	2004	2.69	5.32	4.81	4.24	3.21
	2008	3.05	4.65	5.46	3.72	3.40
Off-farm income (%)	2001	26.38	45.11	60.91	74.04	31.51
	2004	20.77	35.92	54.06	74.64	25.43
	2008	34.77	49.61	58.22	77.41	38.77
Formal and informal business (%)	2001	15.71	28.50	28.09	17.08	18.18
	2004	12.20	22.30	28.32	19.57	14.52
	2008	18.14	30.47	30.26	17.09	20.48
Remittances (%)	2001	4.33	2.73	1.66	1.18	3.92
	2004	2.01	1.33	1.25	1.04	1.86
	2008	11.36	8.81	4.76	6.69	10.62
Formal and informal employment (%)	2001	6.34	13.89	31.16	55.79	9.42
	2004	6.57	12.29	24.49	54.03	9.05
	2008	5.27	10.33	23.19	53.63	7.67

Source: CSO/FSRP Supplemental Surveys, 2001, 2004, 2008.
Notes: AE is Adult Equivalent.

Table 5. Distribution of Households' Income by Poverty Dynamics

| Status	year of survey	Value at pth percentile in the distribution of households income					
		Mean	p10	p25	p50	p75	p95
Consistently Poor	2001	407,224	77,030	157,902	297,461	564,025	1,152,112
	2004	497,908	95,045	195,253	369,028	682,350	1,388,717
	2008	461,031	88,680	176,858	350,734	634,950	1,311,485
Two-times poor	2001	1,682,382	136,428	337,426	1,206,884	1,905,411	4,891,463
	2004	1,439,357	171,547	360,849	744,356	1,757,761	4,077,195
	2008	1,657,811	213,055	462,980	1,160,000	2,323,435	4,781,125
One-time poor	2001	2,703,724	482,494	1,367,643	2,071,709	3,063,878	8,911,927
	2004	3,521,656	703,658	1,473,243	2,445,787	3,946,164	9,747,695
	2008	2,866,742	591,093	1,367,845	2,175,341	3,295,806	8,250,167
Consistently non-poor	2001	4,150,252	1,758,457	2,113,525	3,211,530	5,203,910	9,848,266
	2004	7,238,201	2,399,291	2,923,577	4,153,797	6,653,241	23,983,560
	2008	6,481,327	2,201,965	2,601,563	3,788,625	5,550,519	20,359,296
National	2001	764,137	86,186	176,551	364,848	818,320	2,551,269
	2004	889,550	105,605	215,363	429,155	891,674	2,690,407
	2008	853,353	99,598	204,358	426,715	881,368	2,840,867

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

4.4. Poverty Dynamics by Gender of Household

Results in Table 6 indicate a positive relationship between household income and male headship. In 2001, 76% of the chronically non-poor households were consistently headed by males over the panel period compared to 66% of the consistently poor households. Among the one-time poor, the proportion with male heads rose in 2004 and declined in 2008, whilst female headship slightly increased amongst the households who were poor in two periods (households likely to be declining into poverty) by 3.3%. These results seem to suggest that the change of household headship from male to female, through death or divorce, is somewhat associated with the household falling into the two period poor group and chronically poor households. Another noteworthy point to mention is that we do not see any difference in the proportion of households headed by females to those headed by widows.

For example, we find that among the consistently poor, 24.4% of households were female headed of which 17.1% where headed by widows (70% of all female headed households), whilst among the consistently non-poor households 15.3% were female headed, of which 11.1% were widows (72% of all female headed households). A similar trend exists across the transient poor. These results seem to suggest that not all widow headed are worse off since a sizeable number remain non-poor. However, this does not diminish the earlier fact that a greater proportion of female headed households are more likely to be poor. Rather, these findings call for caution about poverty reduction strategies that are solely based on gender of household head.

Table 6. Household Poverty Dynamics by Gender of Household Head

Changes in household headship				Income Poverty group				
				Consistently poor	Two-times poor	One-time poor	Consistently non-poor	National
				N=1,134,869	N=219,541	N=57,453	N=27,177	N=1,439,039
Survey year	2001	2004	2008	---------------------------Percent----------------------------------				
Male headed								
2001				75.6	82.9	81.2	84.7	77.1
2004				73.8	81.9	86.7	83.4	75.7
2008				70.5	79.6	76.7	79.6	72.3
Female headed in 2001				24.4	17.1	18.8	15.3	22.9
Single				1.5	1.6	.0	1.3	1.5
Married				4.6	3.9	5.4	3.0	4.5
Divorced/Separated				1.1	.8	.6	.0	1.0
Widowed				17.1	10.8	12.8	11.1	15.9
Consistently male headed	male	male	male	66.0	75.2	69.2	76.6	67.7
Consistently female headed	female	female	female	19.9	12.7	10.5	12.3	18.3
From male to female	male	male/female	female	8.9	7.2	11.9	8.1	8.8
From female to male	female	female/male	male	3.8	3.9	7.4	3.0	4.0
Total				100.0	100.0	100.0	100.0	100.0

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

4.5. Poverty Dynamics by Education Endowments

Table 7 shows that the consistently poor had a higher proportion of households with household heads with no education (21%), 1-3 years of education (16.1%) and a huge mass with 4-7 years of education (46.7%) compared to those who were consistently non-poor over the survey period. Among the consistently non-poor, only 0.8% of household heads had no education, while 3.1% had 1-3 years of education and 14.6% had upper primary education level. Moreover, the consistently non-poor had a large proportion of household heads (81%) with secondary and post-secondary education, 36.3% and 45.2% respectively.

Conversely, we find that a higher proportion of members with no education or under three years of education are found in consistently poor households and two period poor households. These findings highlight the importance of education in poverty alleviation over the long run. Given the positive correlation between non-poor status and education, one could conclude that education is one of the main pathways out of poverty, especially among the growing number of Zambian households facing land constraints.

4.6. Social Capital, Migration, and Poverty Dynamics

Social capital, especially close ties to village authorities may be important in helping these households gain an advantage over other households in terms of resource access (see Jayne et al. 2008). Surprisingly, in terms of income poverty dynamics, we find that close ties to village authorities does not help much because a higher proportion of households with head of household related to headman fall into the consistently poor category (45.4%), whilst among consistently non-poor households a smaller proportion (14%) of the households are

Table 7. Household Poverty Dynamics and Education Endowments

Education Level	Income Poverty group				
	Consistently poor	Two-times poor	One-time poor	Consistently non-poor	National
	N=1,134,869	N=219,541	N=57,453	N=27,177	N=1,439,039
Years of education of household head	4.7	6.1	7.8	12.4	5.2
Education Groups (Head of HH)					
No education	21.0	13.3	8.4	.8	19.0
1-3 Years - Lower Primary	16.1	12.8	7.8	3.1	15.0
4-7 Years - Upper Primary	46.7	43.2	34.0	14.6	45.1
8-12 Years – Secondary	15.7	28.8	42.4	36.3	19.1
> 12 Years - Post Secondary	.5	1.9	7.4	45.2	1.8
Proportion of other household members with:					
No education	20.4	12.6	7.4	3.8	18.4
Lower primary education, 1-3 years	15.9	10.9	7.1	2.0	14.5
Upper primary education, 4-7 years	46.1	50.8	37.2	31.0	46.2
Secondary education	11.1	19.1	39.6	46.2	14.1
Post-secondary education	.0	.1	.3	7.9	.2

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004 and 2008**.**

Table 8. Household Relation to Village Authorities by Poverty Category

	Poverty group				
	Consistently poor	Two-times poor	One-time poor	Consistently non-poor	National
	N=1,134,869	N=219,541	N=57,453	N=27,177	N=1,439,039
	--------------------------------------percentage ---------------------------------				
HH head related to headman	45.4	34.8	27.5	14.3	42.5
HH considered local	84.7	68.3	60.3	29.8	80.2
Households in a matrilineal village	41.1	36.5	37.9	39.4	40.2

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004 and 2008.

related to headman (Table 8). A possible explanation of this finding could complacency among households with social ties with local authorities and a failure to use any resource advantage that they may have to their benefit. In addition, we find that there are no clear differences by poverty status with regard to the percentage of households living in matrilineal districts.

Using, the household perception whether they are considered local or non-local as a proxy for migration, we find that a greater proportion of households considered as local to be consistently poor (84%) compared to the proportion of households in the consistently non-poor group (29.8% (Table 8). Thus, 70.2% of the households who are considered to be non-local are in the consistently non-poor category. This finding implies that households that take the initiative to break away from their community and go elsewhere in search of opportunities are more likely to get out of poverty or alternatively they move to go to other areas because they are non-poor. We try to sort out the direction of the causality with the multivariate models.

4.6.1. Mortality and Morbidity Shocks and Household Poverty Dynamics

Table 9 presents findings on mortality and morbidity shocks experienced by the households during the panel survey period. Information on these shocks was collected in order to measure the potential effects of mortality and illness in the household on household welfare outcomes. The results show that between 2001 and 2004, a slightly higher proportion of the transient poor experienced mortality of female head (5%) compared to 2.5% amongst the chronically poor and none amongst the consistently non-poor. There seem to be no huge differences of the percentage of households experiencing male head mortality during the period 2001- 2004 though we see differences during the period 2004-2008. On average, 6% of the chronically poor households during the 2004-2008 period experienced male head of household death compared to 3% amongst the consistently non-poor and about 5% amongst the transient poor.

Turning to morbidity, the results in Table 9 show that on average, more chronically poor and two-time poor houses had chronically ill people between 2001-2004 compared to the one-time poor and consistently non-poor households. The same trend is true for the period 2004-2008, although the percentages were slightly less across all poverty groups. These findings

imply that households with morbidity are more likely to move into poverty or stay in poverty. We test this hypothesis later in the multivariate analysis.

Figure 9 shows the changes of land holding size by poverty status and year. In general, the results show that consistently poor and two-times poor have on average less and declining land access compared to consistently non-poor and one-time poor households. However, land access for the consistently non-poor and one-time poor households has declined by 1.5 times more than the other two groups. The declining land holding size over the seven-year period reinforces the finding that smallholder farmers in Zambia are land constrained, a paradox in a land abundant country. To further examine this supposition, we compare household land holding size (cultivated and fallow) as well as the land that is cultivated by the different types of households, Figures 9 and 10 respectively. The results show that households across all the poverty groups are cultivating almost 80% of all the land that they have access to with 20% in fallow, supporting the finding that most rural farm households in Zambia are land constrained.

Table 9. Poverty Mobility Groups by Shocks

	Poverty group				
Household shocks	Consistently poor	Two-times poor	One-time poor	Consistently non-poor	National
	N=1,134,869	N=219,541	N=57,453	N=27,177	N=1,439,039
	--------------------------------- Percent of households ---------------------------------				
Mortality between 1996-2000					
Male head	2.51	1.60	1.12	4.09	2.35
Female head/spouse	.95	.86	.90	4.39	1.00
Other adults	11.57	14.43	13.98	10.87	12.09
Mortality: 2001- 2004					
Male head	3.42	3.38	3.88	4.81	3.45
Female head/spouse	2.49	4.34	4.63	.00	2.81
Other adults	8.31	7.47	7.29	2.00	8.02
Mortality: 2004-2008					
Male head	6.23	4.69	5.47	3.81	5.92
Female head/spouse	3.05	2.88	1.76	2.24	2.96
Other adults	7.72	6.65	5.76	.40	7.34
Morbidity : 2001 - 2004					
Chronically ill children	6.19	4.98	3.14	3.13	5.82
Chronically ill adults	17.06	15.09	9.66	6.14	16.26
Morbidity : 2004- 2008					
Chronically ill children	2.06	1.47	.29	.00	1.86
Chronically ill adults	5.94	4.39	2.97	1.12	5.49

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

Figure 9. Landholding Size (Cultivated plus Fallow)
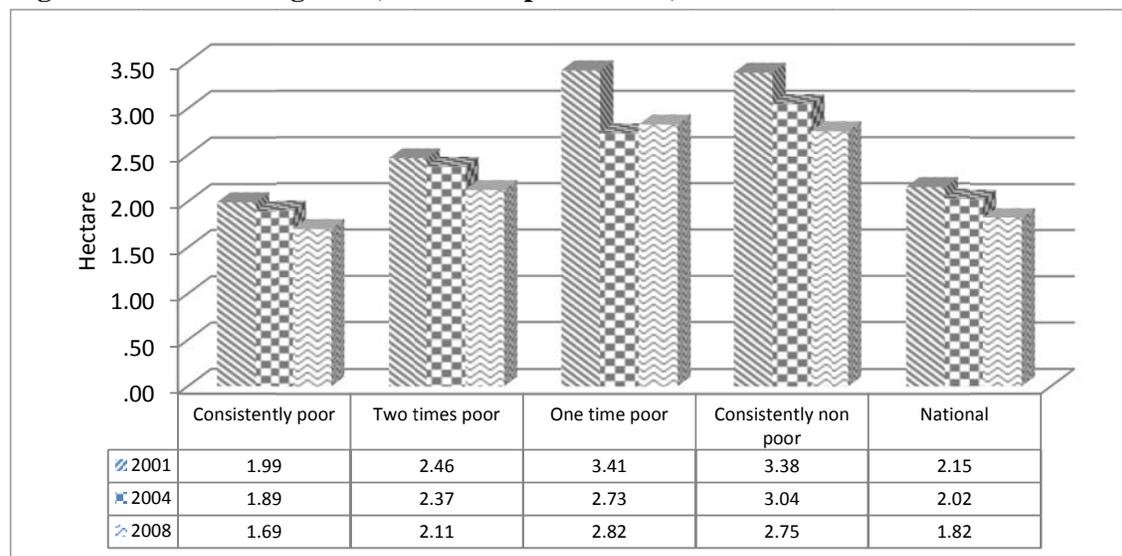
	Consistently poor	Two times poor	One time poor	Consistently non poor	National
2001	1.99	2.46	3.41	3.38	2.15
2004	1.89	2.37	2.73	3.04	2.02
2008	1.69	2.11	2.82	2.75	1.82

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

Figure 10. Land Cultivated
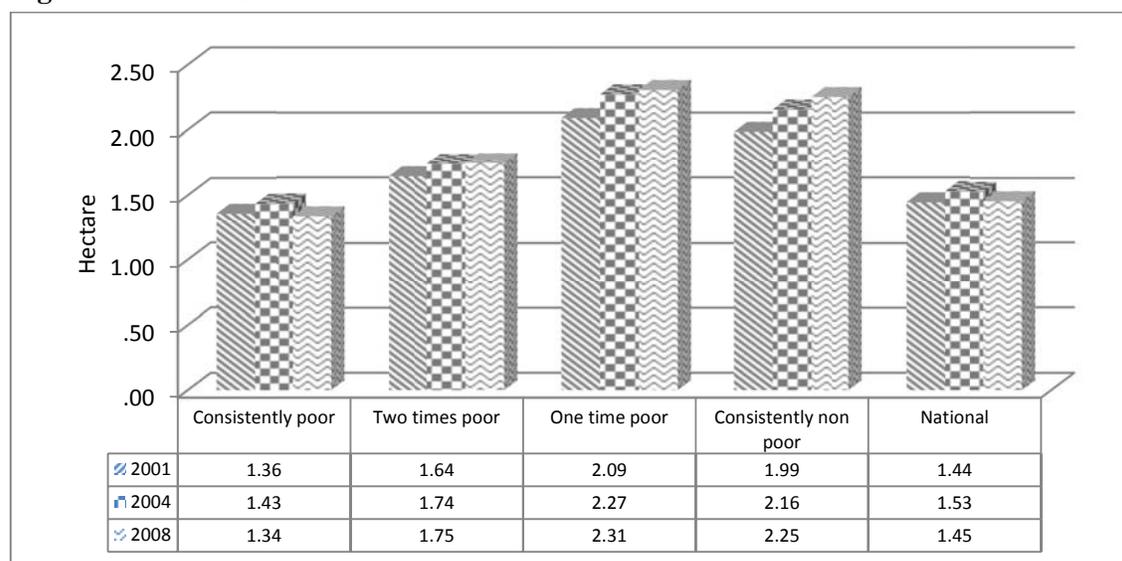
	Consistently poor	Two times poor	One time poor	Consistently non poor	National
2001	1.36	1.64	2.09	1.99	1.44
2004	1.43	1.74	2.27	2.16	1.53
2008	1.34	1.75	2.31	2.25	1.45

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

Recalling the earlier finding that the chronically poor and two-times poor households have also very limited off-farm opportunities as well as being more likely to have household member and head of household have little or no education, on may want to evaluate how current and past poverty reduction strategies have taken these characteristics into account. It is apparent that one way out of this trap is via seriously looking at crop productivity issues as well as creating rewarding off-farm opportunities for them though education that improves their ability to obtain better paying jobs.

4.7. Livestock and Land Ownership by Poverty Dynamics

Livestock can be used as a stock of assets that can be liquidated to cushion the effects of idiosyncratic shocks such as drought and death especially the small ruminants and chickens. Table 10 shows that only 20% of the smallholder farm households in Zambia own cattle in 2008 and only 14.8% in 2001. Comparing across the poverty groups, the results show that the lowest percentage of households owning cattle is among the chronically poor (14-18%) compared to 21-30% among the consistently non-poor households. Consistently non-poor households who owned cattle have on average five times more cattle than the chronically poor household does. From 2001 to 2008, the stockholding for the poorest and the two-times poor decreased by at least two animals whilst the consistently non-poor households increased their stockholding by more 10 animals. We find similar trends with regard to ownership of trained oxen and ox ploughs. However, there seem to be no differences in the proportion of households owning cattle and number owned among the transient poor.

In terms of goat ownership, we do not see a lot of differences across all the poverty groups. However, consistently non-poor households own six more goats compared to the chronically poor. There is no evidence of loss of stock among all the poverty groups except for the consistently non-poor households who increased their stock level from 11 to 16 between 2001 and 2004, only to revert back to 11 goats in 2008.

Surprisingly, we find that a larger proportion of households owned pigs among the poorer households compared to non-poor households. However, the results show that the percentage of households owning pigs between 2001 and 2008 increased from 2.9% to 13% with the percentage of households owning pigs among the poor households remaining stable. In terms of the number of pigs owned by those owning pigs, we find that the transient poor own more pigs than the other groups.

Chickens are by far the most commonly reared animal in rural Zambia. The proportion of households owning chickens is highest among the transient poor followed by the consistently poor with almost 60% of the households owning chicken, though we still have more than 50% of the households among the non-poor households owning chickens. In terms of helping households mitigate short-term shocks as well as nutritional needs, chickens may play an important role since they can be slaughtered regularly or sold easily.

As expected, radio and cell phone ownership is highest among the non-poor and one period poor household with more than 80% of the households in these poverty groups owning a cell phone and or a radio compared to 50% owning a radio and 15% owning a cell phone among the chronically poor households. Therefore, the transmission of extension and market information via these two media works might work very well among those owning a cell phone and radio but this does not preclude other modes of transmission to reach those who do not have these assets especially the poorest.

Table 10. Livestock, Radio and Cell Phone Ownership by Year and Poverty Dynamics

		Consistently poor	Two-times poor	One-time poor	Consistently non-poor	National
		N=1,134,869	N=219,541	N=57,453	N=27,177	N=1,439,039
				Average		
Household who owned cattle	2001	14.0	17.2	18.1	21.3	14.8
	2004	18.2	24.9	25.4	27.4	19.7
	2008	17.9	26.6	24.1	29.9	19.7
Number of cattle owned (among cattle owners)	2001	7.9	12.2	15.3	20.4	9.4
	2004	6.5	15.5	13.0	25.9	9.2
	2008	6.8	11.7	15.0	30.9	8.9
Household owned goats	2001	17.1	16.5	14.2	14.1	16.8
	2004	21.9	22.9	26.4	20.4	22.2
	2008	24.0	23.5	24.4	21.6	23.9
Number of goats owned	2001	5.8	8.1	8.3	11.6	6.3
	2004	5.7	7.4	8.6	16.2	6.3
	2008	6.2	8.3	10.2	11.9	6.8
Household owned pigs	2001	9.1	5.4	5.3	2.9	8.2
	2004	13.1	10.0	11.1	3.7	12.4
	2008	15.8	12.0	15.6	13.0	15.2
Number of pigs owned	2001	5.0	6.5	9.6	3.2	5.3
	2004	3.9	5.4	11.2	7.0	4.4
	2008	4.0	5.5	10.7	5.3	4.5
Household owned chicken	2001	69.8	73.0	72.3	53.9	70.1
	2004	72.4	67.3	70.0	65.8	71.4
	2008	60.8	59.1	55.0	57.3	60.2
Household owned radio	2001	29.4	48.7	67.4	86.5	34.9
	2004	42.9	58.1	73.8	79.0	47.2
	2008	52.5	65.9	82.0	86.6	56.4
Household owned trained oxen	2004	10.3	16.6	19.1	16.6	11.7
	2008	10.7	18.4	17.8	18.1	12.3
Household owned an ox-plough	2004	15.9	22.5	25.8	21.1	17.4
	2008	15.3	24.3	21.1	18.2	16.9
Household owned a cell phone	2008	15.2	36.4	64.9	85.1	21.8

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

4.8. Market Access, Household Commercialization Index

Distances to services and infrastructural facilities are shown in Table 11. In general, the non-poor group has the best access to infrastructure (distance to the nearest tarmac road and District town) while transient poor and chronically poor are somewhat further away from these services. However, with respect to mean private input (fertilizer) and maize market accessibility, the poor households seem to have better access to such services than the non-

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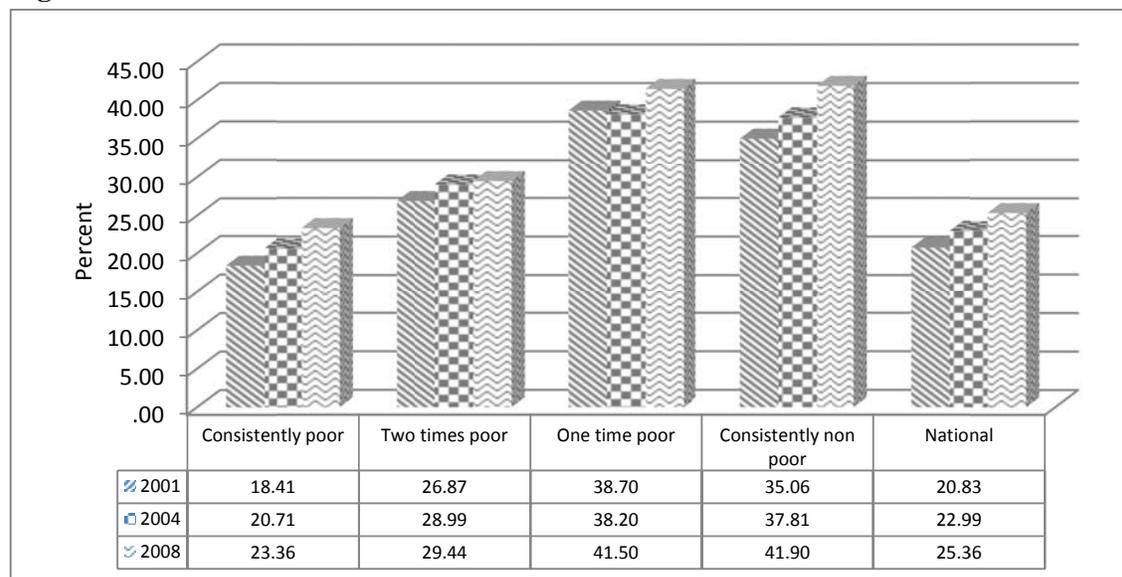**Table 11. Distances to Input Markets and Infrastructural Facilities**

Poverty group		Distance vehicular transport (km)	Distance to nearest district town (km)	Distance to point of maize sale transaction with private traders (km)	Distance to nearest private fertilizer channel (km)
Consistently Poor	Median	3.0	30.8	.00	11.00
	Mean	8.8	35.5	4.81	21.32
	Standard Error	.0	.0	.03	.06
Two-times poor	Median	2.0	26.7	.00	15.00
	Mean	6.4	31.9	9.86	24.04
	Standard Error	.0	.0	.10	.10
One-time poor	Median	1.0	22.0	.00	15.00
	Mean	4.8	27.4	9.63	18.11
	Standard Error	.0	.1	.12	.11
Consistently non-poor	Median	1.0	16.5	.00	17.00
	Mean	4.2	23.7	10.59	26.02
	Standard Error	.0	.1	.17	.22
National	Median	2.0	28.7	.00	12.00
	Mean	8.2	34.4	6.30	21.90
	Standard Error	.0	.0	.03	.05

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

poor households do. There are no differences in distance to the maize market if we consider the median distance to services. Possible explanation why the mean distance travelled to private traders is smaller for poorer households is that poor households are more likely to produce very small marketable surplus hence private traders interested to aggregate such surplus have to travel closer to the households. Also, it is likely that poorer households do not have the means to ferry their products long distances but rather wait for private traders to come to them. On the other hand, non-poor households may be able to transport their maize to further places via hired transport or own transport in order to search for better prices for their products. Unfortunately, we cannot establish the direction of causality between household poverty status and access to infrastructure and /or services with bi-variate analysis, except through the multivariate approach in the next sections.

As mentioned earlier, the household commercialization index represents the concept of marketable surplus and market orientation of the households to agricultural production and their links to the market economy. We use it in this study to determine and subsequently to classify the households as being market oriented/commercialized or not. Figure 11 shows that on average the consistently non-poor and the one period poor are more commercialized compared to consistently poor households and households that fell into poverty twice, despite slightly increasing over the survey period. These results suggest that increasing crop productivity to produce marketable surplus as well as creating market opportunities for the poor may help in the fight against chronic poverty.

Figure 11. Household Commercialization Index

	Consistently poor	Two times poor	One time poor	Consistently non poor	National
2001	18.41	26.87	38.70	35.06	20.83
2004	20.71	28.99	38.20	37.81	22.99
2008	23.36	29.44	41.50	41.90	25.36

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

4.9. Geographic Dimension of Poverty Dynamics

There is a long standing debate over whether the poor would be better served by focusing public interventions and investments directly in less favored regions or by investing scarce resources in areas that provide the highest returns and facilitating the development of markets to spread the benefits to more marginal areas. Characterizing the poverty question in this way assumes that there are *less favored* or *remote* regions where the majority of the poor are located. To examine the validity of this perspective, we regress total household income and household income per adult equivalents on geographic categorical variables of varying size. This is equivalent to an ANOVA test measuring the extent of inter-zone vs. intra-zone variation.

When provincial-level dummy variables are used, the R^2 of household income models is 0.013-0.018, indicating that only 1.3-1.8% of the total variation in household income among small- and medium-scale farm households is accounted for by provincial differences (Table 12). When smaller geographic variables (districts) are used, the R2 of these models only rises to the range of 0.035 to 0.037. And when using the smallest administrative unit available in each of the data sets (standard enumeration areas, which generally contain two or three villages), the R2 of these models indicates that only 8.2% to 8.9% of the variation in total household income and household income per adult equivalents is between villages; the most important sources of variations in household incomes is within villages. Although, there may be some regional differences in incomes, the largest source of variation in household incomes is to be found within villages since only 8% of the variation is explained by the inter-village differences. Most of the variations remain unexplained, indicating that there are many differences among individual household asset holdings, management skills and productivity as well as unobserved intra-village characteristics accounting for the majority of the variation in household income in Zambia.

Table 12. Percentage of Variation in Household Income, per Adult Equivalents Household Income, Explained by Geographic Factors

	% of Total Variation	
	Total household Income	Household income per adult equivalents
Between provinces	1.8	1.3
Between districts	3.7	3.5
Between villages	8.2	8.9

Source: CSO/FSRP Post Harvest Survey 1999/2000 and Supplemental Surveys 2001, 2004, and 2008.

These findings indicate the limitations of conceiving of poverty as a geographic phenomenon (even when the geographic unit is quite small) or formulating area based solutions to the poverty problem. A large share of the poorest smallholder households in Zambia are the neighbors of well off smallholder households. This finding implies that growth linkages should be easier to stimulate, assuming that at least the better-off smallholder farmers can respond to them, than if the relatively poor and non-poor were segregated mainly geographically.

4.10. Econometric Results

The multinomial logit regression results in Table 13 confirm many of the hypotheses emerging from the descriptive analysis. In particular, they underline the importance of education and nonfarm earnings, both for avoiding chronic poverty and for ensuring that livelihood earnings remain consistently above the poverty line. Likewise, accumulation of agricultural assets, such as land and livestock, and a commercial farm orientation offer a pathway to sustained high levels of income.

Negative factors, which tend to trap households in chronic poverty, include health shocks to adult household members. Mortality of prime-age adults as well as their chronic illness increases a household's probability of being trapped in chronic poverty. The same is true of high dependency ratios, particularly young children and aging parents.

A large literature on spatial poverty traps (Carter and Barrett 2006) highlights the importance of a household's geographic location in determining its asset holdings (land scarcity and livestock disease) as well as the return to those assets (through input and output prices, access to health and education services and rainfall and other agro-ecological factors). Household mobility, through temporary and permanent migration, offers households an escape route from spatially disadvantaged zones. Indeed these regression results suggest that migration offers a pathway out of these spatial traps, at least for some households. The significant negative coefficient on the variable *household considered local* suggests that households that are more mobile prove able to maintain earnings consistently in excess of the poverty line, while immobile households are more likely to be chronically poor. Geographic mobility facilitates economic mobility.

The CRE regressions on structural determinants of household earnings echo these principal findings (Table 14). In addition, they identify a clear earnings disadvantage to female-headed married households.

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Table 13. Multinomial Regression Results

	Relative Risk Ratio			Marginal Effects			
	Two-times poor	One-time poor	Consistently Non-poor	Consistently poor	Two-times poor	One-time poor	Consistently Non-poor
	(A)	(B)	(C)	(1)	(2)	(3)	(4)
Demographic Characteristics							
Female headed single (=1)	0.7100	1.0220	0.7400	0.0362	-0.0393	0.0055	-0.0023
	-0.2030	-0.4880	-0.8320	-0.0342	-0.0324	-0.0152	-0.0132
Female headed married (=1)	0.8840	1.2410	1.3380	0.0072	-0.0180	0.0075	0.0033
	-0.1440	-0.4350	-0.8490	-0.0193	-0.0192	-0.0116	-0.0077
Age of household head	0.972***	0.958***	0.962*	0.0039***	-0.0027***	-0.0010**	-0.0002
	-0.0050	-0.0130	-0.0220	-0.0007	-0.0006	-0.0004	-0.0003
Polygamous households (=1)	1.636***	1.4720	0.5710	-0.0552**	0.0559***	0.0094	-0.0101
	-0.2920	-0.5190	-0.5280	-0.0219	-0.0205	-0.0116	-0.0112
% members in household age 0-5	0.354**	0.095***	0.003***	0.1792***	-0.0724	-0.0467*	-0.0601***
	-0.1490	-0.0820	-0.0040	-0.0494	-0.0488	-0.0276	-0.0162
% members in household age 6-14	0.423***	0.089***	0.117**	0.1442***	-0.0661*	-0.0638***	-0.0143
	-0.1410	-0.0560	-0.1120	-0.0387	-0.0383	-0.0214	-0.0115
% members in household age above 60	10.260***	14.882***	8.5650	-0.3001***	0.2355***	0.0572**	0.0074
	-3.9600	-12.8290	-11.8260	-0.0469	-0.0437	-0.0270	-0.0159
Education level of head (0-3 years is base)							
Upper Primary 4-7 years	0.676**	0.514*	0.6500	0.0548***	-0.0370*	-0.0164	-0.0014
	-0.1140	-0.1910	-0.4770	-0.0199	-0.0197	-0.0119	-0.0086
Secondary 8 - 12 years	0.7880	0.6380	1.3500	0.0316	-0.0243	-0.0134	0.0061
	-0.1800	-0.2630	-1.0940	-0.0264	-0.0266	-0.0133	-0.0097
Post-secondary >12 years	0.9080	1.2380	11.137***	-0.0054	-0.0234	0.0000	0.0288***
	-0.4990	-0.8300	-10.3660	-0.0635	-0.0611	-0.0197	-0.0110
Human capital index (school investment)	8.220***	100.922***	525.989***	-0.3329***	0.1720***	0.1093***	0.0516***
	-3.3930	-82.2890	-672.6570	-0.0466	-0.0468	-0.0260	-0.0147
Income sources and assets							
Off-farm income share (%)	1.016***	1.032***	1.046***	-0.0024***	0.0013***	0.0007***	0.0004***
	-0.0020	-0.0030	-0.0060	-0.0002	-0.0002	-0.0001	-0.0001
Household commercialization index	1.011***	1.025***	1.023***	-0.0017***	0.0009***	0.0006***	0.0002**
	-0.0020	-0.0040	-0.0060	-0.0002	-0.0002	-0.0001	-0.0001

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	Relative Risk Ratio			Marginal Effects			
	Two-times poor	One-time poor	Consistently Non-poor	Consistently poor	Two-times poor	One-time poor	Consistently Non-poor
Log of landholding size	1.300***	1.561***	1.748***	-0.0379***	0.0237***	0.0101**	0.0042*
	-0.0850	-0.1990	-0.3240	-0.0076	-0.0075	-0.0040	-0.0022
Number of cattle owned	1.041***	1.068***	1.094***	-0.0058***	0.0036***	0.0015***	0.0007***
	-0.0100	-0.0150	-0.0190	-0.0012	-0.0011	-0.0004	-0.0002
Number of goats owned	1.029**	1.0340	1.071**	-0.0038***	0.0027*	0.0006	0.0006*
	-0.0130	-0.0240	-0.0290	-0.0015	-0.0014	-0.0007	-0.0003
Household social capital							
Households related to headman	0.9090	1.1380	1.0970	0.0069	-0.0129	0.0050	0.0011
	-0.1080	-0.2510	-0.5490	-0.0141	-0.0138	-0.0073	-0.0060
Household in matrilineal District	1.0280	1.0660	1.3050	-0.0053	0.0015	0.0009	0.0029
	-0.1240	-0.2350	-0.4320	-0.0141	-0.0139	-0.0072	-0.0040
Shock							
Number of 20-day periods, Nov.-Mar., with <40 mm total rainfall	0.9910	0.9770	1.0500	0.0011	-0.0010	-0.0008	0.0007
	-0.0410	-0.0790	-0.1410	-0.0049	-0.0048	-0.0026	-0.0016
Chronically ill members:1996-2001	1.0020	0.733*	0.8480	0.0065	0.0042	-0.0098*	-0.0009
	-0.0930	-0.1250	-0.2210	-0.0109	-0.0106	-0.0057	-0.0032
Prime-age mortality:1996-2001	1.0580	1.1390	1.2820	-0.0095	0.0042	0.0029	0.0023
	-0.1880	-0.4000	-0.6630	-0.0213	-0.0201	-0.0114	-0.0061
Chronically ill adult members:2001-2008	0.8810	0.613**	0.445**	0.0261**	-0.0064	-0.0122*	-0.0076*
	-0.0830	-0.1250	-0.1650	-0.0113	-0.0110	-0.0066	-0.0045
Chronically children :2001-2008	0.8420	0.576*	1.0230	0.0280	-0.0143	-0.0165	0.0028
	-0.1260	-0.1880	-0.4370	-0.0176	-0.0174	-0.0109	-0.0052
Prime-age mortality:2001-2008	0.9190	1.1180	0.077***	0.0185	-0.0007	0.0133*	-0.0311***
	-0.1330	-0.2490	-0.0560	-0.0169	-0.0167	-0.0076	-0.0098
Migration							
Household considered local	0.526***	0.539**	0.203***	0.0851***	-0.0624***	-0.0082	-0.0146***
	-0.0750	-0.1350	-0.0790	-0.0164	-0.0164	-0.0081	-0.0048
Years in the settlement	0.9750	0.9400	0.9570	0.0040	-0.0022	-0.0016	-0.0002
	-0.0390	-0.0860	-0.1950	-0.0049	-0.0047	-0.0030	-0.0024
Market Access							
Distance to nearest district town (km)	0.9940	0.9460	0.9440	0.0019	0.0002	-0.0016	-0.0005
	-0.0280	-0.0520	-0.0860	-0.0032	-0.0032	-0.0017	-0.0011

	Relative Risk Ratio			Marginal Effects			
	Two-times poor	One-time poor	Consistently Non-poor	Consistently poor	Two-times poor	One-time poor	Consistently Non-poor
Distance to nearest vehicular transport	0.9580	0.8760	1.1020	0.0065	-0.0040	-0.0042	0.0018
	-0.0440	-0.1070	-0.1220	-0.0055	-0.0053	-0.0040	-0.0013
Household in districts on the line of rail	1.291**	1.655**	1.3730	-0.0373***	0.0233	0.0129*	0.0011
	-0.1590	-0.3690	-0.5290	-0.0142	-0.0142	-0.0073	-0.0046
Agro-Ecological Zones (Zone 1 = base)							
Region 2a	0.7230	1.2850	0.9570	0.0288	-0.0407	0.0120	-0.0001
	-0.1840	-0.6480	-0.6350	-0.0302	-0.0292	-0.0165	-0.0078
Region 2b	0.9800	0.9570	0.3040	0.0084	0.0029	0.0028	-0.0141
	-0.3220	-0.6220	-0.3550	-0.0384	-0.0383	-0.0213	-0.0138
Region 3	0.7070	1.2660	1.0870	0.0307	-0.0436	0.0113	0.0016
	-0.2250	-0.7970	-0.9980	-0.0375	-0.0366	-0.0204	-0.0108
Constant	0.400*	0.018***	0.001***	-	-	-	-
	-0.1990	-0.0190	-0.0020				
Observations	4272	4272	4272	4272	4272	4272	4272

Source: CSO/FSRP Supplemental surveys, 2001, 2004, and 2008. NOTE: Robust standard errors in small font below the coefficients; Significance levels of coefficients: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 14. CRE Determinants of Household Income: 2001-2008

Attributes	Dependent Variable: Log of household income	
	(A)	(B)
Demographic Characteristics		
Female headed single (=1, 0 otherwise)	-0.090	-0.095
	(0.071)	(0.071)
Female headed married (=1, 0 otherwise)	-0.227***	-0.234***
	(0.048)	(0.048)
Age of household head	0.004**	0.004**
	(0.002)	(0.002)
Polygamous households (=1, 0 otherwise)	0.105**	0.112***
	(0.041)	(0.041)
% members in household age 0-5	-0.058	-0.066
	(0.078)	(0.079)
% members in household age 6-14	-0.009	-0.011
	(0.059)	(0.059)
% members in household age above 60	-0.336***	-0.337***
	(0.081)	(0.082)
Education level of head (0-3 years is base)		
Upper Primary 4-7 years	-0.015	-0.014
	(0.030)	(0.031)
Secondary 8 - 12 years	0.009	0.013
	(0.047)	(0.047)
Post-secondary >12 years	0.270***	0.273***
	(0.098)	(0.098)
Human capital index (investment in schooling)	0.392***	0.397***
	(0.090)	(0.090)
Income sources and assets		
Off-farm income share (%)	0.011***	0.011***
	(0.000)	(0.000)
Household commercialization index	0.008***	0.008***
	(0.000)	(0.000)
Log of landholding size	0.384***	0.382***
	(0.013)	(0.013)
Number of cattle owned	0.010***	0.010***
	(0.001)	(0.001)
Number of goats owned	0.009***	0.009***
	(0.002)	(0.002)
Household social capital		
Households related to headman	-0.008	-0.012
	(0.008)	(0.008)
Household in matrilineal District	0.037***	0.019**
	(0.008)	(0.008)
Shocks		
Number of 20-day periods, Nov.-Mar., with <40 mm total rainfall	-0.015**	-0.009
	(0.007)	(0.007)
Chronically ill members:1996-2001	0.007	0.013**
	(0.006)	(0.006)
Prime-age mortality:1996-2001	0.015	0.012
	(0.012)	(0.012)
Chronically ill adult members:2001-2008	-0.014**	-0.011*
	(0.006)	(0.006)
Chronically children :2001-2008	-0.010	-0.009
	(0.009)	(0.009)
Prime-age mortality:2001-2008	0.004	0.004
	(0.009)	(0.009)
Migration		
Household considered local	-0.033***	-0.037***
	(0.011)	(0.011)
Years in the settlement (10 years)	0.002	0.003
	(0.003)	(0.003)

Attributes	Dependent Variable: Log of household income	
Market access		
Distance to district town (10km)	0.003*	0.005***
	(0.002)	(0.002)
Distance to nearest tarmac road (10km)	0.002	0.004*
	(0.003)	(0.003)
Household in district on the line of rail	0.035***	0.040***
	(0.010)	(0.009)
Provincial dummy variables (Lusaka is the base)		
Central	-0.112***	-
	(0.026)	-
Copperbelt	-0.090***	-
	(0.029)	-
Eastern	-0.061**	-
	(0.026)	-
Luapula	-0.238***	-
	(0.028)	-
Northern	-0.086***	-
	(0.027)	-
Northwestern	-0.039	-
	(0.030)	-
Southern	-0.051**	-
	(0.026)	-
Western	-0.100***	-
	(0.027)	-
Agro-ecological Zones(Region 3 is the base)		
region1	-	0.027
	-	(0.017)
region2a	-	-0.012
	-	(0.020)
region2b	-	-0.013
	-	(0.019)
Survey year dummies (2001 is the base)		
Year 2004 (=1)	0.336***	0.234***
	(0.034)	(0.030)
Year 2008 (=1)	0.209***	0.016
	(0.055)	(0.046)
Constant	12.968***	13.365***
	(0.072)	(0.074)
Observations	12,741	12,741
R- squared	0.548	0.54.1

Source: CSO/FSRP Supplemental surveys, 2001, 2004, and 2008.
Notes: Human capital index of the household is calculated as the ration of the sum of all completed years of education for household members age 12 and above divided by the sum of theoretically possible number of completed years of schooling for these members. This index ranges between 0 and 1.
Robust standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

5. CONCLUSIONS

Comparison of households trapped in chronic poverty with those who maintain consistent high incomes suggests two major pathways out of poverty in rural Zambia. One pathway involves agricultural asset accumulation and commercialization. An alternate, though complementary path revolves around investment in secondary and post-secondary education of children which translates, in the next generation, into high-paying nonfarm employment. Household mobility – through temporary or permanent migration – appears to facilitate movement along both pathways.

Key public investments that serve to accelerate these upward trajectories include investments in rural education, public health, feeder roads and improved market access, agricultural technology and management of human and livestock diseases. Policies that facilitate land consolidation, input supply, and market competition will also enhance these rural growth dynamics.

For individual households, a complementary, qualitative study of upwardly mobile households in rural Zambia emphasizes the importance of education and asset accumulation over time. It likewise highlights the many social barriers facing abandoned and divorced women heads of household (Banda and Hamukwala 2011). These findings suggest that broader policies affecting inheritance rights, land allocation and women's rights will also be necessary to facilitate equitable economic growth in rural Zambia.

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