Economic Commission for Africa

The Statistical Estimation of Poverty Duration and Transitions in Zambia

Economic Commission
for Africa
Southern Africa Office

The Statistical Estimation of Poverty Duration and Transitions in Zambia

For this and other publications, please visit the ECA website at http://www.uneca.org

Or contact
Publications
Economic Commission for Africa
P.O. Box 3001
Addis Ababa, Ethiopia
Tel: 251-1-44 31 68
Fax: 251-1-51 03 65
E-mail: ecainfo@uneca.org

Contents

List of Figures

Acronyms and Abbreviations

AIDS	Acquired Immune Deficiency Virus
CSO	Central Statistical Office
FMP	First-order Markov processes
GDP	Gross Domestic Product
HIV	Human Immune Virus
ICT	Information and Communications Technology
IS	Income Support
LCMS	Living Conditions Monitoring Surveys
MDGs	Millennium Development Goals
MoFNP	Ministry of Finance and National Planning of Zambia
PRSP	Poverty Reduction Strategy Paper
PS	Priority Surveys
SAP	Structural Adjustment Programme
UI	Unemployment Insurance
UNDAF	United Nations Development Assistance Framework

Acknowledgements

This paper was prepared by Oswald Mungule, a consultant, under the supervision of Patrick Bugembe, leader of the Economic and Social Policy cluster of the Southern Africa Office of the Economic Commission for Africa (ECA-SA) and the overall guidance of Jennifer Kargbo, Director of the Office.

The paper was presented at a Poverty Measuring and Monitoring Workshop held in Nairobi, Kenya from 13 to 14 December 2005 and benefited from comments provided by participants who attended the workshop.

The paper also benefited from substantive and invaluable comments provided by ECA-SA professional staff members. This team included: Munorweyi Dhliwayo, Irene Lomayani, Kampion Banda, Gladys Mutangadura, Oliver Maponga, Doreen Kibuka-Musoke, Saskia Ivens and Eduardo Frias. Ian Filakati provided the editorial assistance and Ronald Nkhoma handled the layout.

1. Introduction

1. This paper proposes a model that attempts to address poverty dynamics and provides an additional dimension to poverty for countries in the Southern African region. Most importantly, this study could facilitate the design of effective long-term poverty reduction policies. Additionally, chronic poverty alleviation is clearly a priority for governments since persistent suffering from low income, no income, unemployment and the associated outcomes of HIV/AIDS, malnutrition and poor education tend to have long-term effects, particularly on child development and on the overall development of Southern Africa.

2. To focus on both short-term and long term spells of poverty, this study outlines a statistical model for determining poverty dynamics thereby making available information on various statistical tools and provides a justification for use by policy-makers and researchers for analyzing characteristics and changes in circumstances that drive the transitions in and out of poverty.

3. Poverty in Zambia remains stubbornly at high levels and continues to be a deep-rooted problem facing the people and government. However, according to the Central Statistics Office (CSO), poverty incidence is declining and is currently estimated at 67 percent (as at 2003) down from 78 percent in 1996. However, these figures are based on cross sectional estimates of the population and do not say anything about the persistence of poverty and changes in circumstances that drive the transitions in and out of poverty in households. Additionally, the figures can not provide explanations to the following issues: whether households remain trapped in poverty over generations; whether poor households are the same over time and whether families or households fluctuate in and out of material hardship due to changes in employment status, family structure, agricultural conditions, health problems and other household crises.

4. Furthermore, this paper supports the need for governments to know and be aware of the existence of poverty drivers. Knowledge of the existence of poverty drivers will allow governments to focus policies on promoting specific channels and opportunities for the poor.

5. We follow an analytical approach to poverty dynamics from applying theoretical models that explain the above stated poverty issues and include: human capital theory (Becker 1975, Bane and Ellwood 1986, Ehrenberg and Smith 1991) ; permanent income and life-cycle hypotheses (Dornbusch and Fischer 1990, Lillard and Willis 1978, Duncan and Rodgers 1991, Stevens 1999); flawed character theories (Schiller 1976, Duncan 1984); Oscar Lewis' "culture of poverty" theory (Oscar Lewis 1968, Duncan 1984); and the restricted opportunity theories / dual-labour market theory (Duncan 1984), among others. These theories, among others, together provide a multi-dimension to the determinants of poverty.

6. The most notable empirical literature that explains poverty dynamics using statistical techniques like econometrics include: Bane and Ellwood (1986) and Canto (2000) using the spell or hazard models; Lillard and Willis (1978) using the component variance analysis; and Cappellari and Jenkins (2004) using the first-order Markov model.

7. Following Canto (2000:18-22), the distance of household income to the poverty line, the dependency index and the retirement status of the household head are expected to register a higher absolute value poverty durations. The dependence index and the retirement status are highly correlated (especially the dependency index) to the point in the income distribution where the household is placed after an exit from poverty. However, conditioning on the distance from the poverty line may not change the estimations of duration status.

8. There is no differentiated net effect of the sex of the head of household on the re-entering probability found for the sample of households registering an exit from poverty. The sex variable is only significant if mixed with civil status and age. The older the female heads are, the higher their probability of re-entering poverty soon after exit. The marginal effect of age is larger (even if with a much lower initial probability of returning to poverty) if these females have a spouse present in the household than if they do not have one. The inequality in the probability of re-entering poverty within the group of female heads with spouse is higher than within the group of female heads without a spouse. The latter have a higher risk of falling back into poverty while being more homogeneous with respect to age. The presence of a spouse in the household, whatever her/his labour market status, is an advantage when maximizing the length of the non-poverty spell if the household manages to exit poverty sometime.

9. Results on the coefficient of the sex variable in the exit and re-entry equations indicate that male-headed households should expect shorter poverty spells than female headed households. Little can be said, however, on the implications of an exit from poverty for each of these groups. Nonetheless, most re-entry models give some evidence on the likelihood of a 'good quality' exit from poverty for female headed households with a spouse. Despite the fact that its effect increases as the age of the head increases.

10. As one would expect, studies on the correlation of the number of income earners in the household and the risk of poverty, come to the general conclusion that households without income earners (head aged <60) have a higher risk of poverty than households with one or more income earners. However, some country specific differences exist. For instance, European countries, in general, register lower poverty rates for no-earner households than countries like the US or Australia. Within Southern Africa, Zambia could be placed in the group of countries in which the lack of earners in the household is more correlated with poverty. In the Zambian case, we could find that a large number of dependants in the household (over 75 percent of household members) promotes both short-term and long-term poverty spells with very short periods of non-poverty. Moreover, dependants of a short age (especially between 3 and 6 years of age) increase even more the expected poverty spell length.

12. The distribution of permanent and transitory poverty between rural and urban parts of the country is particularly interesting in terms of policy. Intuition would lead one to

consider the higher number of short-term labour market opportunities in cities to predict a higher importance of transitory poverty there. Little differences, however, could be found between townships in household poverty exit hazard rates (length of the poverty spell).

13. Regarding the re-entry, an income improvement is of a 'better quality' in cities than in rural towns. Re-entry variations are also expected within cities and rural towns. For instance, those in low density areas will have a better quality improvement than those in high density areas. The expected time out of poverty after an exit in cities or urban parts of the country is smaller than in rural areas. Thus, it is the re-inflow (and not the outflow) into poverty that is higher in cities and / or urban than in rural areas.

14. Households with an unemployed head are expected to have long-term poverty spells mixed with some short spells of non-poverty (controlling for educational background, non- HIV/AIDS status). Out of this group, those without Unemployment Insurance (UI) or Income Support (IS) (either because they are not eligible for it or because it has already ended) are expected to have a higher probability of leaving poverty compared to those who are receiving these benefits. In the re-entry equation, however, their probability of returning to poverty shortly after escaping it is largely higher than that of the unemployed with benefit. Thus, higher welfare instability is expected from households whose head is unemployed but is not receiving a benefit than otherwise. For those receiving UI or IS, some welfare instability is also expected but spells of poverty or non-poverty will be longer. This result on welfare instability is similar for households whose head is self-employed. Some under-reporting of income for the self-employed is expected while the highest instability may come from the inclusion in this group of self-employed farmers without dependent workers.

15. In attempting to approximate both the income jump associated with the household's exit from poverty and the stability of the jump in itself, Canto (2000), used dummies for the distance from the household's equivalent income to the poverty line using both non-left censored and censored spells equations[1]. All dummies have been estimated to be strongly significant and show higher coefficients as the distance increases, implying long exit spell. Thus, the further up in the income distribution the household ends at after an exit, the less probable it is to fall back into poverty shortly after. The inclusion of duration dummies in the re-entry equation reduces the significance of the dummies which describe the household's distance to the poverty line after an exit. These dummies, however, have been found to be significant with slightly lower coefficient estimates. The size of the jump in equivalent income terms will emerge as a clear determinant of welfare stability whereas the original household income level with respect to the poverty line (poverty gap) before moving out of poverty will be of less importance in determining the household's exit probability, using exit probability equations.

16. All duration dummies in both the exit and the re-entry equations show strong negative coefficient signs, duration in a state (in or out of poverty) promotes stability in that state. However, an exit from poverty does not assure a long non-poverty spell given that the duration out of poverty is not a characteristic which is inherent to the household but a quality which is acquired as the spell evolves. After some time (usually years)

[1] Non censored and censored equations are illustrated under the modeling section.

out of poverty, the probability of a move from above to below the poverty line becomes extremely low (can be shown by the non-parametric hazard rate). However, this strong correlation may be seriously biased by unobserved heterogeneity. Even if this was the case, the inclusion of unobserved heterogeneity in the regression is normally recommended in order to obtain unbiased estimates of other independent variable coefficients. In terms of the marginal effect of duration on the re-entry hazard rate, one finds that it is somewhat weaker than that found for duration on the exit hazard.

17. The importance of inclusion of seasonal dummies in regressions is to control for the effects of quarterly income fluctuations. Dummies for yearly time effects could also be included. These control for the evolution of low income dynamics over time. The combined interpretation of exit and re-entry equation coefficients for these variables could be examined too. In this study, between 1996 and 1998 and 2002 and 2003, a decrease in the re-entry probability of households who had managed to exit poverty is observed. We look for the year with the strongest effect and changes in the poverty exit duration. An indicator for poverty becoming less likely is a negative coefficient in the exit equation, while those experiencing an exit are likely to return to poverty shortly after.

18. The rest of the paper is organized as follows. Section 2 provides a detailed look at the statistical resources. Section 3 gives a theoretical analysis of issues relating to poverty duration and transitions. Section 4 provides an overview of the feasibility of carrying out poverty dynamics studies in Zambia. This section addresses whether household panel data is available and to what extent or how it could be gathered to provide the necessary data for the poverty dynamics analysis. Finally, we propose the best poverty exit measurement model. Section 5 is the conclusion.

2. A Detailed Look at the Statistical Resources

19. Potential countries which could form the basis for considerations for poverty dynamics studies in Southern Africa were identified as South Africa, with the best statistical resources, Botswana and Zambia. Of the three countries, only Zambia is implementing the Poverty Reduction Strategy Paper (PRSP). However, all the three countries need a concrete basis for designing poverty eradication policies. The starting point to policy formulation is to generate appropriate statistical data such as panel data and then to develop capacity to use econometric models to analyse and formulate policies which are aimed at reducing poverty. Additionally, focus is shifting from qualitative poverty analysis only to combining statistical / econometric and qualitative analyses that lead to in depth analyses of poverty dynamics in terms of durations and transitions. These types of studies require certain type of data- panel data- to effectively model poverty durations and transitions in these countries. Due to a number of factors, this paper only presents statistical resources and analysis for Zambia.

2.1. Population Characteristics and Macroeconomics

20. The Central Statistical Office (CSO) is the organisation that is mandated to produce official country statistical data. The need to monitor the living conditions of people became focused during the 1990s when the country vigorously started implementing the Structural Adjustment Programme (SAP). The Government and its cooperating partners realized that a segment of the population was adversely affected by these policies and programmes meant for economic reforms. After the year 2000, due to the sustained poverty and deteriorating socio-economic situation, the Government and the donor community were prompted to reassess various development and assistance strategies from the point of view of poverty reduction. This reassessment culminated into the development of the Poverty Reduction Strategy Paper (PRSP) in 2001. The success of this programme has relied on the institutionalization of a monitoring framework at both the household and community level.

21. The CSO has been conducting household based Living Conditions Monitoring Surveys (LCMS) since 1996 for monitoring various Government and donor policies and programmes. However, the LCMS evolved from the social Dimensions of Adjustment Priority Surveys (PS) conducted in 1991 (PS I) and 1993 (PS II).

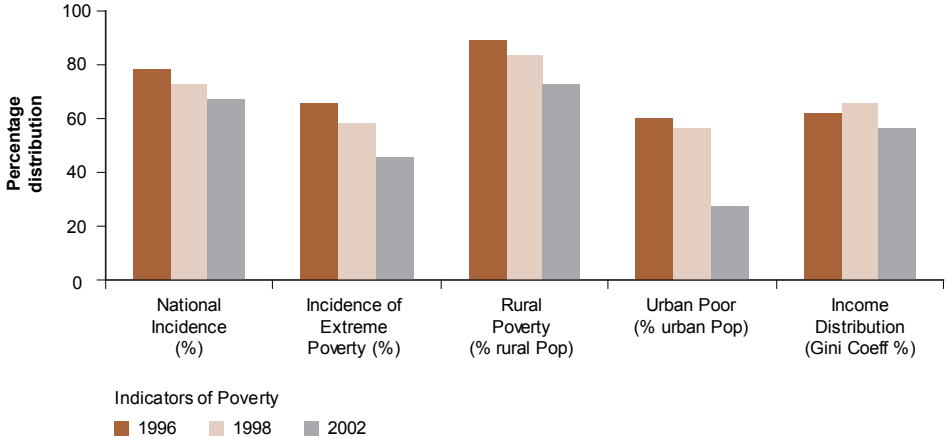
22. Zambia has conducted three LCMS so far, namely; (i) LCMS I of 1996, (ii) LCMS II of 1998 and (iii) LCMS III of 2002/2003.

23. The statistical data covered in the above stated LCMS are on living conditions of households and persons in the areas of education, health, economic activities and employment, child nutrition, death in the households, income sources, income levels, food production, household consumption expenditure, access to clean water and safe water and sanitation, housing and access to various socio-economic facilities and infrastructure such as schools, health facilities, transport, banks, credit facilities, markets, etc.

24. The Country's Ministry of Finance and National Planning (MoFNP), which monitors the implementation of the Poverty Reduction Strategy Paper (PRSP), among others, "has acknowledged the failures in reducing poverty in the country"[2] (MoFNP, 2004: 13). This is also highlighted in the Living Conditions Monitoring Survey (LCMS III) of 2002/2003, which estimated the incidence of poverty at 67 percent with extreme poverty at 46 percent. As at 2003, the rural areas have the highest levels of poverty at 72 percent and 28 percent in urban areas. The LCMS III[3] reports that income distribution continued to be highly uneven. Additionally, Figure 1 reports that the poverty situation in Zambia has been declining since 1996 (MoFNP, 2004: 13). Also, the Gini coefficient declined in 2002 to 0.57 from 0.66 in 1998, indicating some decline in income inequality in Zambia although income inequality still remained high.

25. The Country's economic growth rate, one of the determinants of poverty, has been below an annual average of 8 percent needed to reduce poverty (see Appendix 1). The decline in the mining sector between 1995 and 2002 from around 12 percent of GDP to about 8 percent of GDP adversely affected the social fabric or living standards in Zambia as many people on the Copperbelt province depended on the mines for business contracts, wages, salaries and social provisions (including sports facilities, schools and clinics). The loss of jobs by household heads as a result of the privatization programme also had an effect on poverty through loss of income by households.

Figure 1. Poverty Situation in Zambia

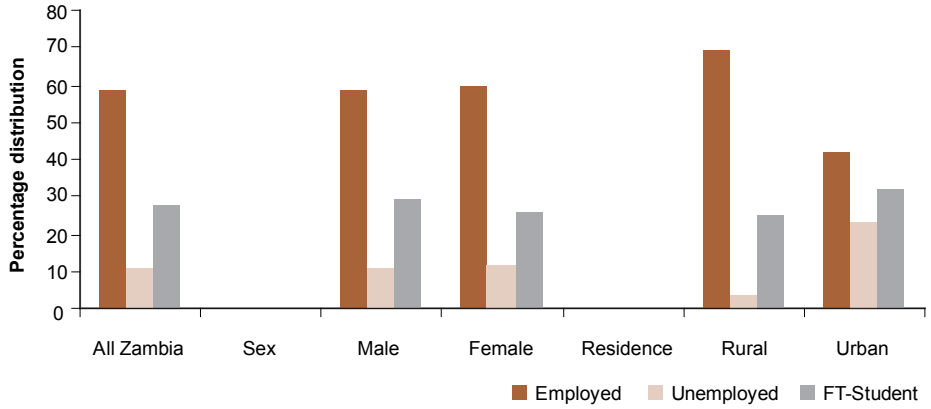


Source: MoFNP, 2004 Economic Report, P.13

Percentage Distribution of Population Aged 12 years and above

[2] This is in reference to the prevailing high levels of poverty in the country.
[3] See Appendix 3 for details on statistics.

Figure 2. Population Characteristics, 2002-2003



Source: CSO, LCMS III 2002-03, p. 58

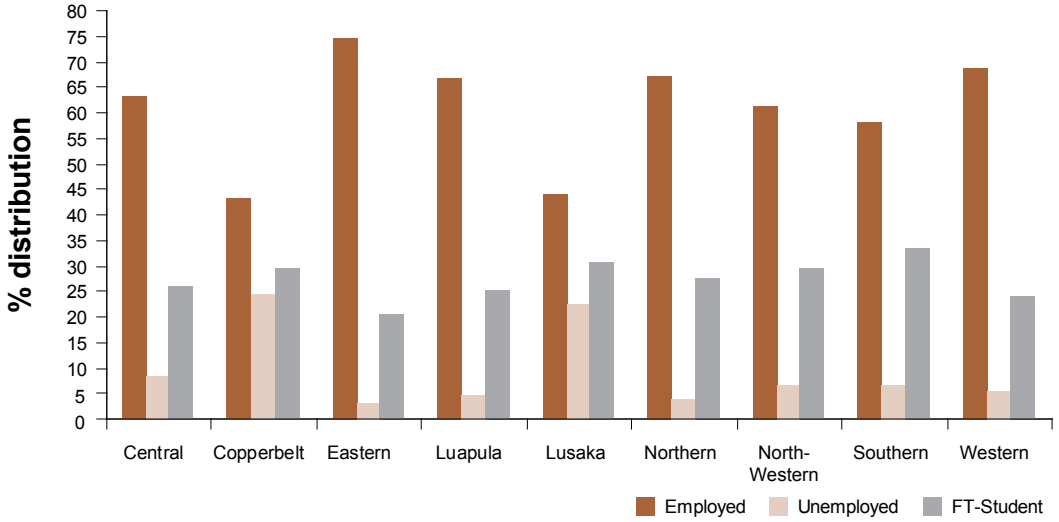
26. Employment (formal or informal), as it relates to the labour market, is also a major determinant of poverty. According to the CSO's LCMS III of 2002/03, out of the total population aged 12 years and above, 70 percent constitute the labour force. Of these, 59 percent were employed[4]. Of the remaining 30 percent who were in the inactive population, 27 percent of them were full-time students[5] and 1 percent were retired or too old to be employed (see Appendix 2).

27. Figure 2 shows highlights on the characteristics of employment by sex, residence and national wide. Figure 2 indicates that the proportion of women in the labour force in relation to other women who were inactive was higher than that of the men. There are more men in employment than women and no major differences in the unemployment rates between males and females. Additionally, in terms of residence, higher unemployment is a phenomenon more prevalent in urban areas than rural areas.

[4] "The employed population comprises of persons who performed some work or conducted business, for pay, profit or family gain". CSO, (2004: 56)

[5] Full-time Students are classified as part of the economically inactive population, which is defined as persons aged 12 years and above who were not economically active. Inactive population also includes full-time home makers, retired persons and not doing any gainful work or business, vagabonds, the invalids, tramps, etc.

Figure 3. Provincial Population Characteristics, 2002-02



Source: CSO, LCMS III 2002-03, p. 58

28. Figure 3 shows that eastern province has the highest proportion of employed population aged 12 and above followed by Western, Northern, Luapula and Central provinces. Unemployment[6] is highest on the Copperbelt and Lusaka provinces (see Appendix 2).

2.2. Poverty Status

29. Poverty analysis is premised on the availability of panel data on household expenditures and income levels; including gender status of household heads; employment and health status of household heads; levels of child health and nutrition (unvaccinated, receiving food supplement, etc); types of household cooking devices and type of household energy source accessed (kerosene/paraffin, electricity, candle, diesel, open fire, solar, etc) and other household amenities and access to facilities such as, household's access to the internet or information and communications technology (ICT). Additionally, we need data on geographic location (such as urban, rural, province) and which is available. These key data variables, with others, could then be analysed by using various dynamic specifications of the multi dimensionality of poverty.

30. Zambia's population (10.8 million) is regarded as being young with 46 % of the population being under 15 years old. Of the population 12 years and older, 47% had never been married, 43% are married, 5 % are widowed, 4% divorced and 1% separated. However, the average household size is six (6).

[6] Unemployed population is defined as that which "constitutes persons who, at the time of the survey, were either looking for work/means to do business or were not looking for work/means to do business but were available for work/business". CSO, (2004:57)

31. In terms of orphaned children, 20% of all children below 19 years are orphans. Of all the orphaned children, 4% are maternal orphans, 11% are paternal orphans and 5% are double orphans. The proportion of orphans increased with increasing age.

Household Income status:

32. According to the LCMSIII, households generally receive low incomes. About 92 % of rural households and 68 % of urban households receive K600,000 (US$150) or less. The mean monthly income for urban households receive K790,652 (US$197.66) and K283,796 (US$70.95) for rural households. The average monthly income for urban households was almost 3 times that of rural households.

34. Income distribution is biased in favour of urban areas. With about 35% of total population, urban areas constitute about 59% of total income while rural areas with about 65% of total population account for only 41% of the total income.

35. The Lorenz curve for urban areas exhibits greater divergence than the curve for rural areas, indicative of higher inequalities in income distribution in urban areas than in rural areas. The most commonly owned household assets are: a hoe (82%); a residential house (66%); an axe (70%); brazier (59%); radio (43%); bicycle (30%); and non-electric iron (25%). Twenty percent of households own a television set, while 43% of all households own a radio; 20% of the urban households own a video player and 12% own a cellular phone.

36. Generally, male-headed households have higher per capita incomes than female-headed households in most provinces except Eastern, Luapula and North-Western provinces.

37. Households in Zambia derived the largest proportion of their incomes from regular wages and salaries (42%) followed by own-produce (21%) and business (18%). However, other sources of income covering borrowing, begging, sales of assets, etc account for 16% of income.

Household Social Conditions:

38. **Health:** About 13% of the population has some sort of an illness. For instance, in rural areas 16% of the people have reported illnesses while for urban areas, only 9% reported illnesses. This means that illnesses are most likely to occur in rural areas than in urban areas. The most common illness is malaria for both rural and urban areas.

39. **Education:** Urban areas have a much higher school attendance rate than rural areas at all levels of age groups. The poverty status of households has tended to influence on school attendance. The school attendance rate for those households who are not poor is higher than those households in the moderately and extremely poor households at all levels.

Household Expenditure status:

40. Average monthly expenditure for Zambia is K490,530 (US$122.63) with an average per capita expenditure of K111,444 (US$27.86). Most of the household expenditure were on food (64%); non-food (26%); and rental (10%). The proportion of household food expenditure was higher in rural areas (75%) than in urban areas (52%). However, the higher the expenditure on food, the more constrained or poorer the household is (Engels Law). Households in rural areas depend to a large extent on own-produced food. This accounted for 55% of the total household food expenditure (consumption), compared to only 4% for the urban households.

Poverty Condition:

41. The LCMS III survey results show that 67% of the population fall below the poverty line, which was equal to K92,185 (US$23.05) in per adult equivalent terms. Most of this poverty is attributed to the inability to acquire enough food. Poverty levels are higher among the rural small-scale households and households residing in urban low cost areas. Head count poverty rates are likely to be high during the last two quarters of the year than during the beginning of the year.

42. Overall, poverty gap ratio is estimated at 27.1%, implying that the incomes of the population, especially the poor, were on average 72.9% of the poverty line. The poverty gap also shows that poverty was much intense in rural areas than in urban areas (CSO, 2004).

3. A Review of Models Relating to Poverty Dynamics Analysis.

3.1. First – Order Markov Models

43. These models provide estimates for poverty transitions by considering poverty measures (wages, earnings, low income transitions, low pay transitions, etc) under panel attrition, non-response and initial conditions. Cappellari and Jenkins (June 2004) have accounted for attrition, economic item non-response and initial conditions for low pay transitions (see Appendix 4, Table 4.1). This analysis is similar to the Cappellari and Jenkins (2004), who addresses attrition and initial conditions as endogenous selection issues under a multivariate model specification. This being the broadest specification for low pay / poverty transitions makes it an ideal candidate for adoption in this paper.

44. The experience of low pay is associated with higher chances of becoming unemployed in the future (the 'low pay – no pay cycle') and, although the overlap between low pay and poverty is relatively low in any given year, the association between persistent low pay and poverty is much higher (Stewart and Swaffield, 1999).

3.2. Spell or Hazard Models

45. These models provide policy makers with an insight into poverty transitions, just like the models based on the first-order Markov processes (FMP). Unlike the FMP, the hazard model, especially the multivariate models analyse events that trigger individuals' entries into and exits from poverty. A spell or hazard model simply provides information about the likelihood (i.e., probability) of experiencing an event at time *t* (e.g., exiting poverty) given that the event has not occurred prior to time *t* (e.g., the person is in poverty in the period prior to *t*, *t-1*). The multivariate hazard model allows the probability of experiencing an event at time *t* (e.g., exiting poverty) to depend on a set of explanatory variables, which includes among other characteristics, age, race, gender, and educational attainment, as well as the trigger events. This multivariate framework allows us to determine the relative importance of multiple events in poverty transitions, something that cannot be learned from a descriptive analysis. Separate poverty entry and exit equations are estimated.

46. Sometimes discrete-time hazard models are used which assume that the probability of entering (or exiting) poverty in a given period (e.g., year) is represented by a logit specification. The logit specification is popular as it is very tractable and restricts the transition probabilities to lie between zero and one (Allison 1984). Several studies of poverty transitions have used the logit specification (Stevens 1994 and 1999, Iceland 1997b). Bane and Ellwood (1986), see poverty as occurring in spells with the duration of poverty exit as the dependent variable.

3.3. Component Variance Analysis Models / Income decompositions models

47. These models provide information on poverty durations, such as analyzing permanent and transitory components of the model. We look at how long families will remain poor / rich and what factors contribute to such states / conditions. Here the poverty index measure is a major factor for scrutiny. The issue of how it relates to household income data and any data of wellbeing is considered.

Ali (1998), Kakwani (1993), Datt and Ravallion (1992) and Lillard and Willis (1978) employ variance analysis to decompose income and provide rich literature on poverty durations.

48. In summary, we have reviewed three models which help analyse poverty transitions (i.e. first-order Markov model and the Spell or Hazard models) and durations (i.e. income decompositions models).

4. Application of Poverty Dynamics Models

49. The estimation of the determinants of poverty, however, requires panel data, where information on income and other socio-economic variables is collected repeatedly over time on the same households and with a number of waves (minimum of two). This type of statistical data could make it possible to investigate the duration of poverty among households and the subsequent transition patterns. However, it is difficult in the Zambian context, as a consequence of inadequate resources and problems in tracking households from one survey to the next, to produce accurate data. Therefore, the availability of accurate and consistent panel statistical data is not guaranteed.

4.1. Linking Zambian Data with Poverty Dynamics Models

50. Zambian Statistics are available on household income and expenditures since 1991 through the IMS; PS of 1991 and 1993; LCMS I and II of 1996 and 1998, respectively and now the LCMS III of 2002/2003. However, the later is measured differently from the former. The CSO is expected to release some LCMS data on the evolution of poverty in Zambia up to 2004, an update of the 1991 through 1996 report (CSO, 1997).

51. There are monthly and annual statistics on the following poverty indicators from the CSO:

- Change in household composition (births, deaths, female headed households/ two adult –headed households, young adults setting up own households)
- Change in labour Supply (loss of employment, gain of employment by head, wife and others)
- Change in disability status (head becomes disabled/ Head ceases to be disabled)
- Change in education and health status
- Change in access to energy, water and sanitations
- Changes in other forms of deprivation (housing, land, credit, government policies, state of the economy)
- Changes in household income and household preferences
- Changes in household expenditures

52. The transmission effects on poverty of some of the above poverty indicators are through effect on wage labour hours and family size in the case of births and deaths. The Change in Marital status affect poverty levels through its effects on wage labour hours and when the young decide to set up household would affect household poverty through their dependency on parents for financial support if not employed. The change in employment status affects poverty through its effects on earnings. Change in disability will be through the effects on wages/salaries.

53. In view of the availability of the statistical data, the three main econometric techniques of Spell or hazard models, components variance analysis and the first order Markov models could be used to estimate the poverty dynamics. First, the Spell or Hazard models

could take care of events that lead to whether a particular household is entering or exiting poverty and for how long. Second, the method for the components variance analysis would take care of temporal / transitory and permanent variance components of income, which could then be used to predict duration and underlying determinants through variance decomposition and impulse response functions. Finally, the first-order Markov model would use some probit specification to determine poverty transitions by controlling for endogeneity of poverty under initial conditions and non-random attrition/non-response. The first-order Markov model takes care of problems associated with panel data, whereby different households could be surveyed each time of the survey and thereby invoking the cross-sectionality of the data.

4.2. Model Specification for Zambia

4.2.1. Needs Assessment

54. Zambia has gone back to the "Five-years National Planning Frameworks and the country is also implementing Poverty Reduction Strategy Paper (PRSP). The country is also being monitored by the international community in terms of her achievements of the Millennium Development Goals (MDGs) and under the United Nations Development Assistance Framework (UNDAF) for Zambia; poverty reduction is a major component of country assistance. These development frameworks are already in place and what the country needs now are statistical estimates on poverty related problems such as; poverty triggers (poverty exit and entry events), poverty spells or hazards, and poverty exit durations for targeted households.

55. This study forms the basis for policy input into the poverty eradication policy formulation process for the Ministry of Finance and National Planning and for statistical collection methodologies improvements for the CSO (i.e. panel data). The poverty situation in Zambia is multi dimensional and to fully understand the characteristics of poverty, there is need to study most aspects of poverty dynamics such as looking at poverty duration (e.g. duration to poverty exit and / or entry) and poverty transition issues. Second, Zambian policy makers also need to understand poverty transitions and durations and their underlying determinants. Finally, determinants of poverty transitions in the light of initial poverty conditions, non-random attrition and non-responses and understanding the dynamics of the previous poverty dynamics on household conditions, need to be established and is proposed in this paper.

4.2.2. The Model

56. In view of the above needs assessment, it would be appropriate to accomplish the understanding of the poverty dynamics through the use of a simultaneous equation system for explaining poverty duration and transitions in Zambia. The use of a vector error correction framework is pursued. We specify measurements for both poverty transitions and durations.

4.2.2.1. Estimation of Poverty Transitions:

57. Following a logit specification in Stevens (1994 and 1999) and Iceland (1997b), we specify the poverty transition model under the following assumption. The logit specification is very tractable and restricts transitional probabilities to lie between zero and one (Allison 1984). With this assumption, the probability of entering (or exiting) poverty for person *i* at time *t* can be written as:

$$P_{it} = \frac{1}{1 + e^{-y_{it}}} \quad \text{.....[1]}$$

where

$$y_{it} = \beta_t + \delta' T_{it} + \Gamma' X_{it}. \quad \text{.....[2]}$$

where;

y is a poverty measure (discrete variable); T is a vector that represents transition events (i.e. the primary focus of this analysis), and the vector X represents control variables. The transition and control variables are based on the following transition events: (1) number of children in the household, (2) two-adult household becomes female-headed household, (3) young adult (under age 25) sets up own household, (4) loss of employment (of head, spouse, and other household members)—measured as a change from positive to zero hours, (5) nondisabled household head becomes disabled, (6) HIV/AIDS status of the household head, (7) education level of household head (s) and (8) weakening economy (change in state unemployment rate and change in GDP). Control variables include: (i) characteristics of the household head (age, race, and educational attainment), (ii) household (female-headed household, single male-headed household, number of adults aged 12-65, number of children), (iii) geographic characteristics, (iv) economic indicators (unemployment rate and GDP), (v) poverty spell information (observed duration of current spell at time *t*, observed number of prior spells, left censored spell identifier), and (vi) year identifiers (see Appendix 4, Table 4.2).

58. Accounting for attrition, non-response and initial conditions, we follow Cappellari and Jenkins (June 2004). We use equation (2) to determine transitions by applying the following transformations, where y is the low pay status of individual i at time t.

59. For each household in the base year sample, we assume that there is a latent low pay propensity, L^*_{t-1}, and observed low pay status, L_{t-1}, depends on whether this propensity is greater or less than some unobserved threshold (set equal to zero without loss of information). That is, initial conditions are described by:

$$L^*_{t-1} = \beta' \boldsymbol{x}_{t-1} + u_{t-1}, u_{t-1} \sim N(0,1) \quad \textbf{[3]}$$

$$L_{t-1} = I(L^*_{t-1} > 0) \quad \textbf{[4]}$$

where $\boldsymbol{x}_{t-1}$ is a vector of personal characteristics, β is a vector of parameters, and u_{t-1} summarises unobserved differences (assumed uncorrelated with observed characteristics).

$I(L^*_{t-1} > 0)$ is a binary indicator function equal to one if the latent low pay propensity is positive and equal to zero otherwise. Stewart and Swaffield (1999) showed that this specification is equivalent to assuming that there exists some monotonic transformation of observed earnings such that the normality assumption holds.

60. Now consider outcomes in the following year (the current year, '*t*') for this sample, taking account of potential non-ignorable attrition and economic item non-response. Suppose that there is a latent panel retention propensity, R^*_t, which is a linear function of observed and unobserved characteristics (analogous to that described above), and observed retention status, R_t, depends on whether this propensity is positive or not:

$$R^*_t = \Psi \boldsymbol{w}_{t-1} + \varepsilon_t, \varepsilon_t \sim N(0,1) \quad \textbf{[5]}$$

$$R_t = I(R^*_t > 0) \quad \textbf{[6]}$$

where $I(.)$ is the binary indicator function, as above. In equation (5), and analogous equations below, year t outcomes are parameterized in terms of base year values of explanatory variables so as to avoid simultaneity between changes in outcomes and changes in attributes.

61. Among the households retained in the panel, a second condition that must be satisfied in order for earnings mobility to be observed, namely being in employment in year *t*. We suppose that there is an employment propensity, E^*_t, that is a linear function of observed and unobserved characteristics, and observed employment status, E_t, depends on whether this propensity is positive or not:

$$E^*_t = \gamma \boldsymbol{h}_{t-1} + \omega_t, \omega_t \sim N(0,1) \quad \textbf{[7]}$$

$$E_t = I(E^*_t > 0) \text{ if } R_t = 1; \text{ unobserved otherwise.} \quad \textbf{[8]}$$

62. For households that drop out of the survey ($R_t = 0$), equation (7) is incidentally truncated.

Finally, there is the mechanism describing low pay status in the current year (L^*_t). In order to characterize low pay transitions, we use a linear index specification again but condition the current year outcome on base year low pay status, thereby defining an endogenous switching regression:

$$L^*_t = [L_{t-1}\,\lambda'_1 + (1-L_{t-1})\,\lambda'_,]z_{t-1} + v_t,\ v_t \sim N(0,1) \quad \textbf{[9]}$$

$$L_t = I(L^*_t > 0) \text{ if } R_t = 1 \text{ and } E_t = 1; \text{ unobserved otherwise.} \quad \textbf{[10]}$$

Equation (9) is incidentally truncated if either $E_t = 0$ or $R_t = 0$. That is, equations (5) and (7) describe two (sequential) selection mechanisms governing whether respondents are in the balanced two-year panel of earners who contribute to the estimation of the low pay transition process.

The combinations of current-year outcomes (R_t, E_t, L_t) that are possible are shown in Cappellari and Jenkins (June 2004:21, Table 2).

We distinguish three groups of households (A, B, and C) with different types of likelihood contribution applicable to each group. The log-likelihood contribution of each household, L, has the form:

$$\log L = (1-R_t)\log L_A + R_t(1-E_t)\log L_B + R_t E_t \log L_C \quad \textbf{[11]}$$

where; L_A, L_B, and L_C are the contributions relevant to households in groups A, B, and C.

Assuming that the unobservables (u_{t-1}, v_t, ε_t, ω_t) have a four-variate standard normal distribution with correlation matrix Σ, then the sample log-likelihood contribution of each household can be written:

$$\log L = (1-R_t)\log \Phi_2(\text{Є}_{\_Lt\_Et};\ \text{Ж}_{\_Lt\_Et}) + R_t(1-E_t)\log \Phi_3(\text{Є}_{\_Lt};\ \text{Ж}_{\_Lt}) + R_t E_t \log \Phi_4(L_{t-1}\,\text{Є}_1 + (1-L_{t-1})\,\text{Є}_2;\ \text{Ж}) \quad \textbf{[12]}$$

where Φ_j denotes the j-variate normal c.d.f., Є_k for $k = 1, 2$, is a vector of index functions, and matrices Ж, $\text{Ж}_{\_Lt\_Et}$, and $\text{Ж}_{\_Lt}$, are derived from Σ. The $\_Lt$ subscript denotes vectors and matrices excluding elements referring to the low pay transition equation, and the $\_Lt\_Et$ subscript denotes vectors and matrices excluding elements referring to the low pay transition equation and to the employment equation.

4.2.2.2. Estimation of Poverty Durations

63. Applying equations [2]; [3]; [5]; [7]; [9]; [11] and [12] we can specify equations for poverty durations.

64. Canto (2000) follows Jenkins (1995) in constructing the likelihood function to maximize for the n-order Markov model by building a discrete-time duration model for non-censored spells. We follow this approach in this paper to determine discrete poverty durations in households. Following Canto, the probability of a non left-censored spell i finishing at moment t given that it survived until t-1 is given as;

$$P_r(T_i > t / T_i > t-1) = P_{it} \prod_{k=h}^{t-1} (1 - P_{ik}) \quad \text{.....[13]}$$

where,

k = the moment when the household is interviewed in the panel and

h = the value of k at which the spell begins. Finally, the probability of a non left-censored spell i lasting longer than t is;

$$P_r(T_i > t / T_i > t-1) = \prod_{k=h}^{t} (1 - P_{ik}) \quad \text{.....[14]}$$

If y_{ik} is a dummy variable, equal to 1 if the household completes a spell at time k

and equal to 0 if the household does not complete the spell at time k or the spell is

censored at time k; then, the log likelihood function to be maximised will be given as;

$$LogL = \sum_{i=1}^{n} \sum_{k=1,h}^{t} \left[y_{ik} (\log P_{ik}) + (1 - y_{ik}) \log(1 - P_{ik}) \right] \quad \text{.....[15]}$$

where,

n = the number of spells and

t = the observed duration of spell i or the moment the event occurs.

The likelihood in equation (15) is always conditional on the household transiting into or out of poverty some time during observation. This model is equivalent to the discrete-state, discrete-time n-order Markov model where the only possible transitions are 1 to 0 or 1 to 1, indicating 1 the poverty (non-poverty) status of the household.

As a result, the probability of suffering an event can be modelled as independent of time as;

$$P_{ik} = Pr(\text{ i not poor at t/ i poor at t-1; } X_{it}, D_{it}, \beta) = F(X_{it}, D_{it}, \beta) \text{ .....[16]}$$

and,

$$P_{ik} = Pr(\text{ i poor at t/ i not poor at t-1; } X_{it}, D_{it}, \beta) = F(X_{it}, D_{it}, \beta) \text{ .....[16*]}$$

Where,

X_{it} = time-varying household characteristics,

D_{it} = the time-varying distance from the poverty line and β is a parameter vector. Thus the model becomes a n-order Markov model with heterogeneity. This is the estimation procedure for models 13 and 14[7].

65. For a first assessment of the change in the probability of a household stepping out of a poverty as the spell evolves in time we specified P_{ik} in a way that it is possible to distinguish between the effect of the *duration of the spell* and the effects of *other covariates*. Thus, the probability of escaping poverty is now specified as;

$$P_{ik} = Pr(\text{ i not poor at t/ i poor at t-1; } X_{it}, D_{it}, d_{it}, \phi) = F(X_{it}, D_{it}, d_{it}, \phi) \text{....[17]}$$

$$P_{ik} = Pr(\text{ i poor at t/ i not poor at t-1; } X_{it}, D_{it}, d_{it}, \phi) = F(X_{it}, D_{it}, d_{it}, \phi) \text{...[17*]}$$

where d_{it} are time-varying dummies for spell duration[8]. Equation (17 or 17*) is plugged into the previous log likelihood expression (equation 15) and assuming a logistic distribution of the error term the likelihood function is maximised with respect to the unknown vector of parameters, ϕ . The model is now a duration dependent n-order Markov process with heterogeneity and is estimated for the sample of both non-poverty and poverty spells in models 15 and 16.

66. Thus, all models are estimated as n-order Markov Chains. Models 14, 15 and 16

[7] Note, however, that in model 1 poverty gap dummies are not included as regressors.

[8] We have inserted duration dummies in the logit regression. Dummy variables take the value 1 if the spell has exactly a given length (3, 6, 9, 12, 15, 18, 21 or 24 months) and the value 0 otherwise (e.g. if the dummy variable "spell length 3 months" is equal to 1 in spell i then spell i is three months long and if it is equal to 0 then spell i is of any other length).

include dummies for the distance between household equivalent income and the poverty line. Their results are conditional on the household's position with respect to the poverty line just before or after exit: given the point in the income distribution where the household is before leaving poverty or has jumped to when exiting poverty, what are the household characteristics that determine an exit or a re-entry into poverty? Models 15 and 16 include dummies for the time the household spends in or out of poverty just before or after an exit as explanatory variables for the exit and re-entry hazard and drop some insignificant regressors. The included duration dummies attempt to measure the degree of duration dependence of the probability of leaving or returning to poverty given that, according to some determined non-parametric hazard rates (to be provided), the longer a household remains either in or out of poverty the less likely it will be either to leave it or to return to it, respectively.

5. Conclusion

67. This paper has generated a discussion on how to measure dynamics of poverty for both poverty monitoring purposes and for designing poverty reduction policies and programmes by the Zambian Government.

68. The paper acknowledges the presence of massive literature on poverty dynamics and has outlined the statistical resources that are available in Zambia. However, the overview of the nature of the Zambian statistical resources could be extended to other countries in the Southern African region.

69. This paper recommends a simultaneous equation logit model system to the application of the Zambian poverty dynamics studies. The model estimates both poverty duration and transitional factors. The model measures the magnitudes and dynamics of the extent to which sex of a household; income status of a household; employment status; health status; educational background; access to ICT; and geographic location, among others, could impact on household poverty exit.

References

Ahluwalia, M. (1976), ' Inequality, Poverty and Development', *Journal of Development Economics,* 3:307-342

Ahluwalia, M., N. Carter and H. Chenery (1979), 'Growth and Poverty in Developing Countries', *Journal of Development Economics*, 6: 299-341

Ali, Abdel Gadir Ali (1998), ' Dealing with Poverty and Income Distribution Issues in Developing Countries: Cross-regional Experiences' , *Journal of African Economies*, Vol. 7 , Supplement 2, pp. 77-115.

Allison, Paul D.(1984) *Event History Analysis.* A Sage University Paper. (Newbury Park: Sage Publications).

Anand, S. and R. Kanbur (1993a), 'Inequality and Development: A Critique', *Journal of Development Economics*, 41:19-43

-------(1993b), 'The Kuznets Process and the Inequality – Development Relationship', *Journal of Development Economics*, 40:25-52

Bane, Mary Jo, and David, Ellwood (1986) "Slipping Into and Out of Poverty: The Dynamics of Spells," *Journal of Human Resources*, 21, 1-23.

Becker, Gary, *Human Capital*. 2nd Ed., Chap. 2 (New York: Columbia University Press, 1975)

Blank, Rebecca M.(1997) *It Takes a Nation: A New Approach to Fighting Poverty.* New York: Princeton University Press, Russell Sage Foundation.

Canto Olga (2000), 'Climbing Out of Poverty, Falling back in: Low Incomes' Stability in Spain', *Journal of Economic Literature* Classification, D1, D31, I32

Cappellari, L., and S. Jenkins (2004) "Modelling Low Income Transitions," *Journal of Applied Econometrics*, 19, 593-610.

----------(June 2004), "Modelling Low Pay Transition Probabilities,

Accounting For Panel Attrition, Non-Response, And Initial Conditions", *Institute of Social and Economic Research Working Paper,* Number 2004-08, UK

Central Statistics Office (CSO), *The Evolution of Poverty in Zambia*: *1991-1996*, December 1997

_____, *Living Conditions Monitoring Survey Report*: *2002-2003*, November 2004.

Datt, G. and M. Ravallion (1992) 'Growth and Redistribution Components of Changes

in Poverty Measures: a decomposition with applications to Brazil and India in the 1980s', *Journal of Development Economics*, 38 (2).

Dornbusch, Rudiger and Stanley Fischer (1990) *Macroeconomics.* 5th Ed. (New York: McGraw-Hill).

Duncan, Greg J. (1984) *Years of Poverty, Years of Plenty.* (Ann Arbor: Institute for Social Research, The University of Michigan).

Duncan, Greg J. and Willard Rodgers (1991) "Has Children's Poverty Become More Persistent?" *American Sociological Review.* Vol. 56, No. 4, 538-550.

Duncan, Greg J. and Willard Rodgers (1988) "Longitudinal Aspects of Childhood Poverty," *Journal of Marriage and the Family,* Vol. 50, Issue. 4, November, 1007-1022.

Ehrenberg, Ronald G. and Robert S. Smith (1991), *Modern Labor Economics*, 4th edition. (New York: Haper Collins Publishers Inc.).

Eller, T. J. (1996) "Who Stays Poor? Who Doesn't?" Current Population Reports. *Dynamics of Economic Well-Being: Poverty 1992-1993*.

Fouarge, Didier and Muffels, Ruud (2000) 'Persistent Poverty in the Netherlands, Germany and the UK: A model-based approach using panel data for the 1990s'. *OSA-Working paper* WP2000- 4.

Hausman, J. and Wise, D. (1979) "Attrition bias in experimental and panel data: the Gary Income Maintenance Experiment". *Econometrica*, **47**, 455–473.

Iceland, John (1997b) "Urban Labor Markets and Individual Transitions out of Poverty," *Demography,* Vol. 34, No. 3 August, 429-441.

Jenkins, S. (2000) "Modelling Household Income Dynamics," *Journal of Population Economics*, 13, 529-567.

Jesuit Centre for Theological Reflection (JCTR), *The JCTR Basic Needs Basket: A comprehensive Overview*, Report, February 2005

Kakwani, N. (1993) 'Measuring Poverty: Definitions and Significance Tests with Applications to Cote d'Ivoire', in M. Lipton and J. Van der Gaag (eds), *Including the Poor.* Washington, DC: World Bank.

Keane, M., Moffitt, R. and Runkle, D. (1988) "Real wages over the business cycle: estimating the impact of heterogeneity with micro-data". *Journal of Political Economy*, **96**, 1232–1266.

Kuznets, S. (1995), ' Economic Growth and Income Inequality', *American Economic Review*, 45(1), pp.1-28

MacRae, Elizabeth Chase (1977), 'Estimation of Time-varying Markov Processes with Aggregate Data', *Econometrica,* vol.45, No. 1, January, pp. 183-198.

Lewis, Oscar, *La Vida*. (London: Panther Books, 1968).

Lillard, L., and R. Willis (1978) "Dynamic Aspects of Earnings Mobility,» *Econometrica*, 46, 985-1012.

Naifeh, Mary (1998) "Trap Door? Revolving Door? Or Both?" Current Population Reports. Dynamics of Economic Well-Being: Poverty 1993-1994. http://www.census.gov/hhes/www/poverty.html

Rank, Mark and Thomas Hirschl (1999a) "Estimating the Proportion of Americans Ever Experiencing Poverty During their Elderly Years" *The Journals of Gerontology*, Vol. 54B, Issue 4, S184-194.

Rank, Mark and Thomas Hirschl (1999b) "The Likelihood of Poverty across the American Adult Life Span," *Social Work*, Vol. 44, No. 3, May 201-216.

Ravallion, M., G. Datt and van de Walle (1991) 'Quantifying Absolute Poverty in the Developing World', *Review of Income and Wealth*, 37 (4): 345-61.

Ruggles, Patricia (1990) *Drawing the Line: Alternative Poverty Measures and Their Implications for Public Policy.* (Washington, DC: The Urban Institute Press).

Ruggles, Patricia and Robert Williams (1987) "Transitions In and Out of Poverty: New Data from the Survey of Income and Program Participation," U.S. Department of Commerce, Bureau of the Census, No. 8716, December.

Schiller, Bradley (1976) *The Economics of Poverty and Discrimination.* 2nd ed. (Englewood Cliffs, NJ: Prentice-Hall).

Shorrocks, A.F. (1982), 'Inequality Decomposition by Factor Components, *Econometrica,* Vol. 50, No. 1, January, pp. 193-211.

Stevens, Ann Huff (1994) "The Dynamics of Poverty Spells: Updating Bane and Ellwood", *AEA Papers and Proceedings*, Volume 84, No. 2, May 1994, 34-37.

Stevens, A. (1999) "Climbing Out of Poverty, Falling Back in: Measuring the Persistence of Poverty over Multiple Spells," *Journal of Human Resources*, 34, 557-588.

Stewart, M.B. and Swaffield, J.K. (1999) 'Low pay dynamics and transition probabilities". *Economica*, **66**, 23–42.

Zabel, J.E. (1998) "An analysis of attrition in the Panel Study of Income Dynamics and Survey of Income and Program Participation with an application to a model of labor market behaviour". *Journal of Human Resources*, **33**, 479–506.

Appendices

Appendix 1: Selected Macroeconomic Indicators; 1994-2002

	1994	1995	1996	1997	1998	1999	2000	2001	2002
GDP (current prices) K'billion	2240.1	3005.1	3950.2	5140.2	6027.9	7477.7			
GDP(constant prices)K'billion	2240.1	2176.9	2404.9	2360.2	2412.7	2499	2499	2621.3	2707.9
Per Capita GDP at current prices (K'000)	256	330	418	526	597	733	978	1245	1505
Per Capita GDP at Constant 1994 prices K'000	256	239	246	246	233	236	242	248	251
GDP growth Rate(1994=100)		-2.8	6.9	3.3	-1.9	2.2	3.6	4.9	3.3
Percentage contribution to GDP (1994=100)									
Agriculture	13.5	18.5	17.2	15.8	16.3	17.5	17.2	16	15.2
Mining	16.5	12.4	12	11.8	9	6.6	6.4	7	7.9
Manufacturing	9.8	10	9.9	10.1	10.5	10.5	10.5	10.4	10.7
Electricity	3.2	3.3	2.9	2.9	3	3	2.9	3.1	2.9
Construction	5	4.9	4.1	5.1	4.8	4.8	4.9	5.3	6
Wholesale & Retail Trade	14.8	13.6	17	17.2	18.1	18.5	18.3	18.4	18.7
Hotels, Bars and Restaurant	1.6	1.7	1.8	1.8	1.9	1.8	1.9	2.3	2.3
Transport and Communication	6	5.7	5.8	5.6	6.2	6.4	6.3	6.2	6.1
Financial Institutions and Insurance	8.2	10	8.6	8.3	8.5	8.6	8.2	7.8	7.9
Real Estate and business Services	5	5.3	6.1	6.6	7.6	8.4	9.5	9.4	9.5
Community, social and personal services	8	8.1	7.8	7.6	7.6	8	7.7	7.8	7.7
Taxes on products	12.9	12	11.9	11.9	11.5	10.7	10.9	11.1	10
GDP at market prices	100	100							
Exchange Rate (Kwacha/US$)	687.2	878.3	1213.1	1321.3	1765.9	2417.3	3170.8	3581	4384.8
Inflations (%)	38.3	46	35.2	18.6	30.6	20.6	30.1	18.7	26.7

Source: Central Statistics Office(2004):p.2

Appendix 2: Population's Occupational Characteristics

Table 2.1- Percentage distribution of the population aged 12 and above

Sex/residence/stratum/province	Labour force		Inactive Population			
	Employed	Unemployed	FT-Student	Retired/ Too old	other	Total #
All Zambia	59	11	27.4	1.5	1	5,814,389
Sex						
Male	58.6	10.5	28.9	1.1	0.9	3,023,301
Female	59.5	11.6	25.8	2	1.1	2,791,088
Residence						
Rural	69.3	3.7	24.9	1.3	0.8	3,665,662
Urban	41.5	23.5	31.8	1.9	1.3	2,148,727
Stratum						
Small Scale Farmers	69.6	3.4	25	1.3	0.7	3,418,188
Medium Scale Farmers	62.4	2.3	34	0.8	0.5	61,759
Large Scale Farmers	64.9	0.7	34.3	0	0	2,964
Non-Agricultural	65.9	10	20.1	1.7	2.3	182,751
Low Cost areas	41.9	25	29.8	1.8	1.5	1,637,943
Medium Cost Areas	38.3	19.6	39.3	2.2	0.6	234,298
High Cost Areas	41.9	18.2	37.1	2.1	0.7	276,486
	Employed	Unemployed	FT-Student	Retired/Too old	other	Total #
Central	63.3	8.4	25.8	1.4	1.2	607,975
Copperbelt	43.1	24.2	29.5	2	1.3	981,750
Eastern	74.5	3.1	20.4	1.4	0.6	798,962
Luapula	66.6	4.9	25.1	2.2	1.2	447,027
Lusaka	43.8	22.5	30.6	1.9	1.3	838,715
Northern	67	3.8	27.5	0.7	1	721,345
North-Western	61.3	6.6	29.5	1.6	1	347,653
Southern	58.1	6.7	33.5	1.3	0.5	638,744
Western	68.8	5.4	24	1.2	0.7	432218

Source: CSO, LCMS III 2002/03, p58

Appendix 3: LCMS III Data

Table 3.1- Population Distribution by Province, Rural and Urban, Zambia, 2002-2003

		Percentage Distribution	
Province	Population	Rural	Urban
Zambia	**10,757,192**	**65**	**35**
Central	1,097,632	76	24
Copperbelt	1,707,843	20	80
Eastern	1,440,604	91	9
Luapula	852,351	85	15
Lusaka	1,496,428	19	81
Northern	1,371,234	87	13
North Western	637,112	87	13
Southern	1,335,538	78	22
Western	818,450	89	11

Source: CSO (2004):Living Conditions Monitoring Survey, p.13

Table 3.2- Population Distribution by Age and Sex, Zambia, 2002-03

Age Group	Male	Female	Total	Population
0-4	15.2	15.2	15.2	1,636,545
5-9	16.2	15.7	16	1,716,303
10-14	14.9	14.3	14.6	1,567,625
15-19	11.8	12	11.9	1,279,827
20-24	9.2	9.8	9.5	1,022,463
25-29	7.2	7.7	7.5	804,830
30-34	6.3	6	6.1	661,114
35-39	5	4.5	4.7	509,183
40-44	3.6	3.5	3.5	379,479
45-49	2.7	3.1	2.9	309,416
50-54	2.1	2.2	2.2	233,609
55-59	1.4	2	1.7	181,987
60-64	1.4	1.5	1.4	155,681
65+	3	2.6	2.8	299,130
Total	100	100.1	100	10,757,192

Source: CSO (2004):Living Conditions Monitoring Survey, p.15

Table 3.3- Population Distribution by Strata, Zambia, 2002-2003

Residence	Stratum	Percentage Distribution	Total Population
Rural	small scale	60.7	6,533,086
	medium scale	1.1	118,906
	large scale	Ng*	5,053
	non agriculture	3.2	349,563
Urban	low cost	27.2	2,928,775
	medium cost	3.6	392,373
	high cost	4.0	429,436
Total		100	10,757,192

Table 3.4 -Percentage Distribution of the Population Aged 12 years and Above by Rural/Urban and marital status, Zambia, 2002-03

			Marital Status			
Sex	Never Married	Married	Separated	Divorced	Widowed	Total
Zambia	46.9	43.1	1.1	3.8	5.1	100
Male	52.9	43.1	0.6	1.8	1.6	100
Female	41.2	43	1.5	5.7	8.5	100
Total						
Age Group	Never Married	Married	Separated	Divorced	Widowed	Total
12-14	98.6	1.3	0.1	0	0	100
			Marital Status			
Sex	**Never Married**	**Married**	**Separated**	**Divorced**	**Widowed**	**Total**
15-19	91.6	7.7	0	0.4	0.1	100
20-24	62.3	33.1	1.3	2.7	0.5	100
25-29	30.5	60.4	1.9	5.3	1.8	100
30-49	7.4	77.3	1.7	6.5	7.1	100
50+	1.3	66	1.1	7.5	24.2	100
Male						
Age Group	Never Married	Married	Separated	Divorced	Widowed	Total
12-14	98.8	1	0.1	0	0	100
15-19	98.1	1.7	0	0.1	0	100
20-24	81.1	17.9	0.2	0.6	0.1	100
25-29	41.9	54.2	1.2	2.2	0.5	100
30-49	9.9	83	1.1	3.8	2.3	100
50+	1.6	87.4	0.9	3.4	6.7	100
Female						

			Marital Status			
Sex	Never Married	Married	Separated	Divorced	Widowed	Total
Age Group	Never Married	Married	Separated	Divorced	Widowed	Total
12-14	98.3	1.6	0	0	0	100
15-19	85.3	13.4	0.4	0.7	0.1	100
20-24	45.1	47.1	2.3	4.7	0.9	100
25-29	20.2	66	2.6	8.1	3	100
30-49	5	71.8	2.3	9.2	11.7	100
50+	1	44.2	1.3	11.6	41.9	100

Appendix 4: Empirical Studies on Poverty Dynamics

Table 4.1. First-Order Markov Model: Examples of Models of Labour Market Dynamics with Endogenous Selection

		Endogenous selection issues addressed?			
Paper	**Outcome of interest**	**Attrition***	**Economic item non-response**	**Survey item non-response**	**Initial conditions**
Hausman and Wise (1979)	Earnings	x			
Keane et al. (1988)	Wages		x		
Zabel (1998)	Wages, work hours	x	x		
Stewart and Swaffield (1999)	Low pay transitions				x
Cappellari and Jenkins (2004)	Low income transitions	x			x
Cappellari and Jenkins (June 2004)	Low pay transitions	x	x		x

Source: Cappellari and Jenkins (June 2004: p.21)

* Attrition is defined as sample drop-out or survey item non-response on income.

Table 4.2: Spell or Hazard Models: Summary of Empirical Poverty Transitions Literature.

Study	Data*	Years	Primary Sample Studied	Research Question(s) Addressed
Bane and Ellwood (1986)	PSID	1970-1982	Persons Under Age 65	Exits, Events
Blank (1997)	PSID	1979-1991	Total U.S.	Events
Duncan and Rodgers (1988)	PSID	1968-1982	Children	Events
Eller (1996)	SIPP	Oct. 1991 - Apr. 1994	Total U.S.	Exits, Events
Iceland (1997b)	PSID	1970-1985	Adults Ages 18-64 in Metropolitan Areas	Exits, Events
Naifeh (1998)	SIPP	Oct. 1992 - Dec. 1995	Total U.S.	Entries, Exits
Rank and Hirschl (1999a)	PSID	1968-1992	Adults Ages 60-90	Entries
Rank and Hirschl (1999b)	PSID	1968-1992	Adults Ages 20-85	Entries

Study	Data*	Years	Primary Sample Studied	Research Question(s) Addressed
Ruggles (1990)	CPS, SIPP	1984	Total U.S.	Entries
Ruggles and Williams (1987)	SIPP	1983-1984	Total U.S.	Entries
Stevens (1994)	PSID	1970-1987	Total U.S.	Exits, Reentries
Stevens (1999)	PSID	1967-1988	Total U.S.	Exits, Reentries

Source: Bane and Ellwood (1986: Chpt 2.)

* Data used in the studies include: PSID = Panel Study of Income Dynamics; CPS = Current Population Survey

SIPP = Survey of Income and Programme Participation.

Table 4.3: Year t outcome combinations and the treatment of item non-response on pay

Group	Retention	Employment	Low Pay	Interpretation
A	Rt = 0	Unobserved	Unobserved	Panel attrition
B	Rt = 1	Et = 0	Unobserved	Retained; OLF/U/SE*
C	Rt =1	Et = 1	Lt =0	Retained; High-paid employee
C	Rt = 1	Et = 1	Lt = 0	Retained; Low-paid employee

Source: Cappellari and Jenkins (June, 2004), p.21

Notes: *: out of labour force or unemployed or self-employed. Year t-1 sample: men with E_{t-1} =1 and no non-response on L_{t-1}. Year t sample, Model 1: men with E_t =1 but non-response on L_t excluded from estimation. Year t sample, Model 2: men with E_t = 1 but non-response on L_t included as cases with R_t = 0.