# Risk, Risk Management and Vulnerability to Poverty in Rural Malawi

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## ABSTRACT

Vulnerability to poverty in Malawi is highly associated with risk. Rural households face multiple shocks, most of which threaten their livelihoods and impact negatively on their welfare. This study investigates three inherently interconnected issues: vulnerability to poverty; risk management strategies; and consumption smoothing. The central research issue is on understanding the role of risk in household vulnerability and poverty. Using a two-period panel dataset of 259 households in rural Malawi, the study addresses three objectives: First, to identify the determinants of vulnerability in rural Malawi. Second, to analyze households' coping mechanisms for different shocks and identify the determinants of these mechanisms. Third, to test for the existence of household consumption smoothing as an insurance mechanism against idiosyncratic shocks.

The panel dataset used in the study was derived from the 2004 second Malawi Integrated Household Survey (IHS2) from which 259 households were sampled and followed up in 2006 with a similar questionnaire. Vulnerability was modelled as expected poverty using Christiaensen and Subbarao (2004) methodology to investigate the extent to which rural households in Malawi are vulnerable to poverty. The results show that in 2004 the sampled households had an average chance of 44 percent of falling into poverty in 2006 and around 21 percent of the non-poor in 2004 were vulnerable to poverty in 2006. Further, female-headed households appear to be more vulnerable than their male counterparts. Education, land holdings and running a non-farm income generating activity in the household reduce household vulnerability. Community infrastructures such as health clinics and access to markets have vulnerability-reducing effects. These correlates of vulnerability are extremely similar to the correlates of poverty among the sampled households. Both covariate and idiosyncratic shocks are felt more by the vulnerable households. The results further show that vulnerability among the studied households is exacerbated by low average consumption levels more than consumption volatility.

The determinants of risk management strategies were analyzed using a multinomial logistic regression model. The results have shown that drought, rising food prices and

illness are among the major shocks that the sampled households face, with crop diversification being used as an *ex-ante* risk management strategy. *Ex-post* coping strategies take the form of safety net programs, use of household assets and getting support from social networks, among others. The major determinants of the choice of the *ex-post* coping strategy among the studied households include the size of the household, the number of economically active individuals in the household, per capita landholdings, ownership of livestock, access to markets and the type of shocks that households face.

Consumption smoothing was analyzed using a household asset index due to unavailability of household income data. A test for consumption smoothing was then run by considering the impact of changes in the household asset index between 2004 and 2006 on changes in consumption. The results, which are robust to measurement error in consumption expenditure, show that the studied households try to protect their consumption from shocks, with food consumption being protected more than non-food consumption. Further, poor households tend to protect their food consumption more than the non-poor households. However, the study found no evidence of perfect consumption smoothing.

The major policy implications are that poverty reduction programmes would be more effective in rural Malawi if they do not only incorporate the currently poor but also the vulnerable. Since the study has shown that the main source of vulnerability appears to be low mean consumption levels among the studied households, social protection programmes that take the form of productivity-enhancing safety nets, targeting not only the poor but also the vulnerable would be effective to help them cope with shocks and increase household mean consumption levels. Programmes that help rural households to accumulate assets are also needed to help them cope with shocks. Further, promotion of small and medium scale irrigation schemes as well as the use of weather insurance, as a means of reducing the costs associated with crop failure, could be effective in dealing with the major covariate shock, drought.

**Keywords**: poverty, vulnerability, shocks, risk management, rural Malawi.

# KURZFASSUNG

Die Verwundbarkeit in Armut zu fallen in Malawi ist stark mit Risiken verbunden. Ländliche Haushalte sind mit einer Vielzahl von Schocks konfrontiert, von denen die meisten den Lebensunterhalt der Haushalte gefährden und ihre Wohlfahrt negativ beeinflussen. Diese Studie untersucht drei inhärent miteinander verbundene Themen: Verwundbarkeit in Armut zu fallen, Risikomanagementstrategien und Konsumglättung. Das zentrale Forschungsthema ist das Verstehen der Rolle von Risiko in Bezug auf Armut und Verwundbarkeit. Die Studie hat drei Zielsetzungen, die mit HIlfe eines zwei-periodischen Panel-Datensatz von 259 Haushalten im ländlichen Malawi verfolgt werden. Erstens, die Identifizierung der bestimmenden Faktoren der Verwundbarkeit in Armut zu fallen im ländlichen Malawi. Zweitens, die Analyse der Bewältigungsmechanismen für unterschiedliche Schocks und die Identifizierung der bestimmenden Faktorenen dieser Mechanismen. Drittens, die Untersuchung der Anwendung von Konsumglättung der Haushalte als Versicherungsmechanismus gegen idiosynkratische Schocks.

Der in der Studie verwendete Datensatz wurde aus der zweiten integrierten Haushaltsbefragung (Integrated Household Survey 2) in Malawi aus dem Jahr 2004 abgeleitet, in der 259 Haushalte im Jahr 2006 mit einem ähnlichen Fragebogen befragt wurden. Mittels der Methodik von Christiaensen und Subbaro (2004) wurde die Verwundbarkeit zur Armut als geschätzte Armut modelliert, um zu untersuchen, in welchem Ausmaß ländliche Haushalte in Malawi verwundbar sind, in Armut zu fallen. Ergebnisse aus dem Jahr 2004 zeigen, dass die befragten Haushalte eine Wahrscheinlichkeit von 44 v.H. hatten, im Jahr 2006 in Armut zu fallen und ca. 21 v.H. der Nicht-Armen im Jahr 2004 verwundbar waren im Jahr 2006 in Armut zu fallen. Außerdem scheint es, dass die von Frauen geführten Haushalte verwundbarer als die von Männer geführten Haushalte waren. Building, Grundbesitz und das Betreiben von anderen nicht landwirtschaftlichen Aktivitäten, die Einkommen erzeugen, können allerdings die Verwundbarkeit in Armut zu fallen der Haushalte dadurch reduzieren, dass der durchschnittliche Zukunftskonsum erhöht wird. Darüber hinaus tragen Infrastrukturen in den Gemeinden wie Krankenstationen und Marktzugang dazu bei, die Verwundbarket in Armut zu fallen zu reduzieren. Diese Zusammenhänge bezüglich der Verwundbarkeit

sind ähnlich den Zusammenhängen bezüglich der Armut unter den befragten Haushalten. Die verwundbaren Haushalte spürten kovariate und idiosynkratische Schocks stärker. Weitere Ergebnisse zeigen, dass die Verwundbarkeit unter den untersuchten Haushalten stärker durch ein niedriges durchschnittliche Konsumsniveau als durch Konsumvolatilität verschlimmert wurde.

Mittels eines Multinomialen Logit Models wurden die bestimmenden Faktoren der Risikomanagementstrategien analysiert. Die Untersuchungsergebnisse zeigen, dass Dürre, Erhöhung der Nahrungsmittelpreise und Erkrankung zu den Hauptschocks zählen, mit denen die befragten Haushalte konfrontriert worden sind, wobei die Diversifizierung von Agrarprodukten als ex-ante Risikomanagementstrategie verwendet wurde. Ex-post Bewältigungsstragegien sind Sicherungsnetz-Programme, die Verwendung von Haushaltsvermögen und die Unterstützung durch soziale Netwerke. Die bestimmenden Faktoren für die Auswahl der ex-post Bewältigungsstrategie unter den untersuchten Haushalten umfassen die Haushaltsgröße, die Anzahl der ökonomisch aktiven Individuen im Haushalt, der Pro-Kopf Grundbesitz, der Besitz von Viehbestand, der Zugang zu Märkten und die Art von Schocks, mit denen die Haushalte konfrontiert sind.

Wegen der Nichtverfügbarkeit der Haushaltseinkommendaten wurde die Konsumglättung mittels des Haushaltsvermögensindex analysiert. Der Test für die Konsumglättung wurde dann mit Rücksicht auf den Einfluss der Änderungen im Haushaltsvermögensindex zwischen den Jahren 2004 und 2006 an Konsumänderungen durchgeführt. Die Ergebnisse, die robust gegenüber Messfehlern bezüglich Konsumausgaben sind, zeigen, dass die untersuchten Haushalte versuchen, ihren Konsum gegen Schocks zu schützen. Dabei wird allerdings der Lebensmittelkonsum mehr geschützt als der Nichtlebensmittelkonsum. Zudem tendieren arme Haushalte stärker dazu, ihren Lebensmittelkonsum zu schützen, als nicht-arme Haushalte. Die Studie fand allerdings keinen Beweis für eine vollständige Konsumglättung.

Die wichtigsten politischen Schlussfolgerungen sind, dass Armutbekämpfungsprogramme im ländlichen Malawi effektiver wären, wenn diese

Programme nicht nur die jetzigen Armen berücksichtigen, sondern auch verwundbare Haushalte. Da die Studie gezeigt hat, dass die Quelle der Verwundbarkeit ein niedriges durchschnittliches Konsumsniveau unter den untersuchten Haushalten zu sein scheint, wären soziale Schutzprogramme, in Form von produktivitätssteigenden Sicherungsnetzen, die nicht nur die Armen berücksichtigen sondern auch die Verwundbaren, effektiver, um Haushalten zu helfen, Schocks zu bewältigen und das durchschnittliche Konsumniveau zu erhöhen. Programme, die ländliche Haushalte unterstützen, Vermögen zu akkumulieren, werden ebenfalls benötigt, um ihnen dabei zu helfen, Schocks zu bewältigen. Des Weiteren könnten die Förderung kleiner und mittelgroßer Bewässerungssysteme sowie die Nutzung von Regenversicherungen als Mittel zur Reduzierung der durch Ernteausfall verursachten Kosten wirkungsvoll sein, den bedeutensten kovariate Schock, Dürre, zu bewältigen.

**Schlüsselwörter:** Armut, Verwundbarkeit, Schocks, Risikomanagement, ländliches Malawi

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AHM | Agricultural Household Model |
| AIDS | Acquired Immunodeficiency Syndrome |
| COICOP | Classification of Individual Consumption According to Purpose |
| EA | Enumeration Area |
| GDP | Gross Domestic Product |
| HIV | Human Immunodeficiency Virus |
| ICRISAT | International Crops Research Institute for the Semi-Arid Tropics |
| IHS1 | Malawi First Integrated Household Survey |
| IHS2 | Malawi Second Integrated Household Survey |
| LSMS | Living Standards Measurement Study |
| MASAF | Malawi Social Action Fund |
| MDGs | Millennium Development Goals |
| MEGS | Malawi Economic Growth Strategy |
| MGDS | Malawi Growth and Development Strategy |
| MK | Malawi Kwacha |
| MPRSP | Malawi Poverty Reduction Strategy Paper |
| MVAC | Malawi Vulnerability Assessment Committee |
| NSO | Malawi National Statistical Office |
| UN | United Nations |
| WFP | World Food Program |
| WHO | World Health Organization |

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# DEDICATION

*To my loving wife, Lucy, for the encouragement and support.*

# Chapter 1

# INTRODUCTION

## 1.1 Introduction

Poverty in Malawi remains widespread. According to the 2004 Malawi Integrated Household Survey, 52 percent of the total population is poor, with 22 percent of the total population living in extreme poverty. The poverty situation in Malawi is exacerbated by the country's little capacity to reduce or mitigate the effects of different types of risks faced by households due to both micro and macro factors. At the household (or micro) level, poverty levels remain unbearably high, formal insurance hardly exists, credit markets are usually imperfect and can only reach a minority of the population, and social safety nets are inadequate. At the macro (or national) level, social protection (generally defined as public measures to provide income security for individuals) is hampered by inadequate government resources, and the economy's dependence on rain-fed agriculture. The agricultural sector remains the backbone of the economy, contributing about 90 percent of export earnings, 45 percent of the gross domestic product (GDP) and supporting about 90 percent of the population (World Bank, 2004).

The poor in Malawi are subjected to different types of risks, most of which threaten their livelihoods and their own existence. Risks are important determinants of poverty due to their effect on households' livelihoods. The majority of the poor are subsistence farmers, depending on rain-fed agriculture. As such, droughts and floods are among the greatest risks that continue to impact negatively on their welfare due to the substantial losses of income, consumption and wealth when these shocks occur. It is obvious that the extent to which these shocks affect households' welfare depend on the households' *ex-ante* risk reduction strategies, as well as their *ex-post* coping strategies. It is therefore logical that an assessment of the dynamics of poverty in Malawi should incorporate a thorough understanding of risks and shocks that households face, and the mechanisms used to cope with such shocks, both *ex-ante* and *ex-post*.

A deeper understanding of the linkages between risk, vulnerability and poverty would provide an empirical basis for social policy, thereby strengthening both the analytical and operational content of the Malawi poverty reduction programmes. The risk and vulnerability analysis are key to understand the dynamics leading to, and perpetuating, poverty. The current study would therefore provide a dynamic approach on what can be done to help the current poor rise out of poverty and to reduce the likelihood of the vulnerable from falling into poverty in Malawi. It endeavours to identify not only the determinants of household vulnerability, but also the determinants of different risk management strategies that are employed by households in the presence of shocks. Further, the study will also attempt to validate the existence of consumption smoothing behaviour as an insurance mechanism among the rural population, as advocated in the literature (see Dercon and Krishnan (2000), Skoufias (2002) and Harrower and Hoddinott (2002)).

## 1.2 Problem Statement

The Government of Malawi, with the support of the international community, has been undertaking poverty assessments, which were incorporated in the Malawi Poverty Reduction Strategy Paper (MPRSP) of 2002, and the recent Malawi Growth and Development Strategy (MGDS) for 2006-2011. However, such poverty analyses only focus on the levels and the distribution of welfare in a specific (static) context and provide a profile of the characteristics of the poor. They are less disposed toward informing about the underlying processes that contributed to the observed levels of poverty or to clarify the reasons for poverty persistence (Hoogeveen *et al.*, 2003). In order to fully understand the dynamics of poverty, there is need to incorporate factors that explain the dynamics of wealth and poverty. One such factor is risk, which needs to be incorporated in the analytical mix to adequately understand the dynamics by which households move in and out of poverty or remain chronically poor.

Furthermore, poverty reduction programmes in Malawi are not sufficient to reduce levels of poverty, (thereby contributing towards achieving the Millennium Development Goals (MDGs)), because they are only based on *ex-post* measures of poverty. The country's

poverty programmes are based on national poverty assessments, which provide detailed profiles of the poor and document the incidence of poverty in various segments of the population. However, the fact that today's poor may or may not be tomorrow's poor implies that policies to effectively address poverty must be forward looking (*ex-ante*). In such forward-looking anti-poverty interventions what really matters is the *vulnerability* of households to poverty, i.e. the *ex-ante* risk that a household will, if currently non-poor, fall below the poverty line, or if currently poor, remain in poverty.

The analysis of risk and vulnerability in Malawi is the entry point of the study. Vulnerability begins with a notion of risk, and the study, therefore, focuses on the role of risk in the dynamics of poverty and the strategies households use to address the exposure to various sources of risk, taking into account the informal and formal mechanisms of risk reduction, risk mitigation and the coping strategies available to households. This risk and vulnerability analysis will illuminate the link between risk and poverty and attach more meaning to the notion of vulnerability in the Malawian context.

### 1.3 Research Objectives

The general objective of the study is to undertake an operational risk and vulnerability analysis at household level in Malawi. Specifically, the study has the following objectives:

1. To identify the determinants of household vulnerability in rural Malawi;
2. To analyze households' coping mechanisms for different shocks and identify the determinants of these mechanisms;
3. To test for the existence of household consumption smoothing as an insurance mechanism against idiosyncratic shocks.

### 1.4 Research Questions

In line with the above objectives, the central research question is 'what is the role of risk in influencing households' vulnerability to poverty in rural Malawi?' This would be answered by considering the following sub-questions?

*1. How vulnerable are rural households in Malawi?*

2. *What are the sources of vulnerability?*

   The objective is to identify key risks and shocks (both idiosyncratic and covariate), their severity, and their impact on households in Malawi.

3. *How do households cope with risk and vulnerability?*

   The study will analyse major *risk prevention strategies* (*ex-ante* risk management), *risk mitigation strategies* (*ex-ante* risk management), and *risk coping strategies* (*ex-post* risk management) employed by households in Malawi. The study will further seek to understand the determinants of these different risk management strategies.

4. *How effective are household coping mechanisms in smoothing household consumption? Is there any evidence of consumption smoothing among the households in rural Malawi?*

   This would be addressed by running a fixed-effect model to control for any unobserved characteristics in the two-period panel dataset used in the study.

## 1.5 Thesis Outline

The thesis proceeds as follows: after this introduction, chapter 2 provides a review of the literature on the main issues that are addressed in this study- vulnerability to poverty, risk management strategies, and consumption smoothing. Chapter 3 presents the theoretical and conceptual framework that is guiding the study, which is followed by a brief introduction to the Malawi economy in chapter 4. It will also include a section on sources of data that were used in the study, including the sampling techniques employed. Chapter 5 presents the poverty profiles in Malawi that were undertaken using the Malawi Second Integrated Household Survey (IHS2) data. The same chapter will also outline the livelihood profiles of the districts from which primary data were collected, after which the determinants of household vulnerability will be dealt with (chapter 6). Chapter 7 provides an exposition of the determinants of different risk management strategies, both *ex-ante* and *ex-post*, that rural residents use in the face of different shocks. It will be followed by a chapter on consumption smoothing. This chapter particularly considers

whether there is any evidence in the data that consumption smoothing was taking place in the sampled areas. Chapter 9 will conclude the whole discussion and offer some policy implications arising from the results of the study.

# Chapter 2
# REVIEW OF LITERATURE

## 2.1 Introduction

In most of the developing countries, households live in environments that are characterized by risk. In particular, in economies where the majority are dependent on rain-fed agriculture for their livelihood, like most of the Sub-Saharan African countries, such households are particularly vulnerable to natural shocks such as drought or floods. Household welfare is significantly reduced not only as a direct result of these shocks, but also as a consequence of the costly measures used by households to protect consumption from such shocks (Kochar, 1995). There is a vast set of literature that addresses the relationship between risk and vulnerability, especially among low-income households. In particular, researchers have focused on the formal and informal arrangements that households use to insure their consumption from shocks and the extent to which these instruments are effective in smoothing household consumption.

This chapter reviews some theoretical and empirical literature on the three topics that are covered in this study: vulnerability to poverty, risk management strategies and consumption smoothing. The chapter proceeds as follows: Section 2 describes the concept of vulnerability from different disciplines. This is followed by a section that reviews some literature on vulnerability to poverty, including different methodological approaches to measuring vulnerability. Sources of vulnerability are presented in section 4. Section 5, which deals with literature on risk management strategies that households employ in the face of risk, is followed by a section on consumption smoothing. Section 7 summarizes the discussion.

## 2.2 Perspectives on Vulnerability

Vulnerability is a concept that has diverse but related meanings in different academic disciplines. A review of the literature shows the distinctions that are made when vulnerability is analyzed in different disciplines. In the social sciences in general, and in economics in particular, vulnerability is perceived as the existence and the extent of a

threat of poverty and destitution (Dercon, 2005). On the other hand, in the natural sciences, in general, and environmental sciences and geography in particular, vulnerability refers to the susceptibility of a household or community to the impact of natural hazards or climate change (De Leon, 2006). Regardless of how vulnerability is perceived, its underlying factor is a sense of insecurity on the extent to which a shock or a hazard will result in a decline in household or community well-being. This section highlights the similarities as well as the differences in the concept of vulnerability as it relates to risks, natural hazards and to economic shocks.

### 2.2.1 Vulnerability to Natural Hazards

Vulnerability to natural hazards has been a central area for scientists and researchers over the past three decades, propelled by an unprecedented increase in the frequency and magnitude of extreme environmental hazard events (Villagran, 2006). Apart from earthquakes and volcano eruptions, the catastrophic events such as the Southeast Asian Tsunami of December 2004 and the Hurricane Katrina in the USA in August 2005 renewed researchers' commitment to disaster preparedness and disaster risk management. In the literature, there are several inter-related terms that are used in the analysis of vulnerability to natural hazards.

The term 'hazard' is defined as a natural, technological, social or human-induced phenomenon that may cause physical damage, economic loss and threaten human life and well-being (Actionaid International, 2005; Villagran, 2006; Warner, 2007). Examples of these potentially damaging events include floods, droughts, earthquakes, hurricanes and tornadoes, among others. Another useful term in the vulnerability literature is risk. In the framework of vulnerability to natural disasters, the term 'risk' is defined as the probability of harmful consequences or expected loss (such as deaths, injuries, environmental damage, property loss, livelihoods loss and disruption of economic activities) resulting from the interactions between hazards and vulnerable conditions (ISDR, 2004). Finally, 'vulnerability' is defined as a set of conditions and processes resulting from physical, social, economic, and environmental factors which increase the susceptibility of a community to the impact of hazards (ISDR, 2004). In simple terms,

vulnerability describes the exposure to hazards and shocks (Actionaid International, 2005).

There is no consensus in the literature on how the three terms defined above are related. ISDR (2004) defines the relationship as in equation 2.1:

$$Risk = Hazard \times Vulnerability \tag{2.1}$$

On the other hand, Whitehead *et al*. (2005) incorporate the notion of coping capacity in the relationship, as presented in equation 2.2:

$$Vulnerability = \frac{\text{Exposure} \times \text{Susceptibility}}{\text{Coping capacity}} \tag{2.2}$$

where coping capacity refers to the use of available resources and capacities to face the adverse impacts of hazards.

Villagran (2006) analyzed the linkages between these interconnected terms by including the concept of deficiencies in preparedness as shown in equation 2.3. These deficiencies may be defined as pre-existing conditions which inhibit an institution, a community or a country from responding to a hazard effectively to minimize its impact. Examples include the lack of emergency committees or lack of early warning systems.

$$Risk = Hazard \times Vulnerability \times Deficiencies\ in\ Preparedness \tag{2.3}$$

### 2.2.2 Social Vulnerability

Recently, *social vulnerability* has been occupying a central role in the framework of natural disasters, as the concept strives to integrate the concept of vulnerability from the natural and social sciences. Social vulnerability to disasters refers to the inability of people, organizations and societies to withstand adverse impacts from multiple stressors which they face (Warner, 2007). This definition is similar to the one proposed by UNDP

(2000) which describes social vulnerability as the degree to which societies or socio-economic groups are affected by stresses and hazards, whether brought about by external forces or intrinsic factors that negatively impacts the social cohesion of a country.

Social vulnerability is unique because it aims at identifying ways of reducing risks more effectively by focusing not only on people but also on institutions, complex social systems and non-structural solutions (Warner, 2007; Dwyer *et al*., 2004). Social vulnerability is concerned with addressing the following questions, among others: Where is social vulnerability the biggest problem? Why is it the biggest problem and who are those that are most affected by hazards? The literature on social vulnerability indicates that marginalized groups including the poor, women, children and the elderly are the ones most affected (see Enarson, 2005; Warner, 2007). Social vulnerability, therefore, relates to the ability to cope with the impacts of a natural disaster at the individual level. For instance, in their study on migration due to tsunami in 2004 in Sri Lanka, Grote *et al*. (2006) were able to show that the migrants were the ones that were mostly affected by the tsunami and thus, were the most vulnerable.

### 2.2.3 Economic Vulnerability

In the literature on vulnerability from disciplines outside economics, economic vulnerability refers to risks faced by households and/or communities arising from exogenous shocks to systems of production, distribution and consumption (Warner, 2007). In the economics literature, however, this is referred to as vulnerability to poverty. One of the most important components in the concept of vulnerability to poverty is risk. The term 'risk' is defined as a potentially dangerous event that is likely to cause a loss in individual and/or household welfare when it occurs (Chaudhuri *et al*., 2002; Dercon, 2002; Harrower and Hoddinott, 2004). In the same vein, a 'shock' is defined as an actual occurrence of a risk.

It is apparent from the above definition that what is termed as 'hazard' in the vulnerability literature on disaster risk management, is referred to as a 'shock' in the economics literature on vulnerability to poverty. Finally, the concept of 'vulnerability' is

defined in the economics literature as the probability that an individual (or household), whether currently poor or not, would find himself (or itself) poor in the future (see Chaudhuri *et al*., 2002; Dercon, 2000; Harrower and Hoddinott, 2004; and Holzmann, 2001). Tesliuc and Lindert (2004) define it simply as the probability now of not having enough of something valuable in the future. Thus, although the definitions of the terminologies used in the literature on vulnerability are slightly different, the concepts are similar both in the natural sciences and in the social sciences. This study adopts the concept of vulnerability to poverty.

## 2.3 Literature Review on Vulnerability to Poverty

Risk and vulnerability to poverty have received a lot of attention in literature since the year 2000 when the World Bank released the World Development Report 2000/2001[1]. However, most of these studies have focused on vulnerability in the developing countries of Asia and in the transition economies, such as Russia and Romania. In Africa, the majority of such studies have been conducted in East Africa (Ethiopia and Kenya) and in West Africa (Mali and Nigeria). Literature on vulnerability to poverty in southern Africa in general, and Malawi in particular, is still lacking. The available literature has been dominated by methodological issues. There is a growing consensus in the literature that the estimation of vulnerability to poverty at the household level should ideally be attempted with panel data of sufficient length and richness. Unfortunately such data are rare, particularly in developing countries. It is against this background that studies have been undertaken to propose new methodologies that would allow the use of data from cross-sectional household surveys to assess vulnerability to poverty. Such methodologies aim at providing an opportunity to undertake vulnerability assessments even in situations where panel data are not available.

Hoddinott and Quisumbing (2003) outline three principal approaches that are used to assess vulnerability in the literature. These are vulnerability as expected poverty (VEP), vulnerability as low expected utility (VEU) and vulnerability as uninsured exposure to

[1] The 2000/1 World Development Report is entitled 'Attacking Poverty: Opportunity, Empowerment and Security'.

risk (VER). While the first two measure vulnerability as a probability of falling below a welfare benchmark (usually a consumption poverty line), VER does not construct probabilities but instead it assesses whether observed shocks generate loss in welfare. This section will briefly outline each approach, including some studies that have used the approaches.

### 2.3.1 Measuring Vulnerability as Expected Poverty (VEP)

Under VEP, vulnerability of household *h* at time *t* ($V_{ht}$) is defined as the probability that household welfare, usually measured in terms of consumption expenditure, at time *t+1* will be below some benchmark (usually the consumption poverty line), as given in equation 2.4.

$$V_{ht} = \Pr\left(C_{h,t+1} \leq Z\right) \tag{2.4}$$

The methodology involves first, predicting consumption for each household. Second, deriving the variance of consumption for each household. Third, making assumptions about the distribution of consumption and determining the probability threshold above which the household is classified as vulnerable.

Pritchett, Suryahadi, and Sumarto (2000) extend the definition presented in equation 2.4 to include a time horizon beyond *t+1*, arguing that since the future is uncertain, the degree of household vulnerability is bound to increase with the length of the time horizon. They then define vulnerability of household *h* for *n* periods, denoted as R, as the probability of observing at least one incident of poverty over the *n* periods. This is the same as one minus the probability of no episode of poverty, as presented in equation 2.5:

$$R_h\left(n, Z\right) = 1 - \left[\left(1 - \left(\Pr\left(C_{h,t+1}\right) \prec Z\right)\right), \ldots, \left(1 - \left(\Pr\left(C_{h,t+n}\right) \prec Z\right)\right)\right] \tag{2.5}$$

Let I [•] denote an indicator equal to one if equation 2.5 is true, and zero otherwise. Pritchett, Suryahadi, and Sumarto (2000) then define a household as vulnerable if the risk, *R*, in *n* periods is greater than a probability threshold *p*, as given in equation 2.6:

$$V_{ht}(p,n,Z) = \mathrm{I}\{R_{ht}(n,Z) \succ p\} \qquad (2.6)$$

The major advantage with this methodology lies in the fact that it can be used to measure the depth of expected poverty. Although equations 2.4 and 2.6 measure expected poverty headcount, the equations can be extended mathematically to account for the depth of the future shortfall in consumption, which is analogous to a poverty gap index.

The pioneering empirical work on assessing vulnerability as expected poverty in situations where panel data are not available was done by Chaudhuri (2000), among others, who proposes a methodology for assessing household vulnerability to poverty from cross-sectional data from Indonesia. The study sets out a methodology where vulnerability is defined within the framework of poverty eradication. In particular, vulnerability is defined as an *ex-ante* risk that a household will, if currently non-poor, fall below the consumption poverty line, or if currently poor, will remain in poverty. The methodology is tested in Chaudhuri, Jalan, and Suryahadi (2002) using December 1998 national socio-economic survey data from Indonesia. The methodology is then tested and the results indicate that while 22 percent of the Indonesian population was observed to be poor in 1998, 45 percent of the population was vulnerable to poverty. The study also found that the distribution of vulnerability across different segments of the population differ markedly from the distribution of poverty. The third major finding is that there are striking differences in the sources of vulnerability for different segments of the population. The major limitation with the methodology is that an attempt to estimate vulnerability from a single cross-section requires strong assumptions to be made about the error term.

Several studies have been conducted following Chaudhuri's methodology: Alayande and Alayande (2004) employ the Chaudhuri (2000) methodology to quantitatively assess vulnerability to poverty in Nigeria. The study uses merged data from the national consumer expenditure survey and the national integrated survey of households. The findings of the study show that 87 percent of Nigerians were vulnerable to poverty in 2004. The study further shows that while around 41 percent of the population fell into

chronic poverty, only 18 percent of the population were vulnerable to chronic poverty. The study further showed that whereas around 69 percent of the population was highly vulnerable, only 32 percent of the population had low mean vulnerability.

Christiaensen and Boisvert (2000) present an approach (parallel to Chaudhuri (2000)) to measure vulnerability to poverty, still within the framework of expected poverty. The study illustrates a methodology to empirically measure household food vulnerability. The study defines food vulnerability as the probability now that a household's future food consumption (defined by household caloric consumption per capita), will be below the food consumption poverty line. The methodology is tested using household data from northern Mali to measure food vulnerability. The results of the study showed that although 37 percent of the population in northern Mali was undernourished at the post-harvest time, 76 percent were vulnerable to undernourishment during the subsequent hunger season. One of the strengths of the methodology is that it can be used to study vulnerability regarding a wide array of household welfare variables, such as income, total consumption, and nutrition.

Christiaensen and Subbarao (2001) adopt the methodology developed by Christiaensen and Boisvert (2000) to estimate vulnerability to consumption poverty in rural Kenya. The study uses a two-period panel of 808 non-pastoralist communities drawn from 1994 and 1997 welfare monitoring surveys. The studies found that in 1994, one fifth of all communities were vulnerable to consumption poverty. Another major finding of the study is that income diversification, adult literacy, market accessibility and the availability of electricity had vulnerability-reducing effects, while the community's malaria incidence strongly increased the vulnerability of households.

Christiaensen and Subbarao (2004) also use the VEP methodology to assess household vulnerability using pseudo panel data of 6,890 households. The data were derived from repeated cross sections and augmented with historical information on shocks in non-arid and arid areas of rural Kenya using data from welfare monitoring surveys of 1992, 1994 and 1997. The results from the study showed that in 1994 the sampled households faced

an average chance of 39 percent of becoming poor in the future. Further, the study found that vulnerability appeared to be higher in arid areas than non-arid areas, due to differences in rainfall volatility, among others. Another major finding was that possession of livestock such as cattle, goats and sheep appeared ineffective in protecting household consumption against covariate shocks.

Although the major advantages of the VEP methodology include the ease with which vulnerability can be estimated and the possibility of estimating vulnerability with a single cross-sectional data, it has the disadvantage of generating perverse policy implications, in principle. In particular, Hoddinott and Quisumbing (2003) point out that using the VEP methodology one can conclude that exposing households to increased levels of uninsured risk does not make them more vulnerable but could actually make them less vulnerable. Nevertheless, estimating vulnerability as expected poverty remains the most common methodology used in the literature. It is also the methodology that is applied in this study (see chapter 6).

### 2.3.2 Measuring Vulnerability as Low Expected Utility (VEU)

According to Hoddinott and Quisumbing (2003), vulnerability ($V_h$) is defined in the framework of expected utility as the difference between the utility derived from some level of certainty-equivalent consumption $Z_{CE}$ at and above which the household would not be considered vulnerable ($U_h(Z_{CE})$), and the expected utility of consumption ($EU_h(C_h)$), as presented in equation 2.7.

$$V_h = U_h(Z_{CE}) - EU_h(C_h) \qquad (2.7)$$

VEU is simply the difference between the utility that a household *h* would derive from consuming some particular bundle with certainty and the household's expected utility of consumption (Ligon and Schechter, 2002). In equation 2.7, $Z_{CE}$ is analogous to a poverty line and $U_h$ is a weakly concave, strictly increasing function. The methodology involves first, making an assumption regarding the functional form of the utility function, *U*; Second, specifying a conditional expectation of the consumption, $EC_h$, as a function of

covariate and idiosyncratic characteristics; And third, calculating the two components of the vulnerability measure $U_h(Z_{CE})$ and $EU_h(C_h)$.

Equation 2.7 can be re-written as:

$$V_h = \left[U_h(Z_{CE}) - U_h(EC_h)\right] + \left[U_h(EC_h) - EU(C_h)\right] \qquad (2.8)$$

The first bracketed term in equation 2.8 is a measure of poverty, which is the difference in utility at the certainty-equivalent level of consumption $Z_{CE}$ and the utility of expected consumption. The second term measures the risk faced by the household *h* (Hoddinott and Quisumbing, 2003). It should be pointed out that equation 2.8 can be decomposed into covariate and idiosyncratic risks.

In the framework of vulnerability as low expected utility, Ligon and Schechter (2003) construct a measure of vulnerability which allows the quantification of welfare loss associated with poverty as well as the loss associated with a variety of different sources of uncertainty. Using a panel data set from Bulgaria in 1994, which was collected over 12 months on 2,287 households, the study found that vulnerability caused an average utility loss of 26 percent in total consumption and a utility loss of 20 percent in food consumption. The study also found that poverty and risk play roughly equal roles in reducing welfare. Aggregate shocks were found to be more important than idiosyncratic sources of risk, but households headed by an employed, educated male were less vulnerable to aggregate shocks than their counterparts.

The most important advantage of the VEU methodology is that it can be decomposed into distinct measures of poverty, exposure to aggregate risk, exposure to idiosyncratic risk, and unexplained risk plus measurement error (Ligon and Schechter, 2002). However, its major limitation lies in the fact that it uses utility units of measurement, *utils*, which are difficult for individuals with limited understanding of economics to comprehend.

### 2.3.3 Measuring Vulnerability as Uninsured Exposure to Risk (VER)

In this framework, vulnerability is seen as an *ex-post* assessment of the extent to which a negative shock leads to a welfare loss. Unlike the two measures of poverty discussed above, VER is a backward looking, *ex-post* assessment of welfare loss. For a household *h* that resides in village *v* at time *t*, the methodology involves defining the change in the log of consumption between period *t-1* and *t* ($\Delta \ln C_{ht}$), and then estimating $\Delta \ln C_{ht}$ as a function of covariate shocks, $S(i)_{tv}$, idiosyncratic shocks $S(i)_{htv}$, community dummy variables $D_v$, and household characteristics, $X_{hv}$ (equation 2.9).

$$\Delta \ln C_{htv} = \sum_i \lambda_i S(i)_{tv} + \sum_i \beta_i S(i)_{htv} + \sum_{tv} \delta_v (D_v) + \gamma X_{hv} + \Delta \varepsilon_{htv} \qquad (2.9)$$

where β, δ, γ, and λ are parameters to be estimated.

Tesliuc and Lindert (2002) used single cross sectional data with retrospective questions on shocks and the households' response to shocks to estimate household vulnerability in Guatemala within the framework of uninsured exposure to risk. By combining quantitative data from the Guatemala Living Standards Measurement study of 2000 with qualitative information from in-depth interviews with households from 10 villages in Guatemala, the study identified the major shocks affecting households. These idiosyncratic shocks included pests, lost harvest and drop in income. Based on the findings, the authors recommended that policy interventions, whether to address poverty or to protect households against shocks, should concentrate on building the assets of the poor.

Although the VER methodology is easy to estimate and can be used to determine whether shocks have different effects across different groups, it does not actually calculate a vulnerability estimate (Hoddinott and Quisumbing, 2003). Another serious limitation besides the need for at least a three-period panel dataset is that VER is an *ex-post* and not an *ex-ante* measure.

It is important to note that regardless of how vulnerability is defined, and which of the three methods is used to measure it, vulnerability is always a function of the expected mean and variance of household consumption (Günther and Harttgen, 2006). In that respect, the mean of expected consumption is determined by household and community characteristics while the variance of household consumption is a function of the occurrence and impact of shocks, as well as the household coping mechanisms to protect consumption from the shocks.

Following the definition that vulnerability is the probability that a household's expected future consumption falls below some minimum level (Holzmann, 2001), vulnerability can be conceptualized in relation to specific welfare outcomes. These outcomes, usually manifested in the form of poverty, are determined by both household responses (in the form of coping strategies) and policy interventions (in the form of risk reduction, risk mitigation and risk coping). Vulnerability can, therefore, be perceived as a product of two components: exposure to a shock and the household's resilience, which is the ability to manage the shock (Devereux *et al.*, 2007; Schneiderbauer and Ehrlich, 2004). Under this conceptual framework, a household is vulnerable to poverty due to either increased exposure to risk or to declining ability to cope with the shock, or due to both.

## 2.4 Sources of Vulnerability

Households, especially in rural areas of the developing world, face different shocks. These sources can be grouped into agricultural, environmental, economic, health, nutritional and demographic shocks. This section briefly outlines each of these sources of vulnerability, by drawing on the major findings reported in the literature, with an emphasis on the sources of vulnerability in Malawi.

### 2.4.1 Vulnerability in Agriculture

Most of the developing countries' economies, particularly those in Sub-Saharan Africa, are agricultural-based. As such agricultural shocks are an important source of vulnerability for the majority of the populations. In the case of Malawi, the economy is heavily dependent on agriculture, from where over 90 percent of the population derive its

livelihood (Malawi Government, 2004); thus climate and environmental risks play an important role in household vulnerability to poverty. In particular, the heavy dependency on rain-fed agriculture renders the majority of the Malawians vulnerable in the face of erratic and unpredictable rainfall. The rural households depend on rainfall for their livelihoods, both directly in the form of crop production and indirectly through on-farm sale of labour. According to the Malawi Government and the World Bank (2006), the volatility in the rainfall pattern in Malawi can reach as much as 50 percent below or above the historical average. This erratic rainfall gives rise to droughts and flooding, both of which can have significant negative welfare impacts on farmers, due to loss in crop production and livestock. The impact of these shocks is also felt by non-farm households through increased price of food commodities, such as maize (Malawi Government and World Bank, 2006). For instance, Tiba (2005) was able to show the variability in maize production in Malawi between 1991 and 2001 that was attributed to erratic rainfall. Two studies (Hoddinott and Kinsey, 2001; Alderman *et al.*, 2004) have shown that rainfall shocks are causally related to reduced human capital formation and that the magnitudes of these effects are meaningful.

In other countries, vulnerability in agriculture is mainly attributed to rainfall shocks. For example, Dercon and Krishnan (2000) reported that rainfall shocks, crop damage and livestock diseases are among the leading shocks that make households vulnerable to poverty in rural Ethiopia. Further, in their study of 15 Ethiopian villages between 1999 and 2004, Dercon *et al.* (2005) found that more than 50 percent of their surveyed households reported drought as the most important shock. The authors were able to show that experiencing a drought at least once during the five-year study period lowered per capita consumption by about 20 percent. In their study on shocks and poverty in Guatemala, Tesliuc and Lindert (2004) reported that 7 percent of all sampled households were affected by drought in 2000. In Bangladesh, on the other hand, floods were reported as an important shock that has an impact on the agricultural sector (Quisumbing, 2007).

Vulnerability in agriculture in Malawi is also exacerbated by land constraints. Land ownership is an important determinant of poverty and vulnerability in Malawi. Land is

unequally distributed, with a Gini coefficient of 0.884 in 2004 (Devereux *et al.*, 2007). Rural households have an average of 1.2 hectares of land and the plot size ranges from 0.29 hectares per capita in the southern region to 0.43 hectares per capita in the northern region. With a rapid population growth, the per capita land size continues to fall over time. Increasing land pressure is a source of vulnerability because poorer households tend to cultivate less land and because declining farm sizes have not been accompanied by agricultural intensification or by diversification (Devereux *et al.*, 2007).

Another source of agriculture-related vulnerability in Malawi is lack of livestock. By southern African standards, livestock ownership in Malawi is very low. According to Devereux *et al.* (2007), Malawians owned 8.9 tropical livestock units (TLU[2]) per capita between 2000 and 2002, compared with 24.9 TLU in the neighbouring Zambia, 45.1 TLU in Zimbabwe and 157.5 in Botswana. There is evidence in the literature that livestock is an important asset that can help to smooth household consumption. Apart from providing draught power and manure for farming, livestock are a store of wealth that accumulates in good times and can be sold during an income shock.

### 2.4.2 Economic Shocks

Important economic shocks affecting households in Malawi relate to price volatility. Although price volatility can be very disruptive to economic activities, its effect is felt more among the poor since they often do not have savings instruments to protect their household consumption. It is important to note that most of the economic shocks are closely related to agriculture because of the important role that it plays in the economy. According to the Malawi Government and the World Bank (2006), fertilizer, maize, and tobacco price risks remain the greatest source of vulnerability to households in Malawi. This is the case because tobacco is the main export crop while maize is the major staple crop and fertilizer is the major input that determines the output for both maize and tobacco. Maize price volatility is a serious problem because the livelihoods of the

[2] Tropical Livestock Unit (TLU) is a common unit for describing livestock numbers of different species. The TLU expresses the total amount of livestock in a single value regardless of the specific composition. To do so, the method assigns conversion factors to different species to reflect their relative value (Malawi Government and World Bank, 2006).

majority of the rural population remain undiversified. Most of the rural households derive almost all their food and income from subsistence maize production. Since livelihood diversification outside agriculture is very limited, any agriculture-related shock, such as rising maize prices, has serious implications on households' vulnerability to poverty.

Another source of economic vulnerability is the existence of weak input and output markets in Malawi. Rural land markets are often non-existent and credit markets, which can serve to finance production and to permit farmers to consume before harvest (Bardan and Udry, 1999), are weak and highly inaccessible. According to Dorward and Kydd (2002), agricultural market failures in Malawi can be explained in terms of high transactions costs and coordination failures.

Studies elsewhere have shown that economic shocks can also take the form of job losses, bankruptcy, and lost remittances, as was the case in Guatemala in 2000 (Tesliuc and Lindert (2004). In Bangladesh, dowry and wedding-related expenses can contribute to economic vulnerability (Quisumbing, 2007), especially among poor households.

### 2.4.3 Health Shocks

Households in Malawi are subjected to many health shocks, most of which are idiosyncratic. These health shocks tend to have significant economic impact, particularly among poor households. Malaria, tuberculosis, and HIV/AIDS are among the leading causes of deaths in Malawi. Illnesses and deaths of economically active members of households may erode household incomes not only due to a loss in labour, but also because the household may be pre-occupied with caring for the sick (Malawi Government and World Bank, 2006). Health risks are a serious source of vulnerability because effective medical services are usually not accessible to the majority of the population. Poor quality of care, limited availability of drugs, and under-provision of reproductive health are all characteristics of public health services in Malawi (Devereux *et al.*, 2007).

In their study of 15 Ethiopian villages between 1999 and 2004, Dercon *et al.* (2005) reported that around 35 percent of their sampled households experienced at least one death of a family member. In the same study, around 39 percent of the households reported experiencing an illness. The authors were able to show that experiencing at least one illness reduced per capita consumption by approximately 9 percent.

### 2.4.4 Demographic Sources of Vulnerability

There is evidence in the literature that households headed by women, children or the elderly tend to be more vulnerable to both chronic poverty and transitory shocks than their counter parts in Malawi (Devereux *et al*., 2007). Such households are usually faced with labour constraints that severely undermine their ability to sustain their livelihood (Kadzandira, 2002). These labour shortages usually occur at the peak of the cropping season. Further, death of a household head or spouse can lead to a significant negative impact on the welfare of the household. For instance, Hoddinott (2005) found that the death of a spouse in a Malawian household severely reduces consumption levels by as much as 45 percent.

## 2.5 Risk Management Strategies

Households in developing countries live in environments that are characterized by substantial idiosyncratic and covariate risks (Dercon, 2000; Günther and Harttgen, 2006; Christiaensen and Subbarao, 2004). As a result, such households have developed a range of risk management strategies. In the literature, the strategies are classified into *ex-ante* risk management and *ex-post* risk coping, depending on whether they are put in place before or after the occurrence of a shock, respectively.

### 2.5.1 *Ex-ante* Risk Management Strategies

*Ex-ante* risk management strategies are prevention or mitigation strategies that are implemented before a shock occurs (Dercon, 2000; Alderman and Paxson, 1994; Holzmann, 2001). The goal of *ex-ante* risk management measures is to prevent the shock from occurring, or if prevention is not possible, to mitigate the effects of the risk. Holzmann (2001) makes a distinction between *ex-ante* prevention strategies and *ex-ante*

mitigation strategies. The *ex-ante* prevention strategies are aimed at reducing the probability of occurrence of a shock, because such actions have an impact of increasing people's expected income and reducing income variance, both of which have the impact of increasing the overall level of household welfare. Most of the *ex-ante* prevention strategies fall outside the domain of the household. The *ex-ante* prevention strategies that are mentioned in literature include sound macroeconomic policies, public health investments, and investments in education (Holzmann, 2001; Christiaensen and Subbarao, 2004; Tesliuc and Lindert, 2004).

The *ex-ante* mitigation strategies are those that households put in place *ex-ante* to reduce the impact of the shock on household welfare when it occurs. Examples include income diversification (Dercon, 2002), livelihoods diversification (Devereux *et al*., 2007), and income skewing, where households are engaged in low risk but also low return activities (Dercon, 2001; Hoddinott and Quisumbing, 2003). While these strategies can help households to avoid risks or maintain their livelihoods in the face of shocks, not all households have the means to employ them because they depend on access to land, labour, capital and knowledge (Malawi Government and World Bank, 2006). For the majority of the poor households, these strategies may be beyond their reach.

Empirically, Christiaensen and Subbarao (2004) reported that non-farm income sources, such as handicrafts, were a promising risk-mitigation strategy for rural dwellers in the arid and semi-arid areas of Kenya. Households grow a mix of crops that embody differing levels of susceptibility to climatic shocks (Hoddinott and Quisumbing, 2003). Migration and use of remittances have also been mentioned in the literature like Barrett *et al.* (2001) for Burkina Faso, and Lucas and Stark (1985) for Botswana. In Malawi, the common risk mitigation actions include income diversification, especially through crop diversification and running non-farm enterprises (Malawi Government and World Bank, 2006). Informal insurance mechanisms have also been reported to be another *ex-ante* risk management strategy in some countries. Examples include group-based insurance schemes for funeral expenses in Ethiopia and Tanzania (Dercon *et al*., 2005).

### 2.5.2 *Ex-post* Coping Strategies

Households put in place *ex-post* coping strategies to deal with the impact of shocks that have not been managed *ex-ante*. The underlying objective of such strategies is to smooth household consumption. One of the most common strategies designed to relieve the impact of shocks is self-insurance (Dercon, 2004; Hoddinott and Quisumbing, 2003; Christiaensen and Subbarao (2004)). Households can insure themselves by building up assets in 'good' years and deplete them in 'bad' years. It is important to note that this strategy is only available to households who have the capacity to save or build up assets, such as livestock, in 'good' years. The effectiveness of such precautionary savings is explored in details by Deaton (1991), who concluded that it is quite an effective strategy to deal with income risk, even though it cannot provide full insurance.

The second coping strategy common in literature is informal insurance in the form of informal group-based risk sharing (Dercon, 2000; Tesliuc and Lindert, 2004; Holzmann, 2001). These are informal arrangements that develop between members of a group or community to support each other during hardships. Coate and Ravallion (1993) provide a theoretical analysis of these mechanisms. Empirically, informal insurance usually takes the form of borrowing from friends, neighbours, relatives, or moneylenders. The effectiveness of informal insurance is considered by Townsend (1994) and Ligon *et al*. (1997) on the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) villages in India, and by Lund and Fafchamps (1997) for the Philippines case. In particular, Townsend (1994) identifies five potential risk-sharing institutions that households use: first, diversification of a given farmer's landholding into various spatially separated plots and into various crops; second, storage of grain from one year to the next; third, purchases and sales of assets such as land; fourth, borrowing or lending more generally, or specifically from money lenders; and fifth, gifts and transfers within family networks.

While self-insurance has the potential to deal with both idiosyncratic and covariate shocks, group-based insurance mechanisms are only effective in dealing with household-specific, idiosyncratic shocks. Group-based informal insurance breaks down in the face

of covariate shocks because risk sharing is no longer possible since the shock is common to all members (Dercon, 2000). It should be noted, however, that for self insurance to be able to smooth household consumption in the face of idiosyncratic and covariate shocks, a sufficiently large pool of assets needs to be built up *ex ante*. Further, although formal credit and insurance markets are imperfect, incomplete or virtually missing in most of the rural areas of the developing countries where most of the shocks occur, they have been reported in literature to be an effective way of smoothing consumption in the face of shocks. Some households that have access to loans from microfinance programmes may use part of the loan for consumption purposes when shocks occur (Dercon, 2000).

The important *ex-post* coping strategies that households used in Malawi between 2004 and 2005 include dissaving, sale of household assets, increased supply of labour, borrowing, cutting down on consumption and receiving assistance from government, non-governmental organizations and religious organizations (Malawi Government and World Bank, 2006). Similar coping strategies were reported being used by rural households in Zambia in 1998 by Ninno and Marrini (2005).

## 2.6 Consumption Smoothing

Since the ground-breaking study on consumption smoothing by Townsend (1994), there has been a lot of research on the ability of rural households in low-income countries to protect their consumption from fluctuations in their income. A vast set of literature points to the fact that households' consumption tend to be remarkably smooth while households' income is subject to large variations. These include Townsend (1994), Chaudhuri and Paxson (2001), and Morduch (2001) for India; Paxson (1993) for Thailand; Skoufias and Quisumbing (2003) for Bangladesh, Ethiopia, Mali, Mexico and Russia; Fafchamps and Lund (2003) for the Philippines; Deaton (1992) and Grimard (1997) for Cote d'Ivoire; and Dubois (2000) for Pakistan.

Among the important theoretical literature on consumption smoothing is Deaton (1992) where he shows that households that have borrowing constraints are able to smooth consumption with relatively low asset holdings. He sets up an inter-temporal model that

incorporates a stochastic labour income and a non-productive asset in the form of cash or grain. In the model, households are able to maintain a stable level of consumption by drawing down on physical or financial assets, even when financial markets are inexistent. He is able to show that substantial changes in consumption arise only when assets are almost completely depleted. The model shows that it is not necessary that a household's asset portfolio be relatively large compared to income. Using simulation models, the study is able to show that for a household holding an average stock of asset value less than the standard deviation of income, consumption variation is half that of income (Deaton, 1992).

Among the growing empirical literature, Skoufias (2003) examined the extent to which Russian households were able to protect their consumption from fluctuations in their income using longitudinal data from 1994 to 2000. The study found that consumption was only partially protected from idiosyncratic shocks to income with food consumption being better protected than non-food consumption expenditures. While non-food consumption expenditure adjustments were seen as an important risk management strategy, other self-insurance strategies, such as borrowing, labour supply adjustments, and sale of assets, also played important roles. However, in a similar study of 364 rural households in Romania, another transition economy, Irac and Minoiu (2007) failed to reject the hypothesis of full insurance of consumption. The authors argue that their findings do not necessarily imply that a Pareto-optimal risk sharing is achieved, as the empirical results could be confounded by the role played by some types of shocks, such as illness, as preference shifters of the utility of consumption.

Using household panel data from Bangladesh, Ethiopia, Mali, Mexico and Russia, Skoufias and Quisumbing (2003) examined the extent to which households are able through formal and/or informal arrangements to insure their consumption from specific economic shocks and fluctuations in their real income. The authors used instrumental variables to correct for measurement error in income, imputation error in food consumption and endogeneity of income and found that food consumption was better insured than non-food consumption from idiosyncratic shocks. The study showed that

adjustments in non-food consumption appeared to act as a mechanism for partially insuring *ex-post* the consumption of food from the effects of income changes.

Among the very few studies on consumption smoothing in Malawi, Tsafack and Maitra (2004) investigated the ability of rural Malawian households to insulate their consumption from idiosyncratic income shocks. Using three rounds of IFPRI data on Malawian households between February 1995 and December 1995, and applying the methodology proposed by Fafchamps and Lund (2003), the authors found that purchases and sales of assets appeared to play an important role in insuring households against idiosyncratic shocks. However, family transfers and borrowing did not seem to be playing an important role. The authors concluded that insurance through asset variation is only effective in the short run because in the medium to long term, this type of insurance could lead to a poverty trap.

## 2.7 Summary

This chapter has reviewed some important literature on vulnerability to poverty, risk management strategies and consumption smoothing. Three different ways to measure vulnerability to poverty have been presented. Empirical studies that employed each of the three methods have been reviewed. Further, the chapter has also considered both *ex-ante* risk management and *ex-post* coping strategies that households use in the face of risk. Finally, a review of literature on consumption smoothing has been presented.

# Chapter 3
# CONCEPTUAL AND THEORETICAL FRAMEWORK

## 3.1 Introduction

This study considers the effects of risk on vulnerability and poverty among rural households in Malawi. The unit of analysis is a peasant agricultural household where consumption and production decisions are intertwined. Agricultural households derive their livelihoods from working in their own enterprises. In most cases, these enterprises are farms. The households are simultaneously units of production and consumption. Using partly purchased inputs and providing some of their own resources into the production process, they produce partly for their own consumption and partly for sale. It is therefore difficult to distinguish household's production decisions from its consumption decisions. It is thus clear that agricultural households in the developing countries, including Malawi, make joint decisions over consumption, production and labour supply. This is the entry point of the agricultural household models (AHM) that form the basis of the theory guiding this study.

Agricultural household models integrate producer, consumer and worker decisions of the household into one microeconomic model, thereby providing a framework for analyzing household behaviour based on these three decisions. The aim of this chapter is two-fold: first, to present a conceptual framework for the study that shows the linkages between the different aspects of risk, vulnerability and poverty that are the subject of this investigation. Second, to present a theoretical framework that is guiding the study. In particular, the agricultural household models are presented under different assumptions. Section 2 will therefore provide a discussion on how shocks, risk management strategies and consumption smoothing are inter-related in this study. This will be followed by section 3 that outlines the features of the AHM under the assumption of complete markets. It will be seen that when both product and factor markets are complete and competitive, household's production decisions are separable from its consumption decisions. Section 4 outlines a theory of risk and insurance in an agricultural economy which will examine the Pareto-efficient allocation of risk in a community. It will also

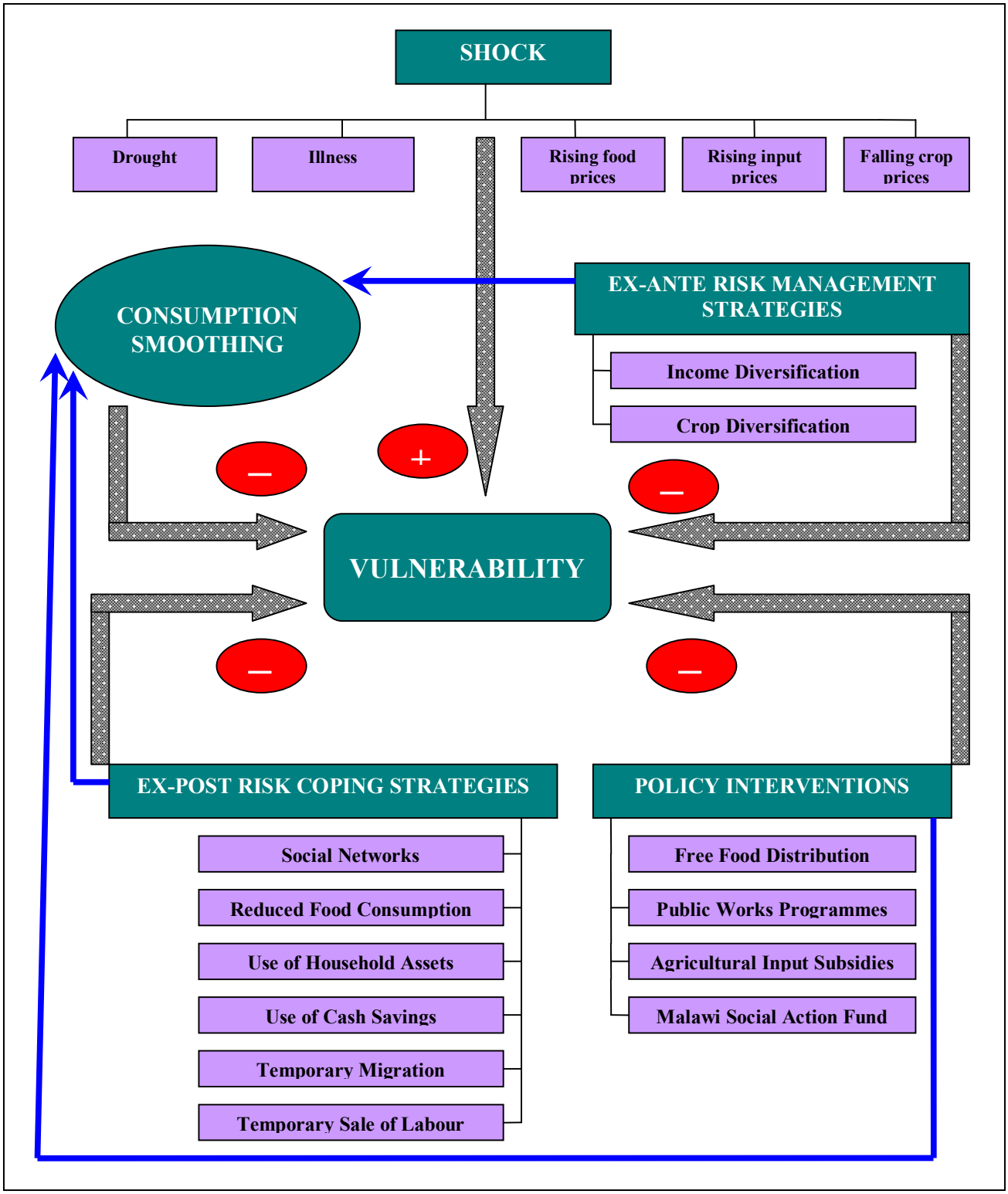
examine the use of inter-temporal consumption smoothing as a means of risk-pooling. Section 5 outlines the hypotheses that will be tested in the study, based on the theoretical and conceptual frameworks. Finally, section 6 will provide a summary of the discussion.

### 3.2 Conceptual Framework

As pointed out in chapter 1, this study addresses three inherently intertwined aspects of poverty and vulnerability - these are the estimation of vulnerability; the determinants of risk management strategies; and consumption smoothing. Figure 3.1 provides a conceptual framework depicting the interrelationships among these important concepts and shows how the different chapters of the study fit together. Among the major shocks that the studied households reported experiencing between 1999 and 2006 include drought, illness, rising food prices, rising agricultural input prices and falling prices for cash crops, among others. These are considered in great detail in chapters 6 and 7. As figure 3.1 shows, the shocks increase households' vulnerability to poverty.

Since households live in environments where shocks are common, they undertake different risk management strategies. The strategies that are undertaken before a shock occurs include income diversification and/or crop diversification. These *ex-ante* risk management strategies are put in place to minimize the impact of a shock when it occurs. As shown in figure 3.1, the *ex-ante* risk management strategies reduce households' vulnerability to poverty. Further, when households fail to manage the shocks *ex-ante*, they devise strategies to cope with the shocks *ex-post*. The important coping strategies among the sampled households include the use of cash savings, use of household assets, getting support from social networks, and temporary migration among others. These coping strategies are aimed at reducing the negative impact of the shocks that have not been managed *ex-ante*, and as figure 3.1 shows, the coping strategies have an effect of reducing households' vulnerability to poverty.

**Figure 3.1: Conceptual Framework: Shocks and Vulnerability**




**Source: Own illustration**

In the face of shocks, there are certain interventions that government, non-governmental organizations and international development agencies operating in Malawi put in place to help households cope. In the study areas, these interventions were mainly in the form of social protection, and they include free food distribution following periods of drought, public works programmes, particularly food-for-work programmes, agricultural input subsidies and the Malawi Social Action Fund. These interventions are aimed at reducing households' vulnerability, as depicted in figure 3.1. Due to data constraints, this study considers only free food distribution and food-for-work programmes, which have been classified as 'safety net programmes', as one of *ex-post* coping strategies in chapter 7. However, the impact of Malawi Social Action Fund (MASAF) programmes on household vulnerability is considered in the analysis of vulnerability determinants in chapter 6.

Available literature on consumption smoothing argue that in the face of shocks that have a negative impact on welfare, households tend to protect their consumption from fluctuations in their income (see Townsend, 1994; Paxson, 2001; Skoufias and Quisumbing, 2003; and Dubois, 2000). This study, therefore, considers the extent to which the studied households are able to smooth their consumption in the face of shocks. As figure 3.1 shows, the extent to which the households are able to smooth their consumption depends on, among other things, the risk management strategies in place both *ex-ante* and *ex-post*, and the policy interventions that are in place. The ability of the studied households to smooth their consumption is analyzed in great detail in chapter 8.

## 3.3 Theoretical Framework: The Agricultural Household Model

This section will outline the agricultural household models that are used to analyze the complex behavioural patterns of agricultural households. The analysis will closely follow Bardhan and Udry (1999) who provide an excellent exposition of the agricultural household models as a framework for analysing households that are jointly engaged in production and consumption. The study will initially assume complete factor and product markets, and this assumption will be relaxed later.

### 3.3.1 Agricultural Household Model: The Case of Complete Markets

Following Bardhan and Udry (1999), Barrett (1993) and Singh *et al.* (1986), assume an agricultural household (with only two individuals, 1 and 2) which exhibit a von Neumann-Morgenstern utility function defined over consumption of leisure ($\ell$) and an agricultural commodity (G). Assume further that the household has an endowment of land (H) and it can produce the commodity, G, on its farm with a concave production function F(L,H), where L is the amount of labour used on the farm. Assuming the existence of complete markets for labour and products, let *p* be the price of output and *w* be the wage of labour. The household utility maximization problem can then be expressed as:

$$\text{Max } U(G_1, G_2, \ell_1, \ell_2) \tag{3.1a}$$

Subject to:

$$p(G_1 + G_2) + wL^Z + rH^Z \leq F(L, H) + w(L_1^m + L_2^m) + rH^m \tag{3.2}$$

$$L = L_1^f + L_2^f + L^Z \tag{3.3}$$

$$H = H^f + H^Z \tag{3.4}$$

$$\xi^H = H^f + H^Z,\ \xi_i^L = L_i^f + L_i^m + \ell_i,\ i \in \{1,2\} \tag{3.5}$$

$$G_i, \ell_i, L_i^f, L_i^m, H^f, H^Z, H^m \geq 0,\ \ i \in \{1,2\} \tag{3.6}$$

Where:

$H^f$, $H^m$, and $H^Z$ denote amount of land used on the farm, land supplied to the market, and land hired from the market, respectively.

$L^f$, $L^m$, and $L^Z$ denote labour used on the farm, labour supplied to the market, and labour hired from the market, respectively.

$\xi^H$ denotes household's endowment of land and $\xi^L$ is the endowment of labour for the household. Finally, *r* denotes the price per unit of land.

Equation 3.1a presents the household's utility function where utility is a function of consumption of the crop G and leisure for each individual. The household's maximization problem is with respect to consumption; leisure; land that is used on the farm, land that is hired and land that is supplied to the market; labour that is supplied to

own farm, labour supplied on the market, and hired labour. Equation 3.2 is the household budget constraint where cash expenditures on consumption of G, hired labour and hired land should not be more than cash revenues from farming, wages from the sale of labour and rent from land supplied to the market. Equation 3.3 is the labour resource constraint where the total amount of labour used on the farm (L) comprises labour supplied to the farm by both individual 1 and 2 and hired labour. Equation 3.4 is the land resource constraint which expresses total land used on the farm as household land used on the farm and hired land. Further, equation 3.5 shows the household's endowment of land that is devoted to the farm or supplied to the market. It also shows that household endowment of labour is divided into labour used on its own farm, off-farm labour supply and leisure time.

We can substitute equations (3.3), (3.4) and (3.5) into (3.2) so that the three constraints are collapsed to yield:

$$p(G_1 + G_2) + w(\ell_1 + \ell_2) \leq \pi + w(\xi_1^L + \xi_2^L) + r\xi^H \quad (3.7a)$$

$$\pi = F(L, H) - wL - rH \quad (3.8a)$$

$$G_i, \ell_i, L, H \geq 0, \quad i \in \{1,2\} \quad (3.9)$$

It can be seen that equation 3.7a presents a full income budget constraint where the value of consumption (of commodity G and leisure) cannot be greater than the household's income derived from farm profits ($\pi$) and the value of the household endowment. Equation 3.8a is the farm profit function. The household's utility maximization problem is now maximizing equation 3.1a with respect to labour (L), land (H), consumption of commodity $G_i$ and leisure ($\ell_i$) subject to the constraints presented in equations 3.7a, 3.8a and 3.9.

It should be pointed out that the model is over-simplified. It assumes that only one crop is produced and other variable inputs such as fertilizer are omitted in the model. It also assumes that family labour and hired labour are perfect substitutes. It should be stressed that the model assumes that the household is a price-taker both in the commodity and the labour markets and as a result, the model is a recursive one. As long as the household

utility function is characterized by local non-satiation, then the full income constraint (equation 3.7a) is binding at the solution and the maximized value of the utility function is increasing in $\pi$.

Since labour (L) and land (H) do not appear in the utility function, we can transform equations 3.1a and 3.7a into:

$$\underset{\{G_i\},\{\ell_i\}}{Max}\, U\left(G_1, G_2, \ell_1, \ell_2\right) \tag{3.1b}$$

Subject to:

$$p\left(G_1, G_2\right) + w\left(\ell_1, \ell_2\right) \leq \pi^*\left(w, r\right) + w\left(\xi_1^L + \xi_2^L\right) + r\xi^H \tag{3.7b}$$

Where:

$$\pi^*\left(w, r\right) = \underset{L,H}{Max}\, F\left(L, H\right) - wL - rH \tag{3.8b}$$

A significant difference between the series of equations 3.1a-3.6 and 3.1b-3.8b is that unlike the previous case, household consumption and production decisions are separable. In particular the maximization problem in equation 3.1a and the subsequent constraints from equations 3.2 to 3.6 imply that the household's choice of the levels of consumption of G and leisure influences its agricultural production decisions. However, the transformation in equations 3.1b, 3.7b and 3.8b now implies that the household production decisions are based on the profit maximization condition, as outlined in equation 3.8b. In order to maximize profits, the household's choice variables are labour and land inputs and the choice is independent of household's endowments. This separation of production from consumption decisions is made possible under the assumption of complete markets. Although household's production decisions are separated from the consumption decisions due to the separation property, equation 3.7b shows that the consumption decisions are still dependent on the profits realized from production, bearing in mind the full-income constraint. Another point worth noting is that profit maximization is not an assumption in the model but it is derived from the assumptions of complete markets and utility maximization.

### 3.3.2 Agricultural Household Models: The Case of Incomplete Markets

Most agricultural households, particularly those from Sub-Saharan Africa live in communities that are characterized by incomplete markets. Indeed, in many areas of Malawi there are no functional land markets, labour markets are seriously fragmented with no agricultural trade unions in existence and the minimum wage legislation hardly enforced, and the credit markets are scarce. In such cases, the separation property of agricultural household models no longer holds, as the assumption of complete markets is unrealistic. Indeed, several researchers who tried to test for the existence of the separation property in developing countries could not find evidence in support of the hypothesis including Barrett (1996), Bardhan (1973), Jacoby (1993) and Udry (1998). Therefore, the assumption of complete markets is relaxed to consider agricultural households when markets are incomplete and households' production and consumption choices are intertwined.

When markets are incomplete, profit maximization is no longer possible and the production decisions are now dependent on household's endowments of factor inputs as well as its preferences. Following Bardhan and Udry (1999), we now assume that there is no market for land and that the labour market is characterized by market imperfections such that there is some involuntary unemployment in the rural labour market. The household production decision now depends on its endowment of land but it is now constrained with the amount of labour that it can supply to the market due to the unemployment. Assuming that the household is now made up of only one individual, the optimization problem of the household is:

$$\underset{G,\ell,L^Z,L^F \geq 0}{Max}\ U(G,\ell) \tag{3.10}$$

Subject to:

$$pG = F\left(L^f + L^Z, \xi^H\right) - wL^Z + wL^m \tag{3.11}$$

$$\ell + L^f + L^m = \xi^L \tag{3.12}$$

$$L^m \leq M \tag{3.13}$$

Where, as before, $L^Z$ is hired labour used on the farm; $L^f$ is the household own labour used on the farm, $L^m$ is the off-farm labour supply, i.e. the time spent by the household

working for a wage. M denotes the maximum amount of time the household can spend on working for a wage.

If equation 3.13 does not hold, then the off-farm labour supply would not be restricted, and the income constraint facing the household (which is presented in equation 3.11) would become $pG + w\ell = F\left(L, \xi^H\right) - wL + w\xi^L$. In this case, the household aims at profit maximization and the separation property holds, as before. On the other hand, suppose that equation 3.13 is binding, and that the household's endowment of labour is more, relative to the endowment of land, such that it wants to supply larger units of labour to the market. In this case, $L^m = M$, $L^Z = 0$ because the household would want to meet the quota that it is allowed to supply on the labour market, and it would not use any hired labour on its farm. We can set the numeraire p=1 and the household optimization problem now becomes:

$$\underset{G,\ell \geq 0}{Max}\, U\left(G, \ell\right) \tag{3.14}$$

Subject to:

$$G = F\left(\xi^L - M - \ell, \xi^H\right) + wM \tag{3.15}$$

The first-order condition for utility maximization are $U_l/U_G=F_L$ and equation 3.15. In this case, the household's production decisions depend on its preferences and its endowment of labour ($\xi^L$) and land ($\xi^H$). The separation property therefore no longer holds.

The analysis has shown that when one or more markets are incomplete, then recursiveness breaks down and agricultural household models become non-separable. There are different sources of this non-separability including the fact that first, agricultural production and marketing in many developing countries are associated with high transaction costs. These costs arise from long distances to the market, high transport costs and excessive marketing margins prompted by intermediate buyers (middlemen). The second source of the non-separability is the nature of markets. Agricultural markets in most of the developing countries, including Malawi, are scarce with a small number of

buyers. The third source is that households are faced with a lot risk and they also have a high degree of risk aversion.

Agricultural household models therefore still remain an important framework for analyzing agricultural household behaviour that incorporates the joint decisions that such households make. In particular, it has a key empirical distinction of accounting for household's farm profit effect. It is also important for policy design and assessing the impact of different policies, such as agricultural price policy.

### 3.4 Risk and Insurance in an Agricultural Economy

Another theoretical framework guiding the study is on the role of risk and the ability to manage the risk in an agricultural community. Households in Malawi face multiple risks, both idiosyncratic and covariate, some of which threaten their livelihoods and their own survival. For instance, based on the 2004 Malawi Second Integrated Household Survey, 77 percent of Malawian households experienced a large rise in the price of food; 62.5 percent reported experiencing a drought; 45.7 percent reported experiencing an illness within the household and death within the household was reported by about 40.6 percent of the households (Malawi Government and World Bank, 2006). As a result, households continue to devise strategies to manage the risks, both *ex-ante* and *ex-post*. Several authors (Bardhan and Udry, 1999; Ligon, 1998; Deaton, 1992) have attempted to develop theoretical frameworks that can model risk-pooling as an informal insurance mechanism against shocks among agricultural households.

A theoretical framework that analyses full risk sharing among all households within the rural community is presented first. The second case will analyze the use of inter-temporal consumption smoothing when full risk-pooling is not achievable. These are based on Bardhan and Udry (1999) and Ligon (1998).

### 3.4.1 Full Risk Sharing

Risk sharing can be said to exist when two economic agents (such as individuals, households, or firms) use state-contingent transfers to increase the expected utility of both by reducing the risk of at least one of them (Ligon, 1998). These transfers can be done by human institutions such as formal insurance markets, credit markets, and share cropping and informal transfer mechanisms in some parts of the developing world. The analysis begins by considering a set of households that live in a village indexed by $i = 1,\ldots,N$, each with a von Neumann-Morgenstern utility function, $U_i$, and a finite set of possible states of the world $s = 1,\ldots,S$, each with the probability of occurrence of $p(s)$. Assume further that there are $T$ periods, indexed by $t$ and in state $s$ of the world each household $i$ receives an income amounting to $Y_{is}>0$. Let $C_{ist}$ denote household $i$'s consumption in period $t$ if state $s$ occurs and suppose that the each household has the utility function of the form:

$$U_i = \sum_{t=1}^{T} \gamma^t \sum_{s=1}^{S} p_s u_i(C_{ist}), \qquad u' \succ 0, u'' \prec 0 \tag{3.16a}$$

where $Lim_{x\to 0} u'(x) = +\infty$. Given a set of household weights $\lambda_i$, such that $0< \lambda_i<1$, $\sum \lambda_i=1$, a Pareto-efficient risk allocation within the village can be found by maximizing the weighted sum of the utilities of the households:

$$\underset{ist}{Max} \sum_{i=1}^{N} \lambda_i U_i \tag{3.17}$$

Subject to:

$$\sum_{i=1}^{N} C_{ist} = \sum_{i=1}^{N} Y_{ist} \forall s,t \tag{3.18}$$

$$C_{ist} \geq 0 \ \forall i, s, t \tag{3.19}$$

Equation 3.18 is the village resource constraint which must be satisfied at every period $t$ and state $s$. Equation 3.19 states that household's consumption at any period $t$ and state of the world $s$ for any household $i$ is non-negative. The first-order conditions with respect to $C_{ist}$ and $C_{jst}$ yield:

$$\frac{u'(C_{ist})}{u'(C_{jst})} = \frac{\lambda_j}{\lambda_i} \forall i, j, s, t \tag{3.20}$$

Equation 3.20 holds for any pair of households (*i,j*) any period *t* and any state of the world *s* and the marginal utilities and the consumption of all households in the village move together. As such, the marginal utility of any household is a monotonically increasing function of the average marginal utility of all households in the village in any state of the world. This implies that household *i*'s consumption is a monotonically increasing function of village consumption. Thus equation 3.20 implies that $Corr\left(u_i'(C_{it}), u_j'(C_{jt})\right) = 1$ and we have full risk-sharing. There is thus a Pareto-efficient allocation of risk within the village and any transient changes in income are fully pooled at the village level. In this respect, households are no longer affected by shocks that are household specific but only covariate shocks that affect the community as a whole.

Full risk sharing can, therefore, be defined as a condition in which all idiosyncratic risk is eliminated. While households may still face risk, this risk is shared so that marginal utilities of consumption are perfectly correlated across all households. Full risk-sharing is a hallmark of any Pareto-efficient allocation, provided that the households have von Neumann-Morgenstern preferences, no one is risk-seeking, and at least one household is strictly risk-averse (Ligon, 1998). It should finally be pointed out that the separation property of households discussed in detail above prevails when there is full risk-pooling.

### 3.4.2 Intertemporal Consumption-smoothing

In the Malawian context, a Pareto-efficient allocation of risk is a far-fetched and an unrealistic assumption. Households are continuously faced with a variety of idiosyncratic shocks that remain uninsured. Such households usually employ inter-temporal consumption smoothing through saving and credit markets as a substitute for full risk-pooling. Following Bardhan and Udry (1999), the case of a household residing in an environment where Pareto-efficient risk sharing is unattainable, but with access to a credit market is now considered. The household's von Neumann-Morgenstern utility function is given as:

$$U_t = E_t \sum_{\tau=t}^{T} \gamma^{\tau-t} u(C_t) \qquad (3.16b)$$

Equation 3.16b is the expected utility function of the household covering the remainder of its lifetime. With the assumption of the availability of a credit market, let the interest rate that a household faces when it borrows from the credit market in any particular period be $r_t$. Assume that the household has a stock of assets $A_t$ at the beginning of period $t$, and $A_t>0$ if the household is a lender and $A_t<0$ if it is a borrower. Assuming further that the household receives a random income windfall of $Y_t$, it will then decide to maximize its utility as given in equation 3.16b subject to:

$$A_{t+1} = (1 + r_t)(A_t + Y_t - C_t) \tag{3.21}$$

The household will therefore make a decision on how to allocate its resources between consumption and net saving in period t+1. Its choice variable is consumption and it will choose a level of consumption that maximizes equation 3.16b subject to the resource constraint in equation 3.21.

Let $\Phi_t$ denote the value of the household's resources in time t, then the value function of the household in period t may be expressed as:

$$\Phi_t(A_t + Y_t) = \underset{C_t}{Max}\left[u(C_t) + \gamma \mathrm{E}_t \Phi_{t+1}\{(1 + r_t)(A_t + Y_t - C_t) + Y_{t+1}\}\right] \tag{3.22}$$

where E is the mathematical expectation operator.

Equation 3.22 shows that the value of the household's current resources (i.e. current assets and income) is equal to the maximized value of current consumption and the expected value of resources in period $t+1$ discounted at the prevailing rate of interest, $r_t$. Optimization and the envelope condition yield:

$$u'(C_t) = \gamma(1 + r_t)\mathrm{E}_t u'(C_{t+1}) \tag{3.23}$$

Equation 3.23 states that a household makes a decision to save or be a lender in such a way that the marginal utility of consumption in period $t$ is equal to the discounted expected marginal utility in the next period, $t+1$. Assuming that returns from assets is equal to the discount rate (i.e. $\gamma(1 + r_t) = 1 \ \forall t$) then equation 3.23 simply equates the marginal utility of current consumption to the expected utility of consumption in the next

period (i.e. $u'(C_t) = \mathrm{E}_t u'(C_{t+1})$). Assuming further that u is quadratic, equation 3.23 is transformed into:

$$C_t = \mathrm{E}_t C_{t+1} \tag{3.24}$$

Equation 3.24 shows that the household makes a consumption decision such that expected consumption is constant.

It can be shown that with some set of assumptions, equation 3.24 is related to the permanent income hypothesis[3]. Since $A_{\tau+1}=0$, the budget constraint (with $r_t$ constant at r) implies that the discounted value of consumption from any time *t* to *T* is equal to the value of asset the household has at period *t* plus the discounted value of its income stream from *t* to *T*. Combining the result with equation 3.24 and allowing T to go to infinity yields the permanent income hypothesis:

$$C_t = \frac{r}{1+r}\left( A_t + E_t \sum_{\tau=t}^{\infty} (1+r)^{-(\tau-t)} Y_t \right) \tag{3.25}$$

In this case, current consumption is the annuity value of current assets plus the present value of the expected stream of future income (Bardhan and Udry, 1999).

The existence of the permanent income hypothesis implies that households' consumption levels are not only based on current income but on the long-term income expectations. This implies that there is some form of consumption-smoothing among the households. Under the condition of consumption-smoothing, if there is a change in income due to a shock, the household's response is based on whether the income shock is temporary or not. If the income shock is transitory and it has no real effect on the household's future income expectations, then current consumption will only change minimally. However, if the income shock changes the long-term income expectations then the household's consumption levels will also change permanently.

[3] Developed by Milton Friedman in 1957, permanent income hypothesis states that choices that individuals make regarding their consumption patterns are determined not by their current income but by their long-term income expectations.

There are several studies that seem to validate the existence of consumption smoothing among households such as Paxson (1992), Rosenzweig and Wolpin (1993), Deaton (1991) and Skoufias (2003). However, the author is not aware of any studies that were aimed at testing for the existence of consumption-smoothing among households in Malawi. This current study will therefore shed more light on whether Malawian households undertake any inter-temporal consumption smoothing (presented in chapter 8).

### 3.5 Hypotheses

Based on the theoretical and conceptual frameworks discussed above, this study will test the following hypotheses:

1. The major source of vulnerability among rural households in Malawi is low mean consumption levels.
2. Rural households in Malawi use a variety of risk management strategies to cope with shocks.
3. Consumption is only partially protected from income shocks with food consumption being better protected than non-food consumption expenditures among rural households in Malawi.

### 3.6 Summary

This chapter has presented the conceptual and theoretical frameworks guiding this study. The different aspects of the study, reflected in the three empirical chapters, were presented in the conceptual framework to show how they are interrelated. The consideration of agricultural household models in the theoretical framework was based on the fact that the unit of analysis in the study is a rural household in Malawi that depend on smallholder agriculture for its daily livelihood. It therefore has to deal with the joint decisions of production, consumption and time use. While the agricultural household model in the case of complete markets was considered in the chapter to enrich the discussion, the primary concern was on modelling agricultural households in the case of incomplete markets because both land and credit markets are severely fragmented and incomplete in rural Malawi.

The chapter also presented the theory of risk-pooling in an agricultural economy. The case of full risk-sharing where all idiosyncratic shocks are insured in the community was presented. However, the realization that this type of Pareto-efficient risk allocation in a village hardly exists in most of the developing countries (including Malawi) led to the discussion on consumption smoothing. The section has shown that households' consumption smoothing is based on the permanent income hypothesis and that while a transitory income shock changes household consumption temporarily, a large income shock changes the entire household long-term consumption pattern.

# Chapter 4

# OVERVIEW OF THE MALAWI ECONOMY AND DATA CONSIDERATIONS

## 4.1 Introduction

Malawi remains one of the most poverty stricken nations in the world and the rate at which poverty is being reduced is unbearably low. While the headcount poverty index was estimated at 65.3 percent of the population using IHS1 data of 1997/98, it only reduced to 52.4 percent in 2005 (based on IHS2 data). Since all the poverty reduction programmes being undertaken in Malawi are based on who is currently poor, it is worthwhile to understand not only the characteristics of the poor but also the settings (economic, social, political and physical) in which the households operate. This is the entry point of the discussion on the economy of Malawi.

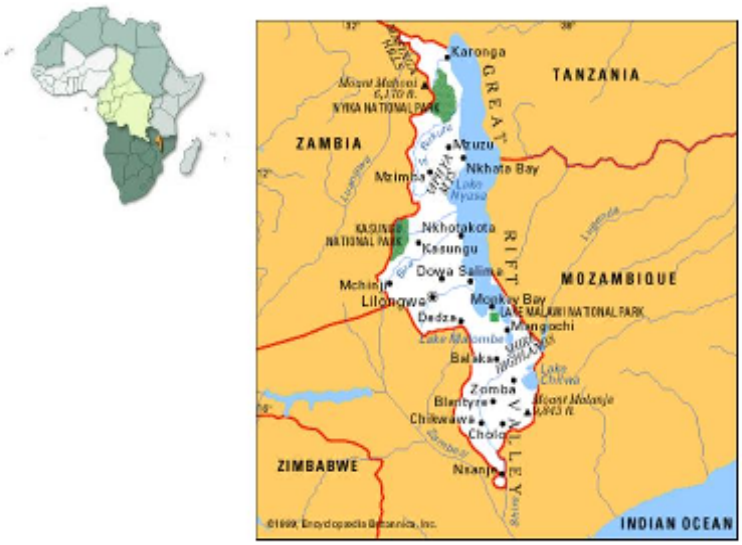
When conducting an analysis of poverty a cross-sectional data set is sufficient because it is simply a snapshot of the poverty situation at one point in time. However, a firm understanding of vulnerability to poverty requires more than one cross-sectional data set. Since vulnerability is basically an *ex-ante* measure of future poverty, its assessment is usually data intensive. This chapter, therefore, gives the details of the different data sets that are employed in the study.

The aim of this chapter is therefore two-fold: first, to present an overview of the Malawi economy such that any poverty and vulnerability analyses are put in their proper perspectives by taking into account the environment in which the households find themselves. Second, to describe the nature and type of data that is used in the study. The chapter proceeds as follows: a country profile for Malawi presented in section 2 is followed by a discussion on the Malawi economy. Section 4 discusses the data issues, including data sources and how expenditure aggregates and poverty lines were constructed. Section 5 concludes the discussion.

## 4.2 Malawi Country Profile

Malawi is a land-locked small country located in southern Africa with a total land area of 118,000 $Km^2$, about 20 percent of which is water. It is bordered by Tanzania to the north, Zambia to the north-west and Mozambique to the south (figure 4.1). The eastern part of the country is dominated by Lake Malawi which is the third largest lake in Africa, stretching over an area of 22,490 $km^2$. Malawi is a highly populated country and the population was estimated at 13 million in 2006 (UK Foreign and Commonwealth Office, 2007). The climate is a sub-tropical one which is usually dry and strongly seasonal with annual average temperature between $20^o$ and $37^o$ Celsius (Malawi Meteorological Services, 2006).

**Figure 4.1: Map of Malawi Showing International Boundaries**

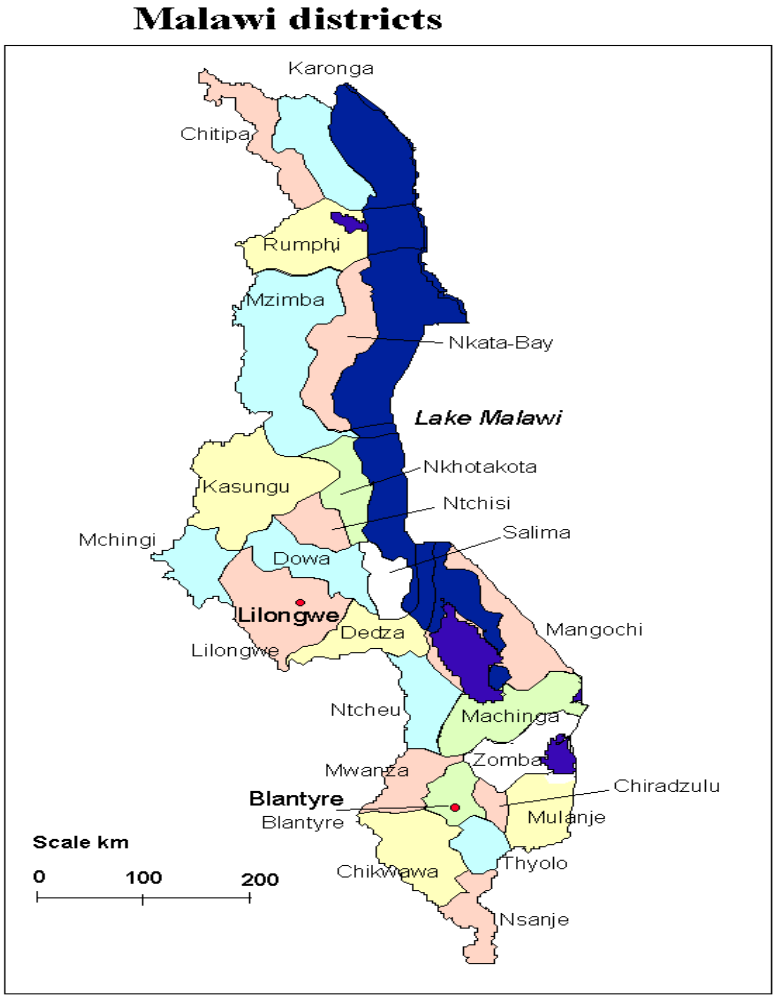



**Source: Canadian Council on Africa (2004)**

The rainy season stretches from November to March and is characterized by wet and warm weather, and it is during this period that 95 percent of the annual precipitation

occurs. In a normal year, the annual rainfall ranges between 725 mm and 2,500 mm. A hot dry season runs from September to October with temperatures varying between 25$^{o}$ and 37$^{o}$ Celsius. A cold winter season lasts from May to July during which temperatures fall as low as 4$^{o}$ Celsius.

**Figure 4.2: Districts of Malawi**




**Source : Reliefweb (1997)**

Following the country's independence from Britain in 1964, Malawi was divided into three administrative regions (north, centre, south) spread across 27 districts (see figure 2.2). The northern region comprises 6 districts, covering a total area of 26,931km$^{2}$, which

is around 28.6 percent of the total land in Malawi. The central region, covering a total area of 35,592 $km^2$ is the largest region, constituting 37.8 percent of land area in Malawi. It is made up of 9 districts, including Lilongwe which is the national capital. The southern region is the second largest region covering a total area of 31,754 $km^2$, spread across 12 districts and representing 33.6 percent of the land in Malawi (Malawi National Statistics Office, 2005). It is home to the commercial capital of Malawi, known as Blantyre.

### 4.3 Structure of the Malawi Economy

The economy of Malawi is agro-based with the agricultural sector contributing over 38.6 percent of the country's gross domestic product (GDP), accounting for over 82.5 percent of its foreign exchange earnings and supporting over 90 percent of the population (Malawi Government, 2004; World Bank, 2006b). Further, 84.5 percent of the total labour force is employed in the agricultural sector, with the majority working as smallholder farmers. It should be pointed out that the agricultural sector comprises the commercial sub-sector and the smallholder sub-sector. The smallholder sub-sector contributes around 25 percent of the total GDP, employs 95 percent of the total agricultural labour force (Malawi Government, 2004), and almost 70 percent of agricultural produce in Malawi comes from smallholder farmers (World Bank, 2006).

Over 80 percent of the cultivated land in the smallholder sub-sector is devoted to maize production, which is the country's staple crop. The country's major export crop is tobacco, which accounts for 60 percent of all export earnings, followed by tea, sugar and coffee, each contributing about 5 percent of the total export earnings (UK Foreign and Commonwealth Office, 2007). The major trading partners include South Africa, Germany, United States of America, Zimbabwe, Mozambique, the Netherlands, the United Kingdom and Japan.

The manufacturing sector in Malawi remains small and stagnant at only 11 percent of the GDP, comprising mainly agro-processing activities in the tobacco, tea and sugar sub-sectors (Malawi Government, 2004). According to the UK Foreign and Commonwealth

Office (2007), annual GDP was estimated at US$ 2.172 billion in 2006 with a GDP per capita of only US$ 147. Annual economic growth was estimated at 7 percent in 2007 from 5 percent in 2004 and 2005 and 5.5 percent in 2006 (Malawi Government, 2004).

Several policies have been put in place to support sustainable economic growth which is necessary to reduce poverty and put the country on course for achieving the United Nations' Millenium Development Goals (MDGs). The Malawi Economic Growth Strategy (MEGS) of 2004 outlined policies and activities within different sectors of the economy that are necessary to achieve a sustained annual economic growth of at least 6 percent which is required to reduce poverty by half by 2015 (Malawi Government, 2004). Recently, the Malawi Poverty Reduction Strategy Paper (MPRSP) of 2002 and the MEGS have been incorporated in the Malawi Growth and Development Strategy for 2006-2011. It is a short-term strategy for achieving poverty reduction through sustainable economic growth, social protection, social development, infrastructure development and improved governance (Malawi Government, 2006).

Malawi heavily depends on development assistance from multilateral agencies and bilateral donors to implement different activities aimed at achieving poverty reduction through sustainable economic growth and infrastructure development, as outlined in the Malawi Growth and Development Strategy for 2006-2011. According to the World Bank (2006b), Malawi receives around US $400 million per year as development assistance. The multilateral agencies operating in Malawi include the European Commission, the International Monetary Fund, the African Development Bank, the United Nations and the World Bank. There are also several bilateral donors that are financing activities in different sectors of the economy with the aim of reducing levels of poverty. The United Kingdom (UK) is the largest bilateral donor to Malawi and it finances programmes in many different sectors as well as the provision of budgetary support. Germany provides support in health, education and democratic decentralization; Norway finances programmes on HIV/AIDS, health, education, agriculture and natural resource management; Japan's resources are geared towards infrastructural development and agriculture while Canada funds projects in health, HIV/AIDS, education, governance and

accountability. Apart from the World Bank, there are several donors that provide budgetary support to the government of Malawi. These include Denmark, Norway, Sweden, UK, Norway, and the EU.

## 4.4 Data Considerations

This section outlines the characteristics of the IHS2 dataset which forms the foundation of the whole study. It also describes how household expenditures were aggregated and poverty lines constructed. This is important because the same method of aggregation was used in the second period data set to make the two data sets comparable. Furthermore, the same poverty lines are used in the whole study to distinguish the non-poor from the poor and the ultra-poor. The official poverty line for Malawi remained at MK 16,165 per capita per annum between 2004 and 2006. It is important to note that the information that is used in the study cover the period between 1999 and 2006. Although the first survey round was conducted in 2004, information was collected from households with a recall period of 5 years. In the second round in 2004, the recall period was two years to cover the time between the two rounds.

The primary data that are used in the study are described in this section. In particular, the section describes how the households were sampled from the main IHS2 data set and consequently followed up with a similar questionnaire to form a two-period panel data set.

### 4.4.1 Data Basis

There are three data sets used in the study. This section will describe all the three in detail. The first data set is drawn from the Malawi Second Integrated Household Survey (IHS2) carried out by the Malawi National Statistical Office (NSO). The IHS2 was a comprehensive socio-economic survey of the living standards of households in Malawi. This is part of the World Bank's Living Standards Measurement Study (LSMS) across countries, aimed at improving current data and methods of poverty and inequality analysis (World Bank, 2007). The first IHS[4] was conducted between 1997 and 1998. The

[4] IHS1 data could not be used in the analysis since it did not have adequate information on shocks.

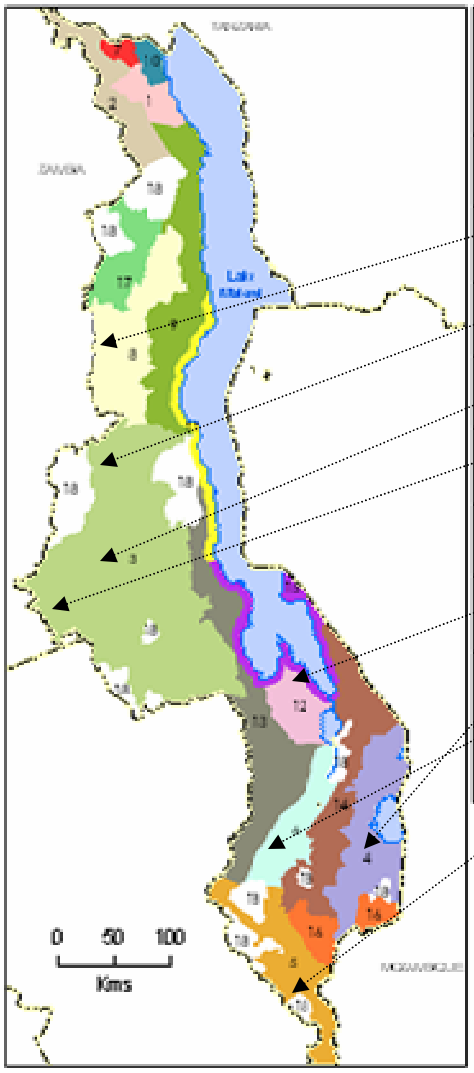
IHS2 data were collected in 2004 covering a sample of 11,280 households spread across 564 communities in 26 districts in Malawi. The survey used two sets of questionnaires: household questionnaire and community questionnaire.

The household questionnaire comprises 31 modules covering different aspects of the household including household identifiers, household roster, education, health, time-use and labour, housing, consumption, income, agriculture, household enterprises, social safety nets, credit, and recent shocks, among others. The community questionnaire was shorter than the household one and it only had seven modules on physical and demographic characteristics of the community, access to basic services, economic activities, agriculture and prices, among others.

The second data set is the primary data which were collected between June and December 2006. Due to a lack of household panel data in Malawi, a small sample of 300 households was obtained from the IHS2 dataset, with the aim of following them up and applying a similar questionnaire to obtain a 2-period panel data. As mentioned in the literature (see Christiaensen and Subbarao (2004), Dercon (2001), Chaudhuri (2000), and many others), vulnerability assessments are better conducted using panel data. The second round was therefore initiated to facilitate a worthwhile vulnerability assessment of the households in Malawi.

The sampling procedure for the 300 households involved the identification from the IHS2 data of one district in the northern region, three districts in the central region, and four districts in the southern region. The districts were purposively sampled based on rainfall distribution in 2004-2005 cropping season. The districts with the highest and the lowest annual rainfall were included. This is important in our estimation of the vulnerability model since drought (which is the major shock included in the study) is highly correlated with rainfall distribution. In each district, at most two traditional authorities (TA) were randomly sampled, and then at most three enumeration areas (EA) in each TA were randomly sampled. Finally, at least thirty households in each EA were randomly selected to form the sample. The result was a sample of 300 households.

**Figure 4.3: Map of Malawi showing Sampled Districts**




| REGION | District | COMMUNI -TIES (EA) | HOUSEHO -LDS |
|---|---|---|---|
| 1. NORTH | Rumphi | 2 | 30 |
| 2. CENTRAL | Kasungu | 3 | 30 |
| | Lilongwe | 2 | 40 |
| | Mchinji | 3 | 30 |
| 3. SOUTH | Zomba | 4 | 50 |
| | Mangochi | 2 | 30 |
| | Blantyre | 2 | 20 |
| | Chikwawa | 2 | 30 |
| | Total = | 20 | 260 |

**Source: MVAC (2003)**

During the data collection exercise, which ran from June to December 2006, several logistical problems were encountered. Attrition was one of the serious problems encountered as some household heads had migrated and others had died. The result is that data was only collected from 259 households spread across twenty communities (figure 4.3).

The third dataset is secondary data on livelihood profiles of the sampled areas which were collected from the Malawi Vulnerability Assessment Committee (MVAC)

secretariat, based at the Ministry of Economic Planning and Development headquarters in Lilongwe. The livelihood profiles collected were for 2003, 2004 and 2005. The information also included a description of all the 11 livelihood zones in Malawi, as well as maps for the zones which are used in chapter 5 of this study.

### 4.4.2 Construction of Expenditure Aggregates

Consumption expenditure, as opposed to household income, is the common measure of household welfare in Malawi. Expenditure aggregates and poverty lines from IHS2 were constructed by the Malawi National Statistical Office (NSO) and the World Bank. This section presents the methodology used to aggregate household[5] consumption expenditure which is then used to develop the poverty lines that are used in the study. Consumption-related expenditures were classified in IHS2 based on the UN statistical classification system known as Classification of Individual Consumption According to Purpose (COICOP) (World Bank, 2006a). The consumption expenditures were categorized into four groups: food; non-food, non-consumer durables; consumer durable goods; and actual or estimated rental cost of housing (table A6-1 in appendix A6). Food consumption expenditure was computed from three different sources: purchased food, consumption from own production and food received as gifts. The recall period was the last seven days. The values were then annualized.

A spatial price index was developed and used to correct for temporal and spatial differences in prices. The index was developed using price data collected by NSO for February/March 2004 along with the national basket weights for 42 food and non-food items for all the survey areas (World Bank, 2006a).

[5] In IHS2 (and also in the second round of data collection) the unit of analysis is a household. A household member is defined as any resident in the dwelling who had been present in the dwelling for 9 or more of the 12 months prior to the survey. The household head, guests who had visited more than 3 months, infants younger than 9 months, new spouses, and members residing elsewhere but still dependent on the household were also considered members. Servants, hourly workers and lodgers were not considered members if they had their own family elsewhere (World Bank, 2006a).

### 4.4.3 Construction of Poverty Lines

The poverty line derived from the IHS2 data is pegged at (Malawi Kwacha) MK 16,165[6] per person per year or MK 44.30 per person per day. The poverty line comprises a food component and a non-food component. The *food poverty line* is defined as the amount of expenditure below which an individual is not able to purchase enough food to meet a recommended daily caloric requirement. The food poverty line was derived by adopting the World Health Organization's (WHO) calorie requirements for moderate activity. The minimum calorie requirement was then applied to the IHS2 sample to yield a median caloric requirement of 2,400 calories per day per person (World Bank, 2006a).

In order to estimate the cost of buying the 2,400 calories' worth of food, a reference population was identified as the population in the 5$^{th}$ and 6$^{th}$ deciles of the consumption aggregate distribution. This was to ensure that the combination of food that contributes to the minimum calories are not those consumed by wealthy households (so that the food is expensive) or those consumed by extremely poor households (such that the food is extremely cheap). The cost of 1000 calories was then estimated at MK11.48, yielding a food poverty line of MK 10,029 per person per year. It should be pointed out that the food poverty line is also the *ultra-poverty line*. Following this definition, the ultra-poor are those households whose total expenditure per capita is below the food poverty line.
The *non-food poverty line* was calculated based on the non-food consumption of the households whose food consumption is close to the food poverty line. The non-food component was obtained as the weighted average non-food expenditure for those households close to the food poverty line.

The average expenditure was kernel weighted to ensure that households that are very close to the food poverty line are given more weight than those further away from the line (World Bank, 2006a). Using this method the non-food poverty line was pegged at MK 6,136 per person per year. Adding together the food and non-food components yields a *total poverty line of MK16,165* per person per year.

[6] €1=MK 223 (at the July 2008 exchange rate)

## 4.5 Summary

This chapter has outlined the country profile for Malawi including the structure of its economy. It has highlighted the fact that Malawi is an agro-based economy which relies heavily on development assistance to carry out different projects aimed at reducing poverty, as those outlined in the current Malawi Growth and Development Strategy (MGDS, 2006-2011). The chapter has also described the types and sources of data that are used in the study.

# Chapter 5

# POVERTY AND LIVELIHOOD PROFILES OF THE STUDY AREAS

## 5.1 Introduction

Knowledge of a country's poverty incidence is not sufficient for policymakers and development practitioners who are involved in developing poverty reduction strategies. Effective poverty reduction strategies are based not only on poverty rates in a country but also on the distribution of poverty among the different segments of the population. In order to institute policies that are effective to reduce levels of poverty in Malawi, policymakers need to be aware of how the extent of poverty varies across subgroups of the population. The poverty profiles presented below are geared towards achieving this objective. These are complemented by livelihoods profiles that describe sources of food and income in the different study sites.

Using the whole IHS2 data set, this chapter, therefore, outlines poverty profiles that enable one to determine which household characteristics are highly correlated with poverty in Malawi. This is followed by section 3 which describes the livelihood profiles of the study areas. Finally, section 4 provides a conclusion to the discussion.

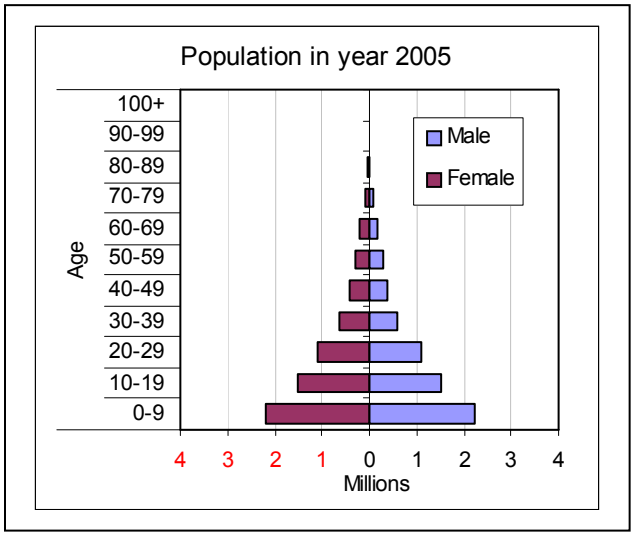
## 5.2 Poverty Profiles

This section presents the poverty profiles for Malawi. A poverty profile can be defined as a presentation of the poverty conditions under which the population is living (Ravallion and Bidani, 1993). Using national survey data, a poverty profile assesses the magnitude of poverty, identifies the extent of poverty in the various segments of the population and highlights the correlation between wealth or poverty status of a household and its educational, health, and economic characteristics. This section presents Malawi poverty profiles with respect to household demographic characteristics, education, employment and health. These profiles are derived from the IHS2 data.

### 5.2.1 Demographic Characteristics

The population in Malawi is predominantly young, with around 60 percent of the estimated 12.9 million people aged only 20 (figure 5.1). According to the CIA World Factbook, the population growth rate in Malawi is estimated at 2.38 percent in 2007.

**Figure 5.1: Malawi Population by Age and Gender in 2005**




**Source: IHS2 data, and Malawi Government and World Bank (2006)**

This high population growth rate is one of the variables that are fuelling poverty in Malawi. This can be verified by considering differences in household size between poor and non-poor households (table 5.1). The table shows that poor households have larger household sizes than the non-poor ones who have an average of 3.8 members.

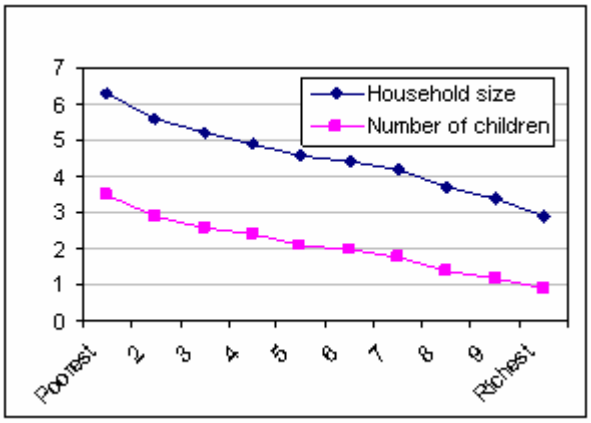
**Table 5.1: Poverty Profile: Household Demographics**

| | Non-Poor Households | Poor Households | Overall |
|---|---|---|---|
| Household size | 3.8 | 5.4 | 4.5 |
| Dependency ratio | 0.81 | 1.41 | 1.1 |
| Number of children | 1.5 | 2.8 | 2.1 |

**Source: Own compilation from IHS2 data**

If we classify children as those individuals between age 0 and 14, then the same pattern emerges. Poor households have 2.8 children on average which is higher than the non-poor average of 1.5 children. The dependency ratio, defined as the ratio of the economically dependent individuals (those individuals between 0 and 15 years old + those above 65 years of age) to the economically active group ( between 16 and 64 years of age), is also higher for poor households (1.4) compared to 0.8 for the non-poor households (table 5.1). A further classification of these demographic characteristics by consumption expenditure deciles indeed reveal that the poorer the household the larger the household size and the more the number of children (figure 5.2).

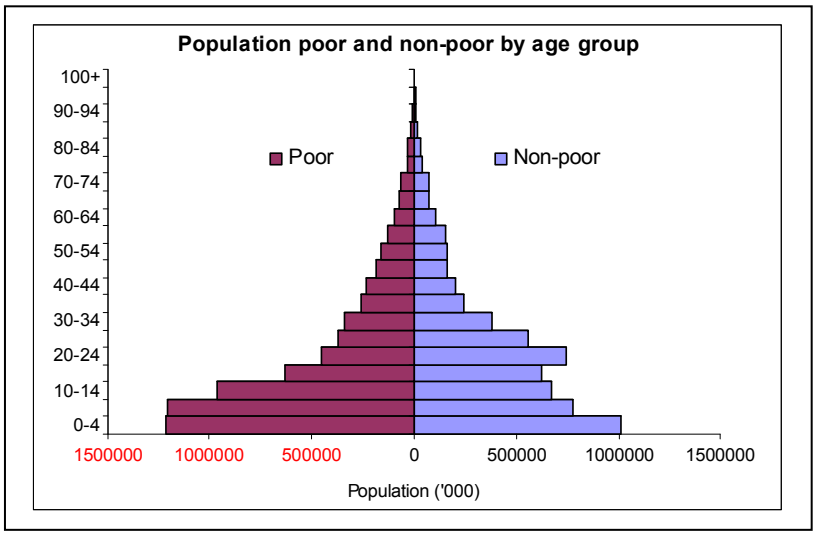
**Figure 5.2: Household Size and Number of Children by Income Decile**




**Source: Own compilation from IHS2 data**

A further classification of the poor by age-group shows that around 53 percent of the poor are children (aged 0 to 14 years), as presented in figure 5.3. Since there is a rapid population growth in Malawi, the proportion of the young age groups is bound to increase, thereby worsening the poverty situation.

**Figure 5.3: Demographic Composition of Poverty in 2005**



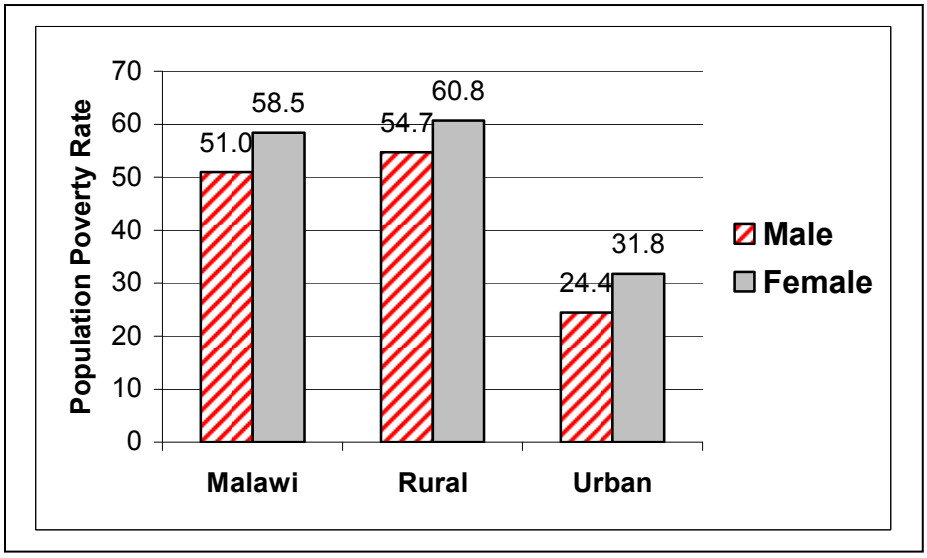

**Source: Own compilation from IHS2 data**

### 5.2.2 Poverty Profiles: Characteristics of the Household Head

The study also explores which characteristics of the household head are major correlates of poverty in Malawi. First, considering the relationship between gender of the household head and poverty yields the results presented in figure 5.4. It is shown in figure 5.4 that poverty rates are higher in female-headed households in both urban and rural Malawi. About 61 percent of the female-headed households in rural Malawi are poor compared to only 32 percent in the urban areas. It should, however, be pointed out that although female households are poorer than male-headed ones, the majority of the poor in Malawi live in male-headed households. A plausible explanation to this scenario is that male-headed households are in majority comprising 77 percent of all households in Malawi.

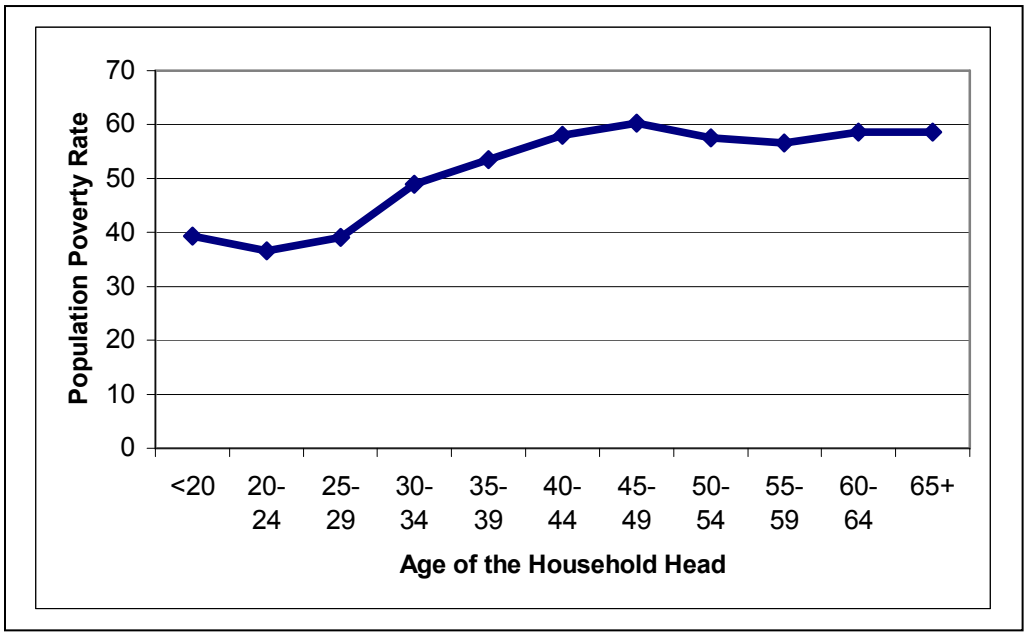
Comparing poverty rates by the age-group of the household head also shows that, to some extent, households are poorer the older the household head (figure 5.5). For the households whose head is older has a higher poverty rate than those with a younger head up to the 45-49 age-group, beyond which the relationship becomes less apparent. A further analysis of poverty rates by the educational attainment of the household head reveals that there is an inverse relationship between the number of years of schooling and poverty rates (figure 5.6).

**Figure 5.4: Poverty Rates by Gender of Household Head and Residence**




**Source: Own compilation from IHS 2 data**

**Figure 5.5: Population Poverty Rates by Age-group of Household Head**

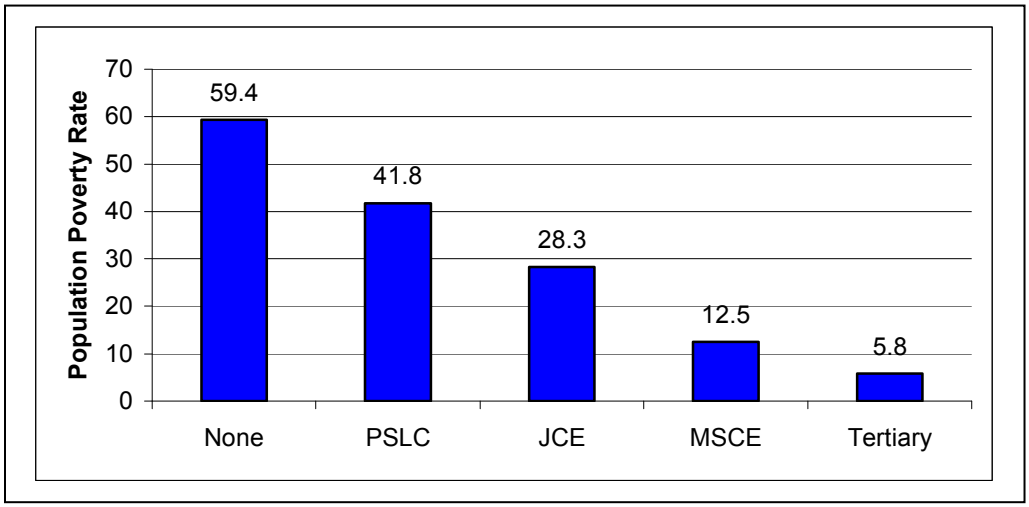



**Source: Own compilation from IHS2 data**

About 60 percent of the households whose head has no educational qualification at all are poor, while around 42 percent of the households whose head has a Primary School

Leaving Certificate PSLC (equivalent to eight years of schooling) are poor. The trend continues for the Junior Certificate Examination (JCE) level (equivalent to ten years of schooling) and the Malawi School Certificate Examination (MSCE) level (equivalent to twelve years of schooling), and for the tertiary level which is the post-MSCE level. Thus, the more educated the household head the less likely that the household would be classified as poor.

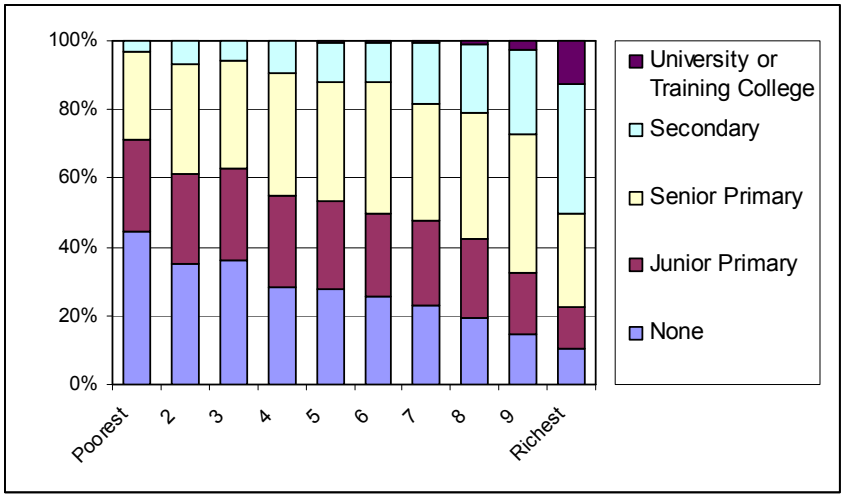
**Figure 5.6: Population Poverty Rate by Educational Attainment of Household Head**




**Source: Own compilation from IHS2 data**

The educational level of the household head can also be analyzed according to household expenditure deciles, as shown in figure 5.7. It can be seen that almost 75 percent of the household heads in the poorest decile have less than senior primary education. For the richest decile the figure is as low as 20 percent. On the other hand, all the households whose heads have post-secondary education are relatively well-to-do, falling into the richest and the second richest deciles.

**Figure 5.7: Education of Household Head by Expenditure Decile**




**Source: IHS2 data, and Malawi Government and the World Bank (2006)**

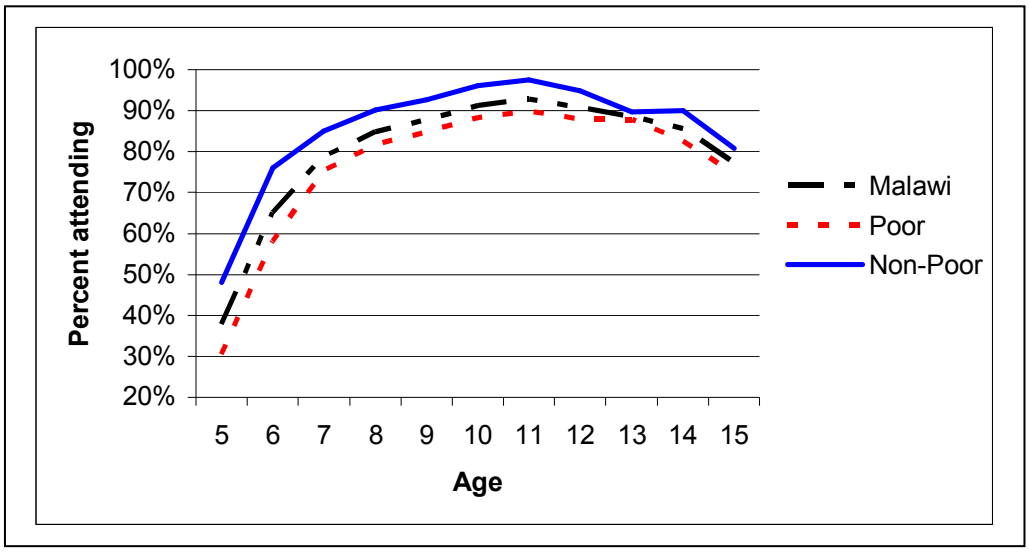
**Note:** Junior Primary is between 1 and 4 years of schooling; Senior Primary is from 5 to 8 years of schooling; Secondary is from 9 to 12 years schooling; and university or training college is beyond 12 years.

### 5.2.3 Poverty Rates by Education, Employment, Health, Sanitation and Land

Data from IHS2 reveal that children from poor households are less likely to be in school than those from the non-poor families (figure 5.8). The disparity between children from the poor and the non-poor households is highest for the very young age groups but the percentage attending school for both the poor and the non-poor children continue to rise from age 5 until it reaches a pick at around 11 years and it then starts to decline.

Another important correlate of poverty is literacy rate. The adult literacy rate is the proportion of individuals who are at least 15 years old and are able to read and write a simple statement about their everyday life (World Bank, 2006b). According to figure 5.9, the rate is higher for males (76 percent) than for females (53 percent), yielding a national average of 64 percent. The rate is higher in urban than the rural areas and it is higher for the non-poor than for the poor households.

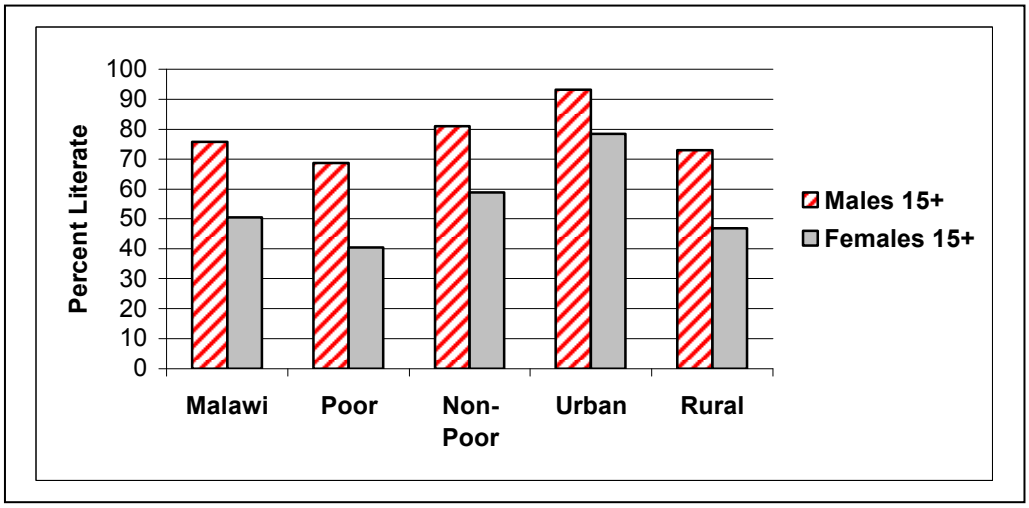
**Figure 5.8: Children Attending School by Poverty Status**




**Source: IHS2 data, and Malawi Government and the World Bank (2006)**

Youth literacy, defined as the percentage of individuals between 15 and 24 years who can both read and write, is pegged at 76 percent which is 12 percent higher than adult literacy. However, it shares the same trends with adult literacy in Malawi (figure 5.10). The non-poor have a higher rate than the poor and it is higher in urban than rural areas.

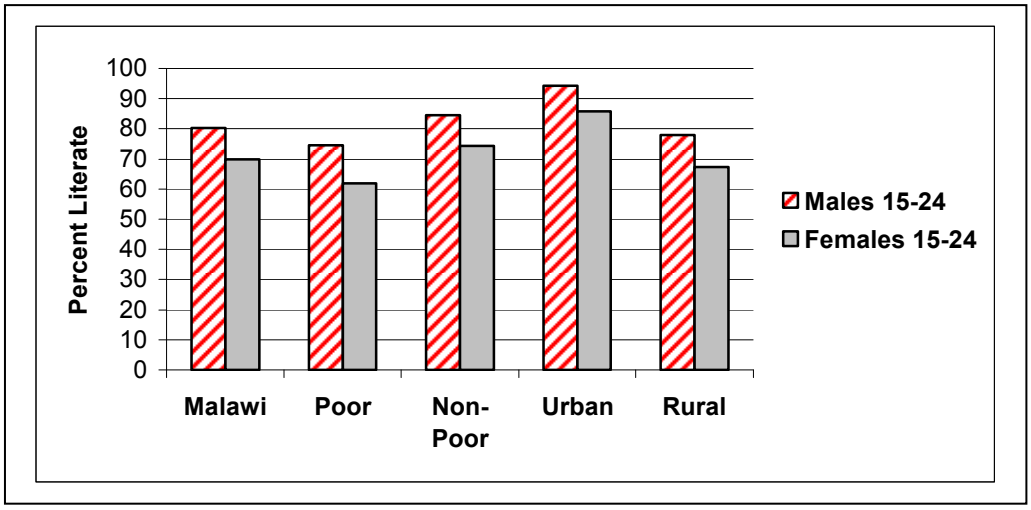
**Figure 5.9: Adult Literacy Rate (Percent)**




**Source: Own compilation from IHS2 data**

However, the major difference between adult literacy and youth literacy is that there is less disparity between males and females in the youth literacy rates with the ratio of youth literacy females to males at 95 percent.

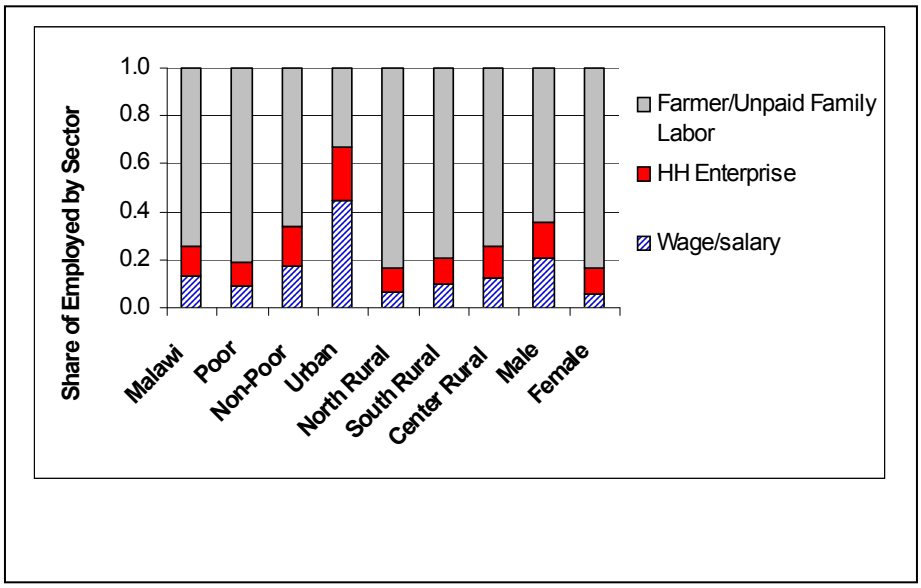
**Figure 5.10: Youth Literacy Rate (Percent)**




**Source: Own compilation from IHS2 data.**

An analysis of employment by sector shows that salaried employment is very low in Malawi, as depicted in figure 5.11. The majority of the population are engaged in farm and/or unpaid family labour. About 80 percent of the poor are farmers as compared to 62 percent of the non-poor. A small proportion of the poor are engaged in household enterprises and salaried employment since wage employment is biased towards non-poor individuals. A comparison of sources of employment by location shows that a wage or salaried employment is an important source of employment (accounting for about 40 percent) in the urban areas as compared to the rural areas which is less than 10 percent. A breakdown of rural employment by region further shows that over 85 percent are employed in the farm in the northern region as compared to 80 percent in the southern and about 75 percent in the central region. Employment by gender shows that farming is dominated by women with around 85 percent of females employed on-farm compared to only 65 percent of males. On the other hand, wage employment is dominated by male individuals, accounting for around 9.9 percent, as compared to females' share of only 2.5 percent.

**Figure 5.11: Employment by Sector**

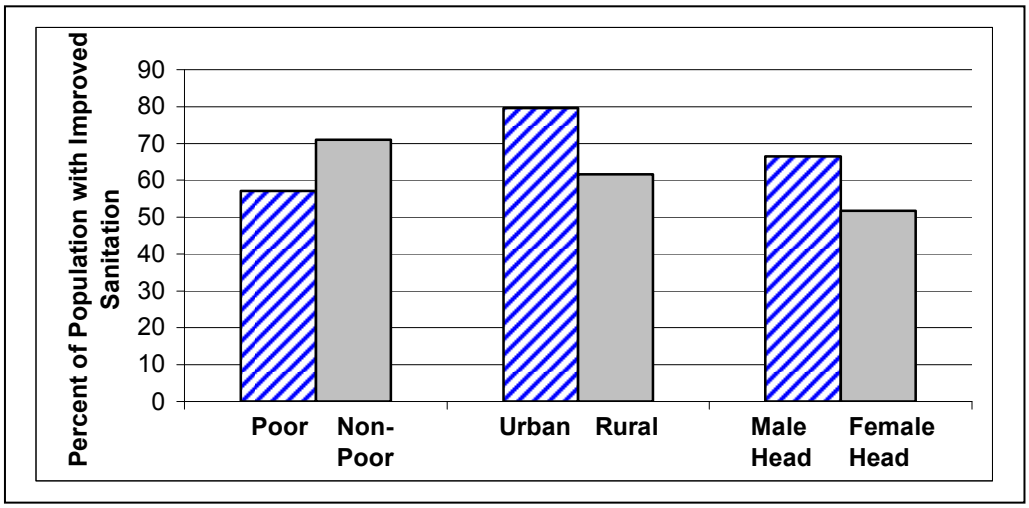



**Source: IHS2 data, Malawi Government and the World Bank (2006)**

The proportion of households that has improved sanitation facilities is higher among the non-poor than the poor households. IHS2 defined the presence of improved sanitation as occurring in those households which reported having a flush toilet, a ventilated pit latrine or a roofed traditional latrine. Figure 5.12 shows that 71 percent of the non-poor households have improved sanitation facilities compared to 58 percent of the poor. The proportions are higher in the urban areas (80 percent) than the rural areas (71 percent). They are also higher among male-headed households (67 percent) than among their female-headed counterparts (52 percent).

Access to improved water is another important variable that is strongly correlated with community poverty levels. IHS2 classification for improved water sources include water piped into a dwelling; water piped outside a dwelling; communal stand pipe; and personal or communal hand pump. Figure 5.13 shows that there is not much difference in access to improved water between poor and non-poor households. However access is higher in the urban areas (88 percent) than the rural areas (64 percent).

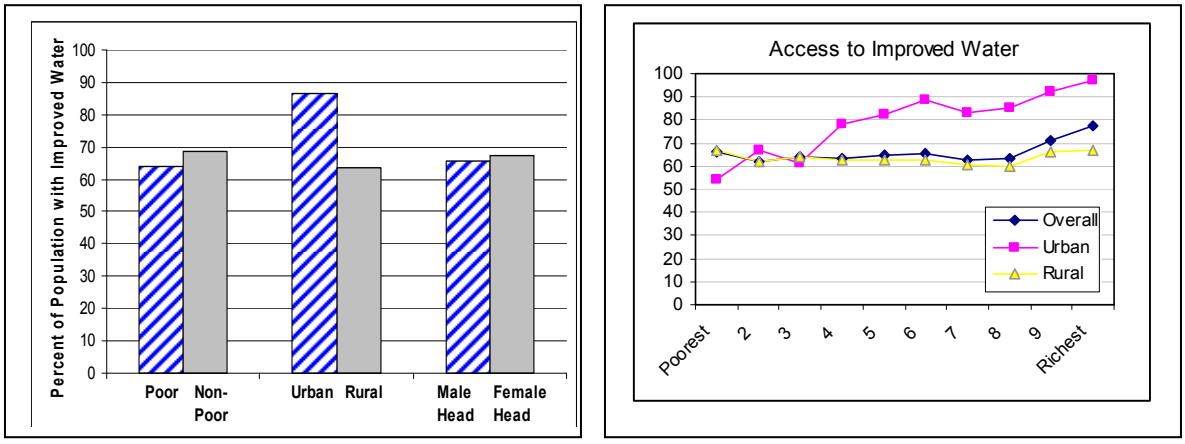
**Figure 5.12: Proportion of the Population with Access to Improved Sanitation**




**Source: Own compilation from IHS2 data**

A further classification of access to improved water by expenditure deciles shows that access to improved water increases by decile in the urban areas but is fairly constant in rural areas. Overall, about 67 percent of those in the poorest decile have access to improved water compared to 78 percent in the richest decile.

**Figure 5.13: Proportion of Population with Access to Improved Water Source**

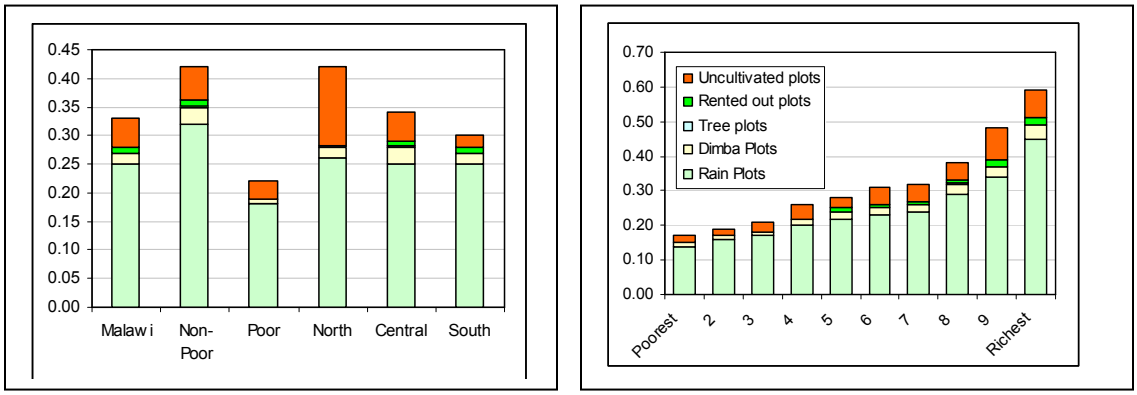



**Source: IHS2 data, Malawi Government and World Bank (2006)**

Poverty profiles can also be classified according to rural land holdings. Since the economy is dominantly agro-based, with more than 85 percent of the population engaged

in smallholder rain-fed agriculture, land holding size is a major determinant of poverty. According to figure 5.14, rain-fed plots remain the most dominant form of land owned by Malawians. The non-poor have larger land holdings than the poor but the national average is only 0.33 hectares per capita. Land holdings are largest in the northern region (0.43 ha per capita) then central region (0.35 ha) and least in the southern region (0.29 ha).

**Figure 5.14: Rural Land Holdings (Average Hectares per capita)**



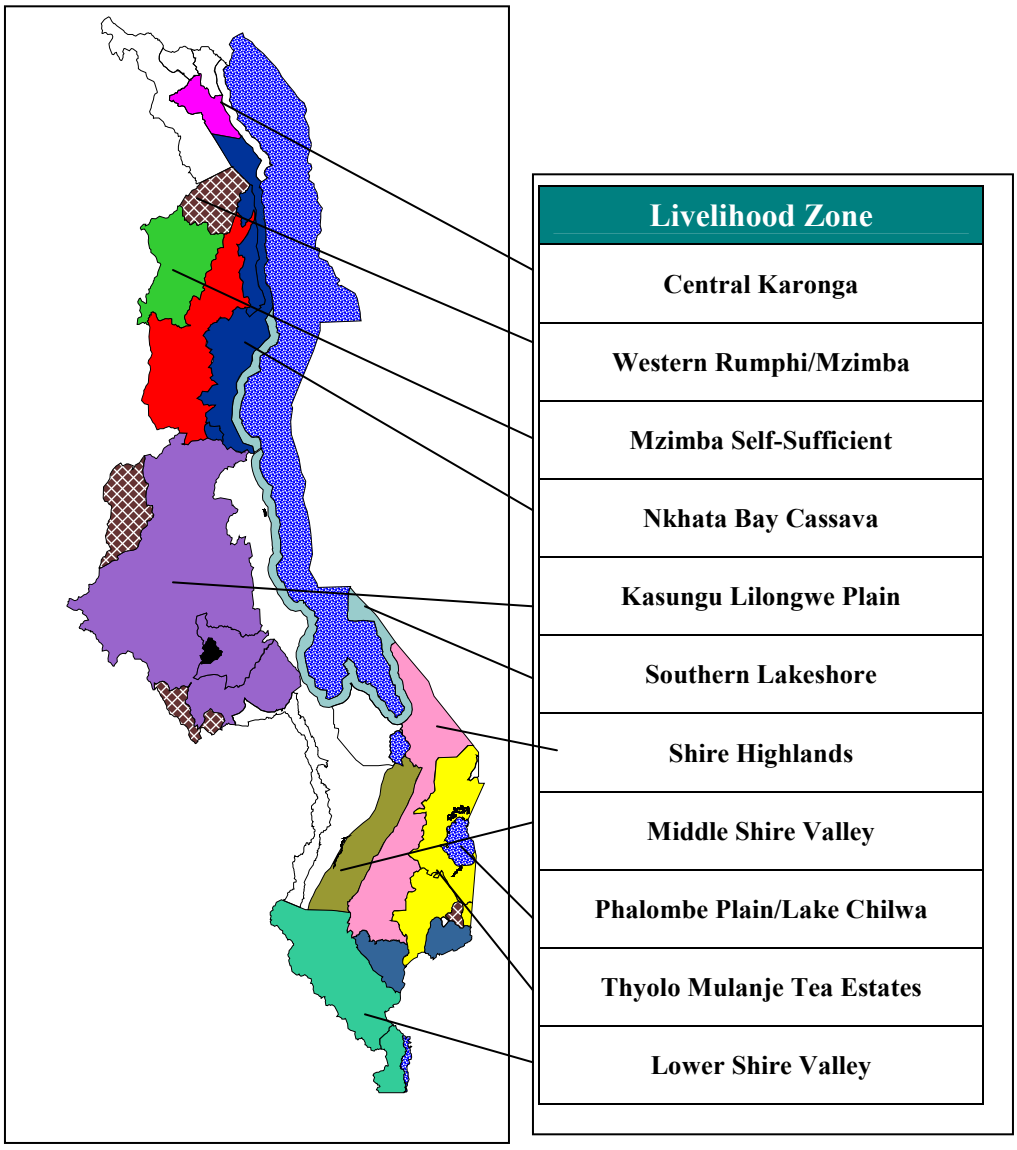

**Source: IHS2 data, Malawi Government and World Bank (2006)**

## 5.3 Livelihood Profiles of the Sampled Districts

This section presents livelihood characteristics of the 8 districts in Malawi from which primary data were collected (as shown in figure 3.1). In this chapter, livelihoods are defined as the ways and means that households use to make a living. In particular, these livelihoods are the activities, the assets, and the access that jointly determine the living gained by an individual or a household (Ellis, 2000; Chambers and Conway, 1992). The analysis of the district characteristics is in the framework of livelihoods as developed by the Malawi Vulnerability Assessment Committee (MVAC)[7]. This section therefore adopts the livelihood zones that were mapped by the MVAC.

[7] MVAC is a consortium committee of Malawi Government, Non-governmental Organizations (NGOs) and United Nations agencies in Malawi and it is chaired by the Ministry of Economic Planning and Development. MVAC provides timely information on food insecurity thereby informing policy formulation, development programmes and emergency interventions aimed at reducing poverty and food vulnerability in Malawi.

**Figure 5.15: Malawi Livelihood Zones**




**Source: MVAC (2003)**

It should be noted that the MVAC's livelihood analysis is an input in an analysis of vulnerability to hunger and food insecurity in Malawi. Their purpose is to undertake assessments and analysis with the objective of improving the understanding of vulnerability as well as informing policy to reduce household vulnerability to hunger (MVAC, 2003). Their work is based on the livelihoods-based vulnerability approach

which hinges on the Household Economy Approach (HEA)[8]. An exposition of this approach is not a subject of this study but it suffices to note that their approach involves mapping the country into different livelihood zones. These zones are simply areas where households share similar options for obtaining food and income, and they are presented in figure 5.15.

The sampled districts are allocated in six different livelihood zones, one in the northern region which incorporates the only sampled district in the northern region; one zone in the centre comprising all the three districts from the central region included in the sample, and five livelihood zones, one for each of the five southern region districts in the sample.

### 5.3.1 Rumphi District

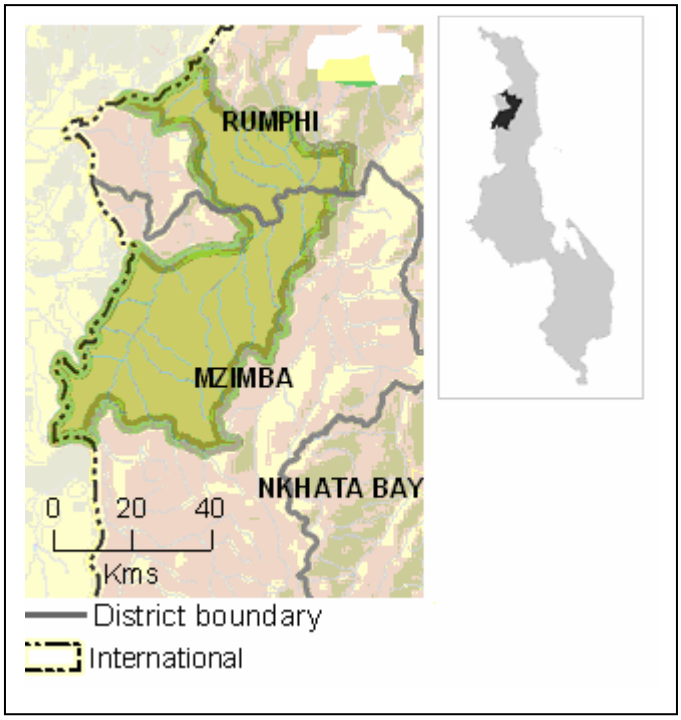
Rumphi District is the only northern region district from which data were collected. The enumeration areas within the district fall under the Western Rumphi and Mzimba livelihood zone, as shown in figure 5.16. The figure also shows the location of the zone on the Malawi map. The Western Rumphi and Mzimba Livelihood Zone, is an agricultural area with an average annual rainfall of 900mm, (which is only 100mm lower than the national average), producing mainly maize and tobacco. Groundnuts, sweet potatoes and pulses are also produced in smaller quantities. It is also surrounded by Nyika National Park and Vwaza Game Reserve where locals collect wild foods and fruits to supplement their food consumption. The population was estimated at 139,250 in 2004 (MVAC, 2004), and almost all households cultivate tobacco, most of them at very low levels.

Agriculture in the zone is entirely rain-fed and the agricultural season runs from November to July. The rainfall is uni-modal running between mid-November to mid-April but the cropping season starts in September with land preparation and it does not finish until harvest period in July. The winter growing season is not rain-fed and as a

[8] For a full description of the approach and methodology, see Boudreau (1998) and Seaman *et al*. (2000) who present a thorough description of the household economy approach and how it can be applied.

result crop production is only limited to swampy areas. The winter cropping is usually practiced by non-poor households in the livelihood zone and the main crops grown are vegetables and maize, both of which are partly consumed and partly sold.

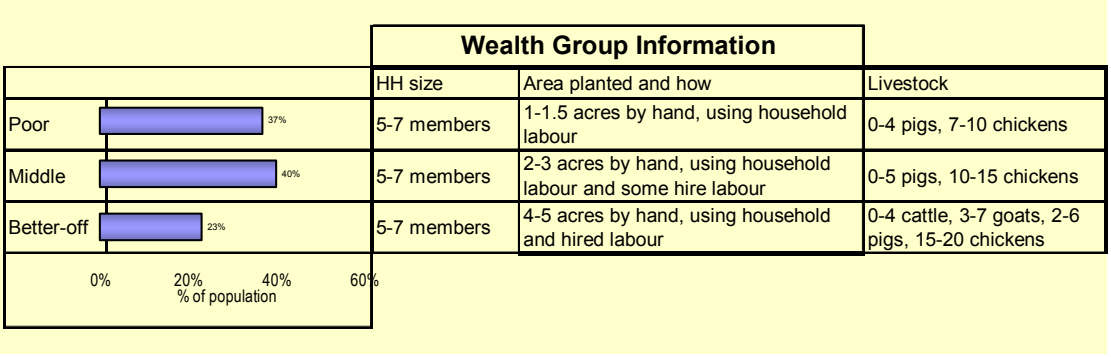
**Figure 5.16: Western Rumphi and Mzimba Livelihood Zone**




**Source: MVAC (2004)**

A classification of the population into 'poor', 'middle' and 'better-off' based on annual household expenditure, reveals that 37 percent of the population are 'poor' (their annual household expenditure per capita is less than MK 18,300), the 'middle' group constitute 40 percent of the population (with a per capita expenditure level between MK 18,300 and MK41,200), and only 23 percent are 'better-off' with a per capita expenditure of over MK41,200 annually (figure 5.17). Wealthier households also tend to have larger farm sizes and more livestock. Informal sale of agricultural labour (*ganyu*) plays an important part of the household economy in the livelihood zone. Informal agricultural labour (*ganyu*) is supplied throughout the agricultural season. The returns to *ganyu* are in the form of food or cash (figure 5.18).

**Figure 5.17: Wealth Breakdown in Western Rumphi and Mzimba Zone**

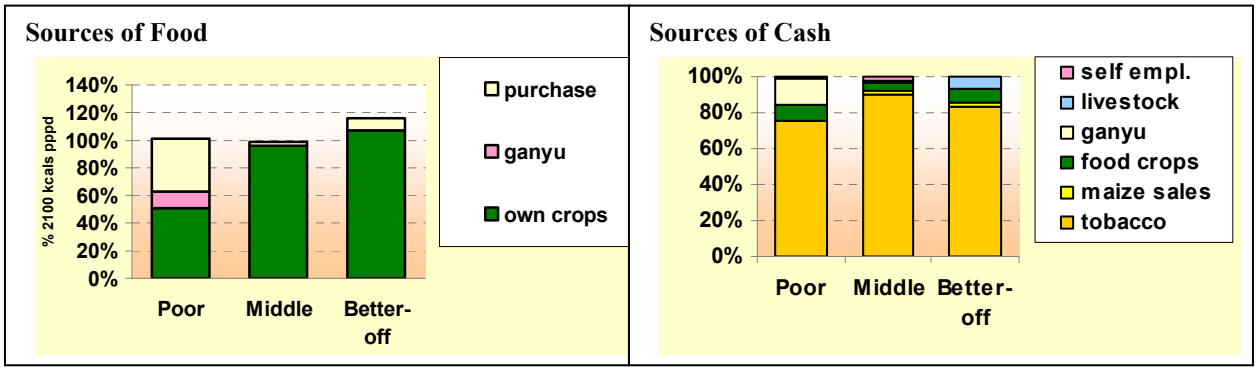



| Wealth Group Information | | |
|---|---|---|
| HH size | Area planted and how | Livestock |
| 5-7 members | 1-1.5 acres by hand, using household labour | 0-4 pigs, 7-10 chickens |
| 5-7 members | 2-3 acres by hand, using household labour and some hire labour | 0-5 pigs, 10-15 chickens |
| 5-7 members | 4-5 acres by hand, using household and hired labour | 0-4 cattle, 3-7 goats, 2-6 pigs, 15-20 chickens |

**Source: MVAC (2004)**

While the middle and the better-off households can sustain their household food requirements from their own production, the poor rely on purchased food and *ganyu* to supplement their own food production. In most cases the food purchases are made using money generated from tobacco sales and/or *ganyu*. With regards to sources of cash (figure 5.18), tobacco sales contribute more than 75 percent of the cash available for each of the three groups, while *ganyu* is the second most important source of income only for the poor group.

**Figure 5.18: Sources of Food and Cash in Western Rumphi and Mzimba Zone**




**Source: MVAC (2004)**

Sale of other food crops such as groundnuts and sweet potatoes is another income source for all the three different groups, but sale of the staple crop, maize, is very small and is a

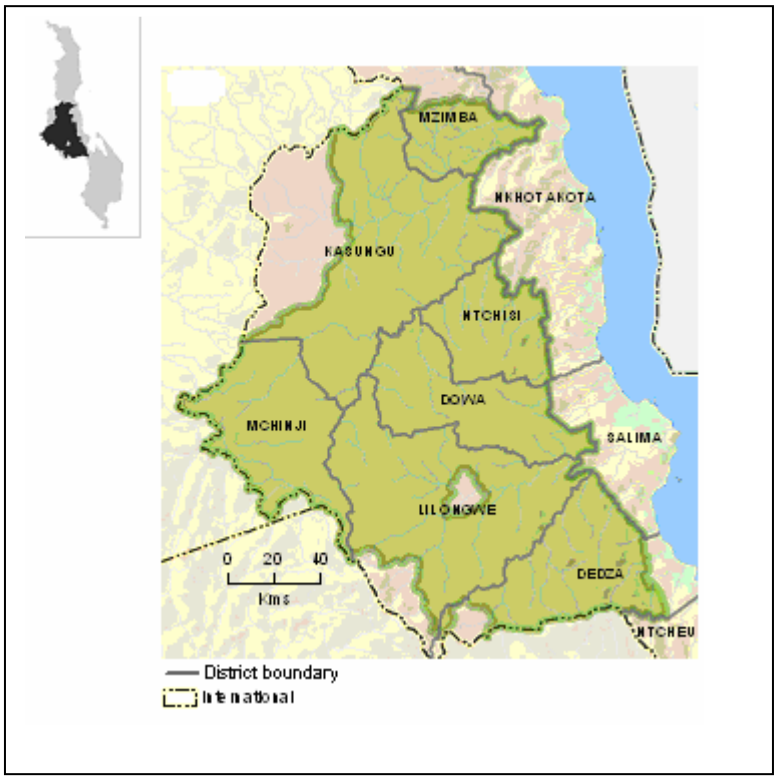
source of income for the 'middle' and the 'better-off' groups only. Another source of income available to the better-off group is sale of livestock, such as goats and cattle.

The main frequently occurring hazards within the zone include dry spells especially when the maize crop is tasselling, causing severe crop damage. Further, households' dependence on intermediate traders as buyers of their tobacco leads to farmers getting very low prices for their tobacco. Newcastle disease in chicken is also a chronic problem within the zone (MVAC, 2004). Periodically, the zone suffers from severe droughts (in some years) and floods (in other years) from rivers whose source is the Nyika Plateau.

### 5.3.2 Kasungu, Lilongwe and Mchinji Districts

In the central region of Malawi, primary data were collected from three districts of Lilongwe, Mchinji and Kasungu. All the three districts are located in one livelihood zone called Kasungu-Lilongwe Plain which comprises over 3 million people (figure 5.19).

**Figure 5.19: Kasungu-Lilongwe Plain Livelihood Zone**



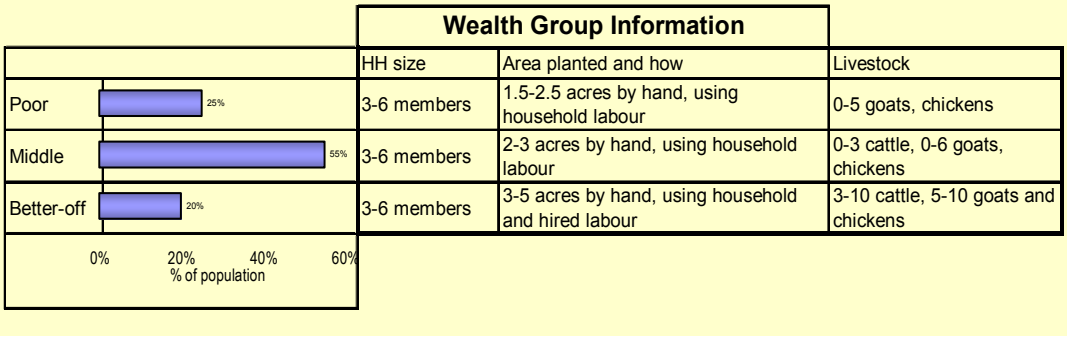

**Source: MVAC (2004)**

The zone comprises 7 districts in the central region, including Lilongwe, the capital city of Malawi. It is predominantly an agricultural area, acting as a bread basket for the whole country.

Tobacco remains the main dominant crop, grown by both the estate sub-sector and the smallholder farmers. However, maize, groundnuts, sweet potatoes and cassava are also widely grown. The agricultural seasonal calendar within the Kasungu-Lilongwe Plain is similar to that in Western Rumphi and Mzimba zone. However, casual agricultural labour (*ganyu*) is less prominent than in Rumphi.

The household sizes are not different between 'poor' and 'better-off' households, as figure 5.20 shows. However, 'poor' households which constitute 25 percent of the households in the zone have less land holdings and less livestock.

**Figure 5.20: Wealth Breakdown in Kasungu-Lilongwe Plain Livelihood Zone**




| Wealth Group Information | | | |
|---|---|---|---|
| | HH size | Area planted and how | Livestock |
| Poor | 3-6 members | 1.5-2.5 acres by hand, using household labour | 0-5 goats, chickens |
| Middle | 3-6 members | 2-3 acres by hand, using household labour | 0-3 cattle, 0-6 goats, chickens |
| Better-off | 3-6 members | 3-5 acres by hand, using household and hired labour | 3-10 cattle, 5-10 goats and chickens |

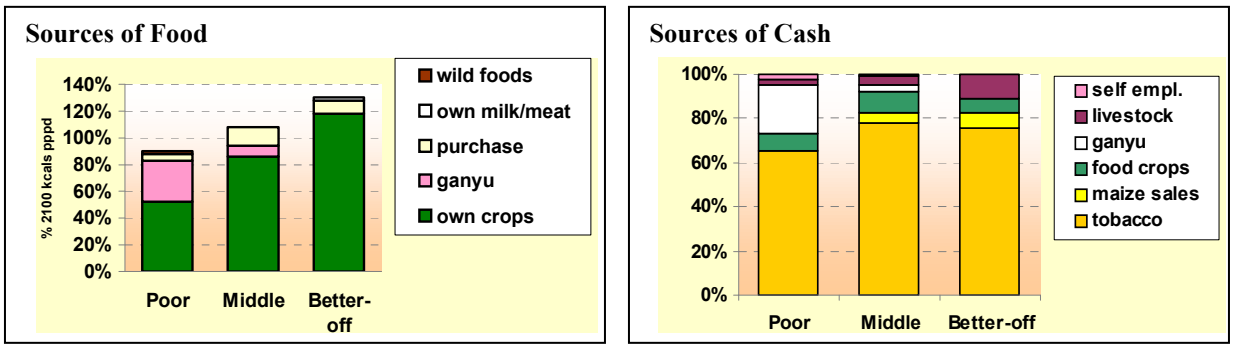
**Source: MVAC (2004)**

For the 'middle' and 'better-off' households, their livestock may include some head of cattle, which are important household assets in their rural economy.

The sources of food within the Kasungu-Lilongwe Plain come predominantly from their own production for all the three different types of households. Figure 5.21 shows that while own crops cover only about 50 percent of annual needs for the 'poor', they cover about 85 percent of the food needs of the 'middle' group and over 100 percent for the

'better-off'. For the 'poor', their food production is complemented by *ganyu* which contributes more than 20 percent of their food needs especially during the period of critical food shortage (hunger season) between January and March.

**Figure 5.21: Sources of Food and Cash in Kasungu-Lilongwe Plain**




**Source: MVAC (2004)**

The sources of cash for the households in the Kasungu-Lilongwe Plain livelihood zone underscore the dominance of agriculture in the rural economy. It can be seen from figure 5.21 that sale of crops is the most important source of income for all the three wealth groups. Tobacco is the most important crop whose sales contribute more than 60 percent of income for the 'poor', close to 80 percent for the 'middle' group and more than 75 percent for the 'better-off'. Informal sale of labour (*ganyu*) remains an important source of cash for the poor while sale of livestock is an important source of income for the 'better-off'. Furthermore, figure 5.21 shows that the sale of the main staple crop, maize, contributes less to household income and it is only an option for the 'middle' and 'better-off' wealth groups. This shows that households prefer using maize for their own consumption to selling for cash.

An important point that is worth noting for the Kasungu-Lilongwe Plain is that income from tobacco, which is a relatively drought resistant crop, is an important source of household income. In theory, such income should reduce the susceptibility of even 'poor' households to fall deeper into poverty by helping to maintain food purchasing power in a 'bad' year (MVAC, 2004). On the contrary, Kasungu and Mchinji are areas of high

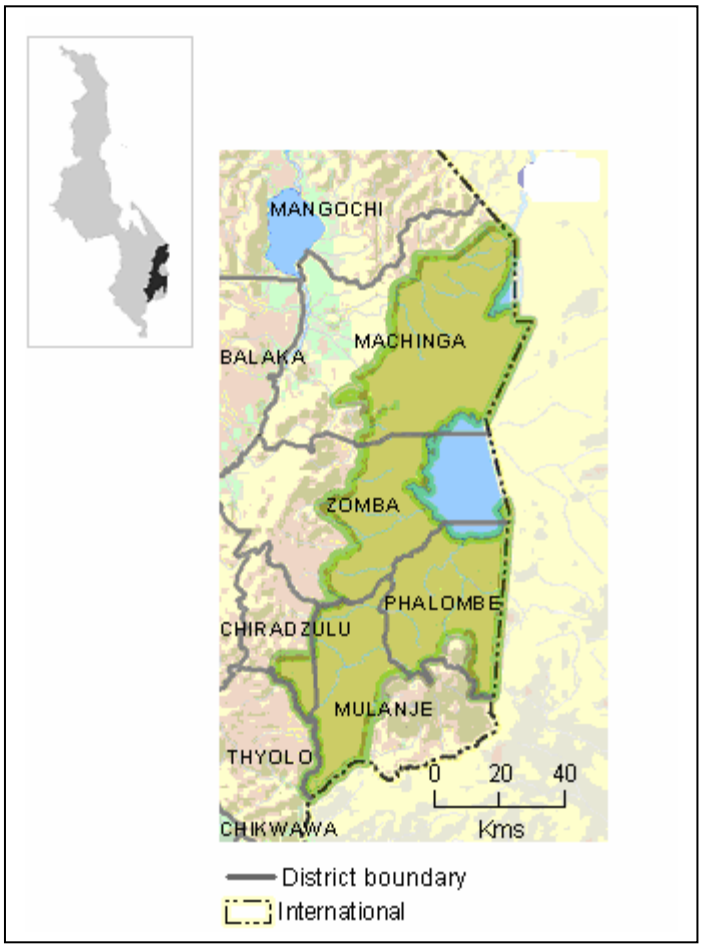
vulnerability to poverty (as will be seen in chapter 6). A possible explanation to this phenomenon is that income from tobacco comes in a single lump-sum and most households quickly spend the money on non-food items rather than on saving or building up food stocks or household assets.

Frequent hazards within the zone include dry spells at the beginning or in the middle of the agricultural season which affect not only maize but also other crops such as tobacco and groundnuts. Further, farmers' continued dependence on intermediate tobacco buyers usually makes tobacco production less lucrative as an agricultural enterprise. The tobacco crop is usually ready for market between January and March, coinciding with the hunger period within the zone. As a result, farmers sell their tobacco at a very low price to intermediate buyers and use the money to purchase maize and other household food requirements. The intermediate buyers, in turn sell the tobacco at a far much better price at the Tobacco Auction Floors in the capital city of Lilongwe. Periodically, the zone also experiences serious drought making crop production impossible and sometimes leading to livestock loss, as well. Crop pests such as armyworms sometimes cause severe crop damage in the zone.

### 5.3.3 Zomba District

Zomba District is located in the Lake Chilwa and Phalombe Livelihood Zone, which also covers the districts of Machinga, Phalombe, part of Thyolo, part of Mulanje and part of Chiradzulu (see figure 5.22). The zone had a total population of 1.2 million in 2003. Although the zone has an adequate annual rainfall in a 'good' year, averaging between 700 mm and 1,000 mm, crop production is less prominent than the other zones already discussed due to poor quality sandy soils, especially around the Lake Chilwa basin. For the areas where soil quality is manageable, maize, groundnuts, rice, cassava and tobacco are cultivated at smallholder level.

**Figure 5.22: Lake Chilwa and Phalombe Livelihood Zone**



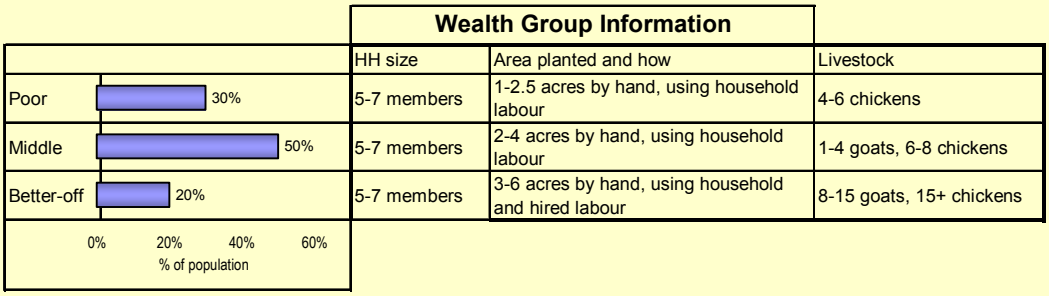

**Source: MVAC (2004)**

The seasonal calendar is similar to those prevailing in the other zones, with weeding remaining the most critical farm activity as it comes at a time when food is scarce. This means that 'poor' households have to make a choice between using their labour time in their own gardens and selling their labour for food (MVAC, 2004).

Furthermore, the 'poor' consist of 30 percent of the population within the zone and this figure is higher than that of the Kasungu-Lilongwe Plain livelihood zone. A similar pattern emerges from 2004 headcount poverty index ($P_0$) for the sampled households where the average $P_0$ is 0.43 for the three districts in the Kasungu-Lilongwe Plain zone (Kasungu, Lilongwe and Mchinji districts), as compared to 0.68 for Zomba district (see chapter 6).

Figure 5.23 also shows that the average household size within the zone is larger than in Kasungu-Lilongwe Plain zone but similar to the Western Rumphi livelihood zone. About 50 percent of the population in the zone are in the 'middle' wealth group and the remaining 20 percent are 'better-off'. Further, the livestock holdings within the zone are so poor that cattle are usually not available even among the 'better-off' households. However, the land holding size is comparable to that of the Kasungu-Lilongwe Plain.

**Figure 5.23: Wealth Breakdown in Lake Chilwa and Phalombe Zone**

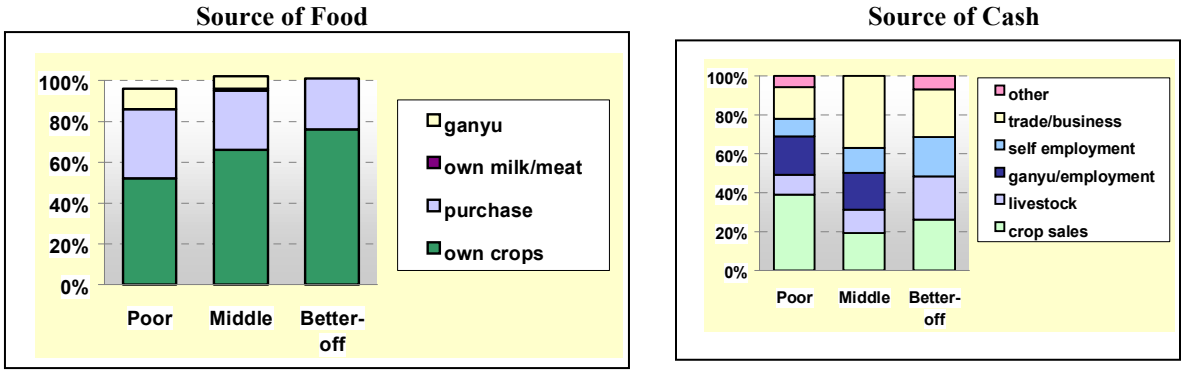



| Wealth Group Information | | |
|---|---|---|
| HH size | Area planted and how | Livestock |
| 5-7 members | 1-2.5 acres by hand, using household labour | 4-6 chickens |
| 5-7 members | 2-4 acres by hand, using household labour | 1-4 goats, 6-8 chickens |
| 5-7 members | 3-6 acres by hand, using household and hired labour | 8-15 goats, 15+ chickens |

**Source: MVAC(2004)**

Figure 5.24 shows sources of food and income for the households in the Lake Chilwa and Phalombe Plain. While own crop production remains a dominant source of food for all the three wealth groups, purchased food also plays an important role in the households. Unlike the Western Rumphi and Kasungu-Lilongwe cases, tobacco does not play a significant role as a source of income for any of the wealth groups. Instead, crop sales in the form of maize, rice, pigeon peas, groundnuts, cassava, sweet potatoes, sorghum, cowpeas and sugar cane are the largest source of income for all the wealth groups (MVAC, 2004). Other sources of income for the 'poor' and the 'middle' groups include *ganyu*, trade and business in selling firewood, moulding bricks, and fishing for those close to Lake Chilwa, among other activities.

**Figure 5.24: Sources of Food and Cash in Lake Chilwa and Phalombe Plain**



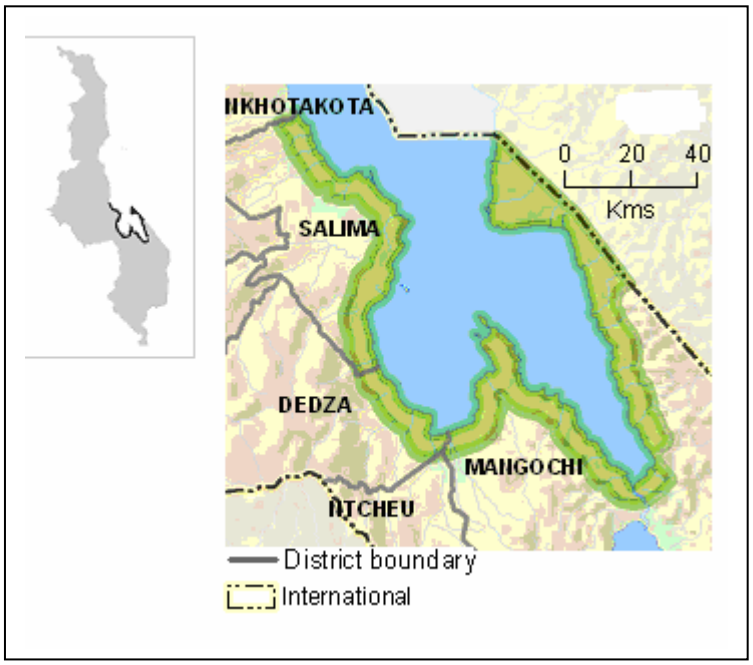

**Source: MVAC (2004)**

Agricultural production within the zone is severely hampered by poor soils and this problem is worsened by periodic dry spells, especially when the maize crop is cobbing. Furthermore, parts of the zone periodically experience flooding of the Lake Chilwa which destroys the rice crop and make roads impassable, making it difficult to bring in staple foods from the other areas, resulting in high grain prices (MVAC, 2004).

### 5.3.4 Mangochi District

The district of Mangochi is one of the four areas of study in the southern region. It is located within the Southern Lakeshore Livelihood zone (figure 5.25). The zone comprises Salima, Dedza, Ntcheu and Mangochi districts and it had an estimated total population of 406, 320 in 2004 (MVAC, 2004). The Southern Lakeshore zone is Malawi's major fishing area, as the zone is a thin strip of land covering an area of around 5 Km inland from Lake Malawi. In a normal year, the zone receives an average rainfall of 750mm but the zone remains a deficit area for maize. Maize is the dominant crop but rice, sweet potatoes, groundnuts and sorghum are also widely grown.

**Figure 5.25: Southern Lakeshore Livelihood Zone**

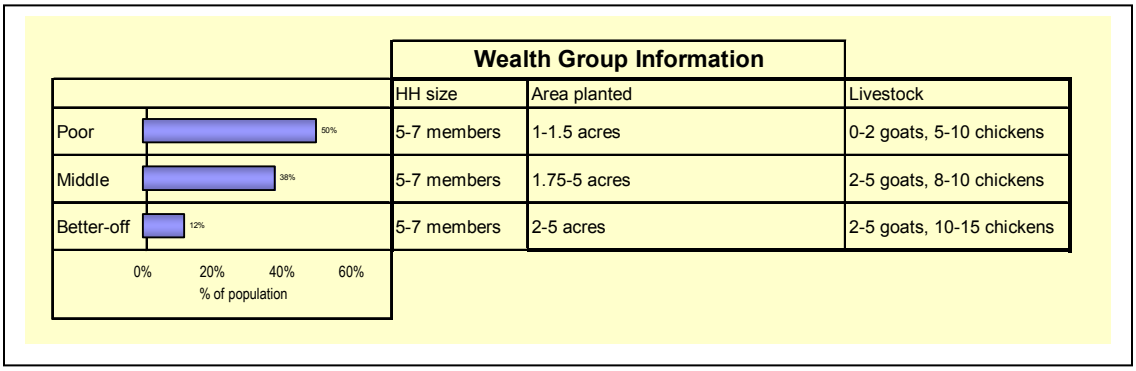



**Source: MVAC (2004)**

The agricultural seasonal calendar is similar to the other zones already discussed where planting is done between November and December and harvesting is not done until April. The food deficit months (December-February) are associated with a large increase in informal labour supply (*ganyu*) and fishing activities, especially among the 'poor' households. Further, a breakdown of wealth within the livelihood zone reveals that around half of the population falls within the 'poor' wealth group (figure 5.26) and the 'better-off' are a minority, around 12 percent of the population. The surveyed households in Mangochi share a similar trend as 53 percent were consumption poor in 2004 (see chapter 6).

Land holding size is smaller than all the other zones discussed, with the 'poor' using between only 1 and 1.5 acres for crop production and the 'better-off' only using a maximum of 5 acres as their farm land. In terms of sources of food, as shown in figure 5.31, most food comes from own crop production, of which about 60-70 percent is maize and 10-17 percent is rice (MVAC, 2004).

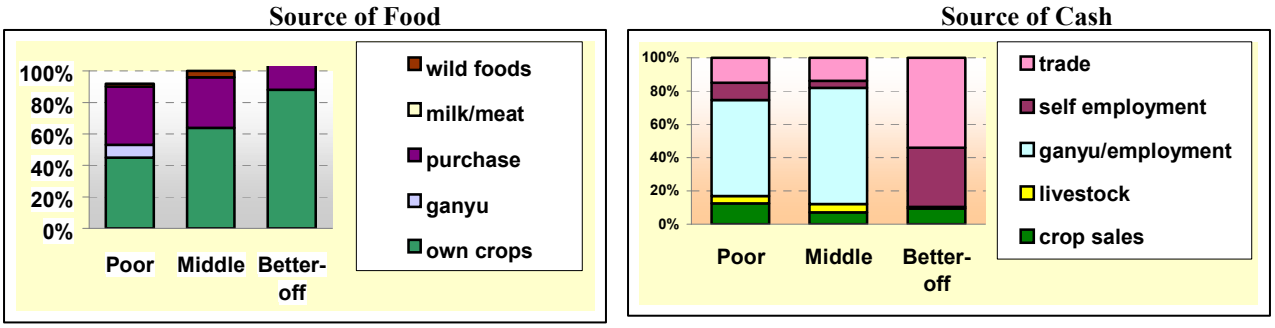
**Figure 5.26: Wealth Breakdown in Southern Lakeshore Zone**




**Source: MVAC (2004)**

Unlike the other livelihoods zones already discussed, *ganyu* is not a source of food for the 'middle' group and it is not a significant source even for the 'poor' in the zone, although *ganyu* is quite prominent in the zone.

**Figure 5.27: Sources of Food and Cash in Southern Lakeshore Zone**




**Source: MVAC (2004)**

This shows that, unlike in some zones like Kasungu-Lilongwe plain, *ganyu* in Southern Lakeshore zone is not heavily remunerated in terms of food, but rather in the form of cash. However, purchased food is an important source of food for the 'poor' and the 'middle' groups, implying that such types of households are not self-sufficient in terms of food production. Provision of causal fishing labour to owners of fishing nets (fishing *ganyu*) and formal employment at the numerous holiday resorts along the lake are the largest income sources for the 'poor' and the 'middle'groups while trade is an important

source of income for the better-off', as figure 5.27 shows. The 'better-off' households are involved in fish trading which also gives some casual employment to the 'poor' and the 'middle' groups. Crop sales are also a source of income for all the groups although its contribution is less than 20 percent in each category.

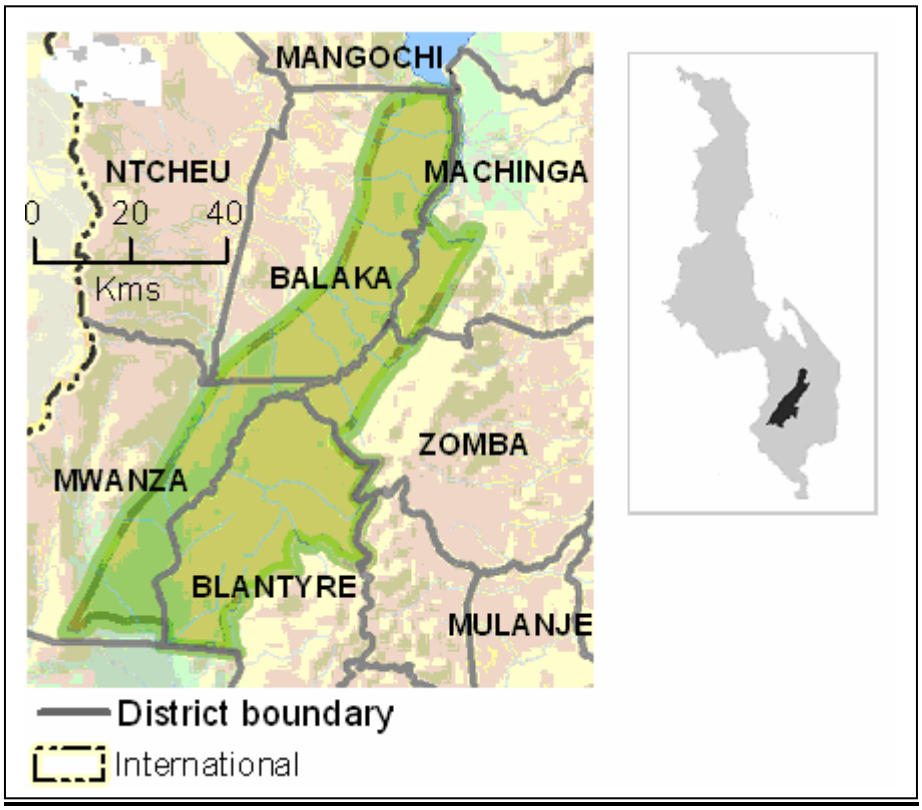
The zone experiences floods from the Shire River and its numerous tributaries, usually causing a great deal of crop damage. At times, many households, especially those close to the Shire River are displaced because of flooding. Another chronic hazard within the zone is the existence of dry spells, usually a week after maize is planted and it lasts up to a month or two. This usually causes farmers to plant twice, after their initial maize seed is lost due to the dry spells. Periodically, the zone also experiences severe drought.

### 5.3.5 Blantyre District

This study also covers some households from Blantyre District which falls under the Middle Shire Valley Livelihood Zone. The zone extends from parts of Mangochi districts, through Machinga, Balaka, part of Zomba, part of Mwanza to Blantyre (figure 5.28). The average annual precipitation is low at around 600 mm and as such rain-fed crop production is not as prevalent as in the other livelihoods. Fishing is another livelihood activity, especially for households living close to the Shire River.

The agricultural season starts in August with land preparation followed by planting and weeding for the rain-fed crops. Harvesting is done between May and June and the main cash crop grown in the zone is cotton, while the food crops include maize, sweet potatoes, sorghum, rice and pigeon peas. In terms of wealth breakdown, it can be seen from figure 5.29 that the majority of the households (53 percent) within the zone are 'poor' and only 14 percent are 'better-off'. The average household size is quite large with 5 to 6 members for all the three wealth groups. Further, the area devoted to agriculture is very low, with the 'poor' cultivating an average of 1.5 acres and the 'better-off' devoting a maximum of 4 acres to crop production.

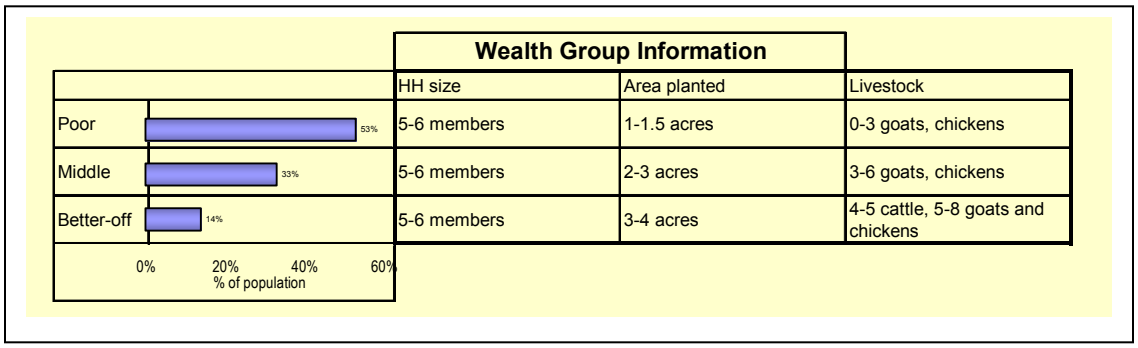
**Figure 5.28: Middle Shire Valley Zone**




**Source: MVAC (2004)**

Sources of food in Middle Shire Valley are similar to those in all the other zones, with the 'better-off' relying almost solely on their own food production, while food purchases contribute more than 20 percent for the 'poor' and the 'middle' wealth groups (see figure 5.30). Maize accounts for between 50 to 60 percent of own food consumption for all the three groups, while rice is important only for the 'middle' and the 'better-off' accounting for a range of 12-24 percent (MVAC, 2004). Although *ganyu* constitutes a significant proportion of household food consumption for the 'poor', it is mainly through purchasing food using money earned from cash-paid *ganyu*. Crop sales account for around 46 percent of income for the 'poor' of which 37 percent is from vegetables (planted along the Shire River banks), and less than 10 percent is from cotton. Further, the sale of wood and charcoal is an important source of income for the 'poor', accounting for around 20 percent of household income.

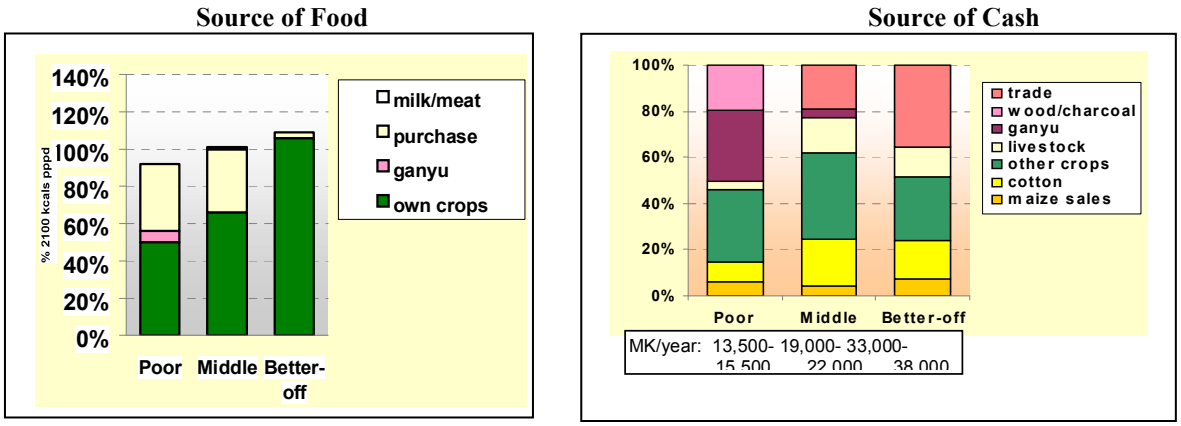
**Figure 5.29: Wealth Breakdown in the Middle Shire Valley Zone**




**Source: MVAC (2004)**

The wood and the charcoal are usually sold to the low and middle-income households in the urban areas of Zomba and Blantyre. On the other hand, the 'middle' and the 'better-off' groups supplement their crop sales with cotton sales and livestock sales.

**Figure 5.30: Sources of Food and Cash in Middle Shire Valley Zone**



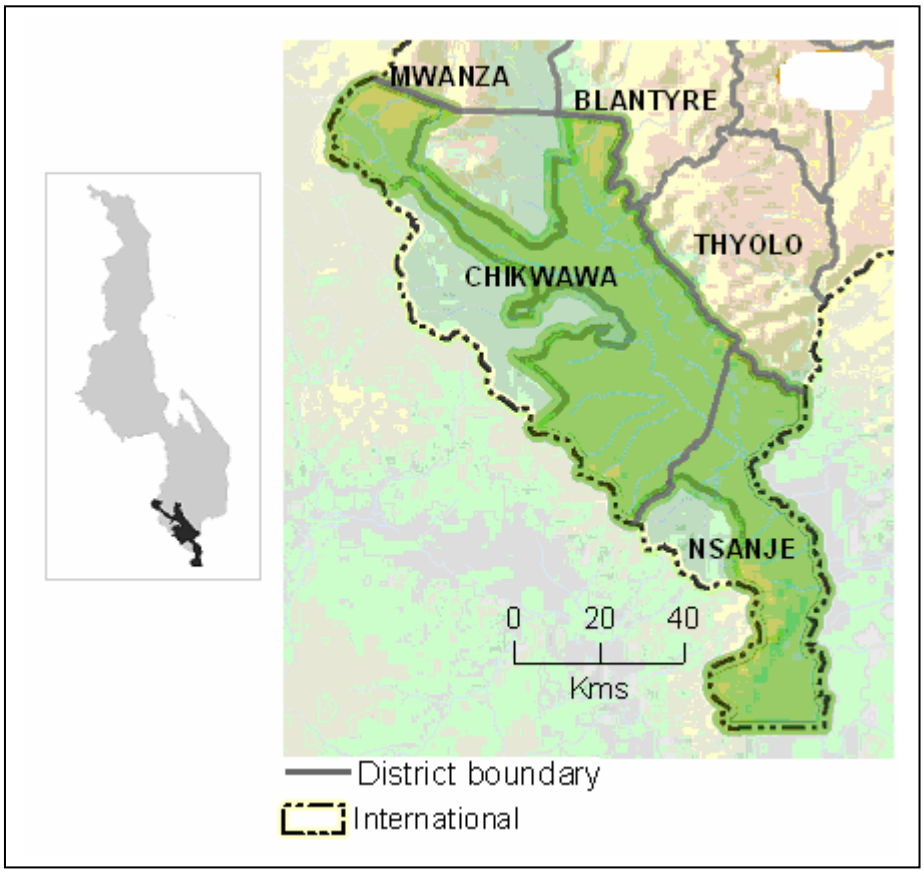

**Source: MVAC (2004)**

Frequent hazards within the zone include dry spells especially when maize is at cobbing and tesselling stages, causing severe damage to the staple. Flooding of the Shire River and its tributaries is also an annual problem in the zone, which usually contribute to food shortages within the zone. Periodically, the zone experiences droughts and livestock diseases.

### 5.3.6 Chikwawa District

Chikwawa district lies in the Lower Shire Valley Livelihood Zone that also comprises Nsanje district, on the southern tip of Malawi (figure 5.31). The total population for the zone was estimated at 631,000 in 2003 (MVAC, 2004). Annual precipitation in the zone ranges between 900 mm and 1,200 mm in a 'normal' year which is essential for the rain-fed agriculture that is practiced in the upland areas. However, wetland cultivation is also very common along the Shire River. Crop production in the upland areas include maize, sorghum and millet, while in wetland areas maize, rice, tomatoes, cowpeas, pigeon peas and vegetables are widely grown.

**Figure 5.31: Lower Shire Livelihood Zone**



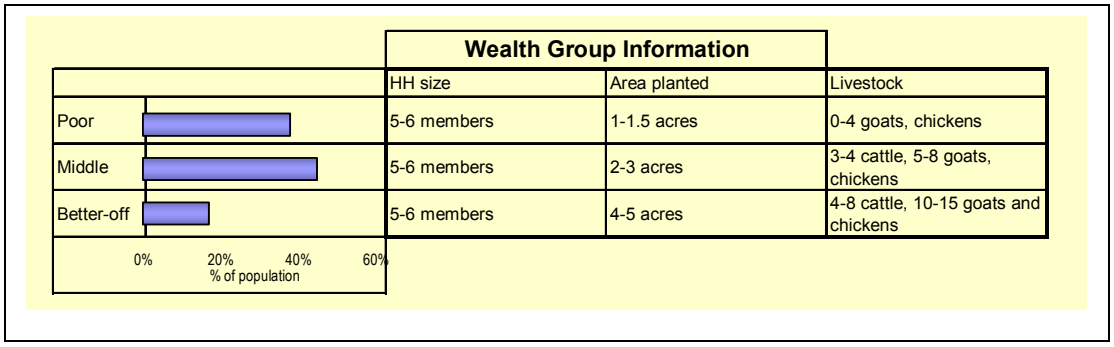

**Source: MVAC (2004)**

The agricultural season calendar usually starts in November and it lasts until March for the rain-fed summer cultivation and from April to July for the winter cultivation that is

common along the River Shire. It should be pointed out that for most households living close to the Shire River, winter cropping is more important than the rain-fed summer cropping.

According to MVAC (2004), the 'poor' and the 'middle' groups own similar areas of land (3-4 acres), but the 'poor' cultivate only between 1 and 1.5 acres due to labour shortages and lack of other important agricultural inputs, such as organic fertilizer. The 'better-off', on the other hand, cultivate the whole area of land which they own, which is 4 to 5 acres, on average. Further, livestock play an important role in enhancing household income, and as it can be seen from figure 5.32, the 'middle-group' and the 'better-off' usually own some cattle. These livestock are an important source of income as it will be seen later in the discussion.

**Figure 5.32: Wealth Breakdown in Lower Shire Valley Zone**



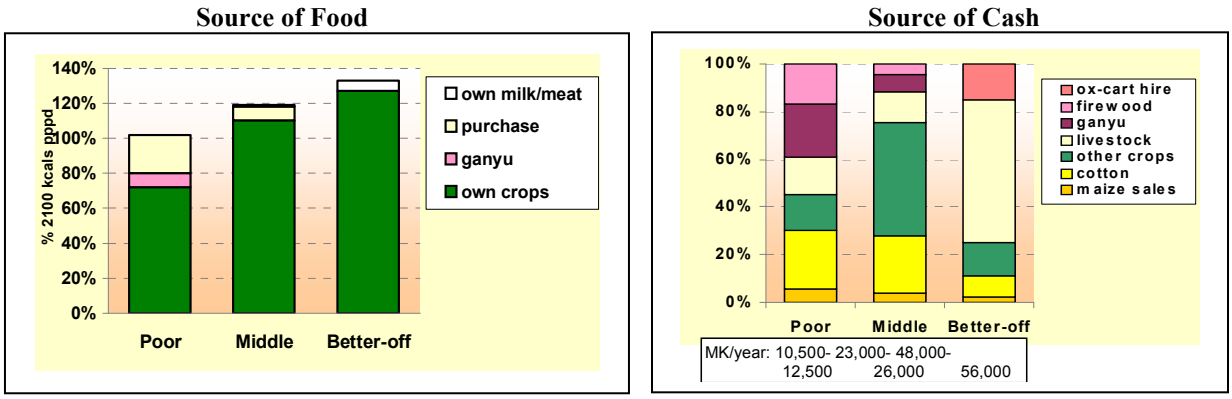

| Wealth Group Information | | | |
|---|---|---|---|
| | HH size | Area planted | Livestock |
| Poor | 5-6 members | 1-1.5 acres | 0-4 goats, chickens |
| Middle | 5-6 members | 2-3 acres | 3-4 cattle, 5-8 goats, chickens |
| Better-off | 5-6 members | 4-5 acres | 4-8 cattle, 10-15 goats and chickens |

**Source: MVAC (2004)**

During periods of good harvest, the 'middle' and the 'better-off' are usually food-self sufficient, but the 'poor' supplement their own production with purchased food and food from *ganyu*, which account for about 5 percent and 20 percent, respectively (figure 5.33).

Further, since livestock is an important asset for the 'middle' and the 'better-off' groups, milk and meat from their own livestock is also another source of food for the 'better-off' group. In terms of access to cash, figure 5.33 shows that *ganyu* is an important source of income for the poor, accounting for around 20 percent of household income but it is not a very important source for the 'middle' group.

**Figure 5.33: Sources of Food and Cash in Lower Shire Valley Zone**




**Source: MVAC (2004)**

Figure 5.33 also shows that cotton is not as an important source of income for the 'better-off' as it is for the other two wealth groups. The underlying reason is that cotton is seen as a low-value cash crop in Malawi whose prices have been constantly falling over the years. Furthermore, the 'non-poor' earn around 60 percent of their income from livestock sales and they also let out their ox-carts to 'poor' and 'middle' groups, thereby generating an income (around 15 percent of household income annually).

It is worth noting that cross-border trade between Malawi and Mozambique plays an important role in the zone. The 'poor' and the 'middle' group usually sell their cotton and other crops to intermediate buyers in Mozambique where prices are perceived to be better than the local markets within the livelihood zone. During periods of acute food shortage, households also buy their maize and other types of food (such as cassava) from Mozambique.

The frequent hazards in the zone include dry spells mid-way through the season, with complete droughts in certain years. Flooding of the Shire River is also an annual hazard leading to severe loss of crops for those cultivating along the wetlands. Households residing close to the Shire River are displaced by floods every year. Periodically, the zone also experiences armyworm infestation leading to severe loss of crops, as well as livestock diseases, which are fatal, at times.

## 5.4 Summary

This chapter was aimed at discussing the poverty profiles for Malawi based on the complete IHS2 dataset. It has shown that the poor in Malawi tend to have a large family size, higher number of children and a higher dependency ratio. Further, the chapter has shown that in 2004, more than 50 percent of the poor in Malawi were children who were less than 15 years old. Female-headed households were found to be more likely to be poor than male-headed households.

The second part of the chapter has provided details of livelihood activities in the eight districts that are considered in the study. Using the livelihood mapping done by the Malawi Vulnerability Committee (MVAC), the chapter has outlined the profiles of each of the livelihood zones to which the sampled districts belong. This section is important in analyzing the differences in rates of vulnerability among households presented in chapter six.

# Chapter 6

## AN ASSESSMENT OF HOUSEHOLD VULNERABILITY TO POVERTY IN RURAL MALAWI

### 6.1 Introduction

Malawi, like many countries in Sub-Saharan Africa, continues to experience high levels of poverty despite decades of implementing poverty alleviation and prevention programmes. The depth and severity of poverty in Malawi (see chapter 5) are an indication that the static anti-poverty programmes are not sufficiently effective in moving the majority of the population out of the trap of poverty. For example, a comparison between the Malawi first Integrated Household Survey (IHS1) of 1998 and the IHS2 of 2004 shows that there is no significant decline in the headcount poverty rate in Malawi. While the poverty rate was estimated at 54.1 percent in 1994, the figure only declined to 52.4 percent in 2005 (Malawi Government and World Bank, 2006).

There is now a growing consensus in the poverty literature (see Dercon (2002), Chaudhuri *et al.* (2002), Christiaensen and Subbarao (2001) and Hoddinott and Quisumbing (2003), among others) that policies aimed at reducing the levels of poverty should not only be based on the static measures of poverty. Instead, such policies should be forward-looking to incorporate the proportion of the population who are currently non-poor but may be poor in the near future. This is the entry point for vulnerability assessments. This chapter aims at analyzing the major determinants of vulnerability in Malawi using a two period dataset (which is described in detail in Chapter 4). It endeavours to determine how vulnerable the sampled households are, identify the characteristics of the vulnerable households in rural Malawi and identify the sources of this vulnerability. The chapter proceeds as follows: section 2 outlines a framework for the analysis of risk, which is an extension of the conceptual framework presented in chapter 3. In particular it discusses the concept of the risk chain, as well as the settings-assets-activities framework that is important in the analysis of vulnerability. This is followed by section 3 which outlines the sources of vulnerability in Malawi, as advocated in the literature. The methodology that is used in the study is outlined in the fourth section

which is followed by a brief statement on data considerations for the vulnerability analysis. Section 6 provides results in the form of descriptive statistics as well as econometric regression results. The section further provides a profile of household vulnerability in the sampled districts. Section 8, which provides some results on variance decomposition to highlight sources of vulnerability, is preceded by section 7 which provides an analysis of vulnerability and poverty transition. Section 9 presents results on a test for multicollinearity in the model, while section 10 concludes the discussion.

## 6.2 The Concept of Risk

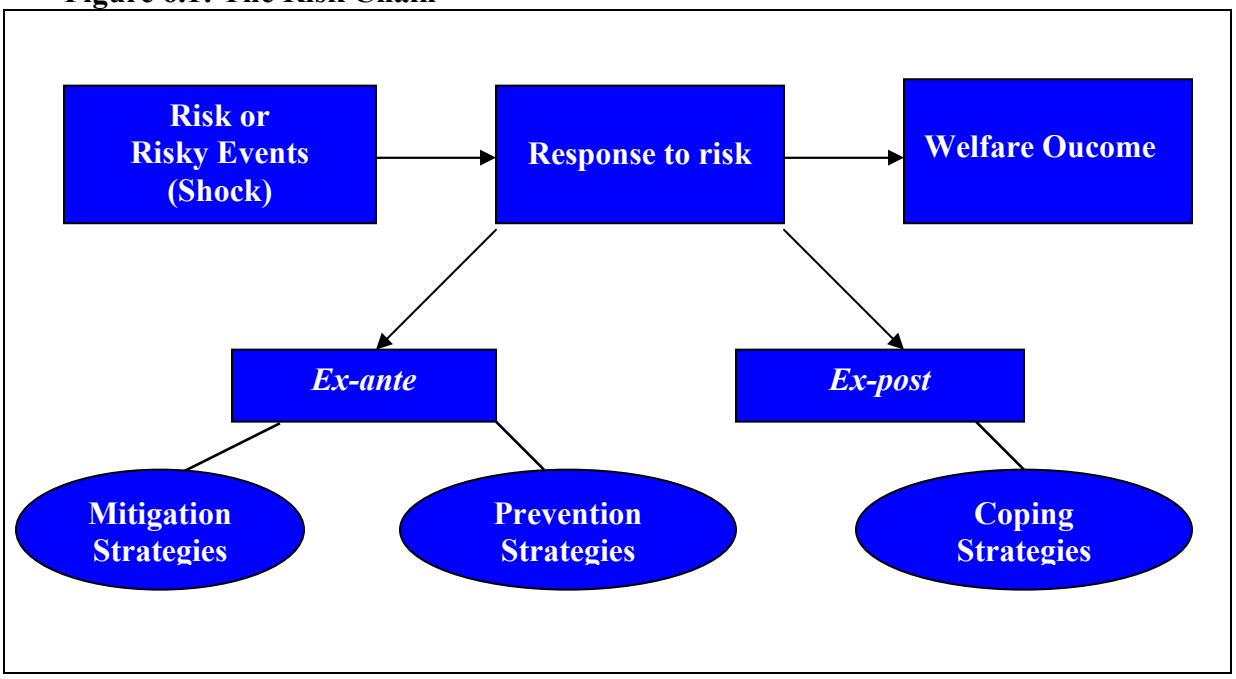
### 6.2.1 The Risk Chain

The understanding of how households move into or out of poverty hinges on the notion of risk. Risk relates to events that have a likelihood of occurrence, but where the household has no direct control over this likelihood. With respect to vulnerability, the concern is only on 'down-side' risk that negatively impacts on household welfare (Dercon, 2001). Thus, the concept of a risk chain is central to the study of household economic vulnerability. The risk chain theory postulates that the level of economic vulnerability of households is a function of not only the degree to which they are exposed to negative shocks that impact on their welfare, but also the extent to which they can cope with such shocks when they occur, as shown in figure 6.1.

Based on the framework presented in chapter 3, figure 6.1[9] shows three main components of a risk chain. The extent to which a household faces a shock or a risky event has a bearing on the household vulnerability to poverty. These shocks may be household-specific, commonly referred to as *idiosyncratic*, such as illness or death in the household, business failure, unemployment, among others. The second category of shocks is community-specific, also known as *covariate* shocks. These include droughts, epidemics, and floods, among others.

[9] Figure 6.1 is similar to figure 3.1 which shows the interrelationships among the important concepts in this study. Figure 6.1, on the other hand, depicts how households' exposure and response to risk impact on its welfare.

**Figure 6.1: The Risk Chain**




**Source: Adapted from Dercon (2001)**

The second component of the chain illustrates the fact that the extent to which a shock will affect a household's welfare depends on its response to such event. These risk management strategies vary and may be broadly grouped into two. First, *ex-ante* risk management strategies are employed before the shock occurs in order to reduce the impact of the risk when it occurs. The strategies may include income diversification, and investing low-risk activities. The second response involves *ex-post* coping strategies where households put in place strategies to reduce the impact of the risky event after it has already occurred. Households' responses to risk in great detail are presented in great detail in chapter 7.

The third component of the chain depicts the welfare outcomes of the household. These could be measured in terms of level of income, consumption, nutrition, health or education (Dercon, 2001). In the literature on vulnerability and poverty, consumption is most widely used measure of welfare.

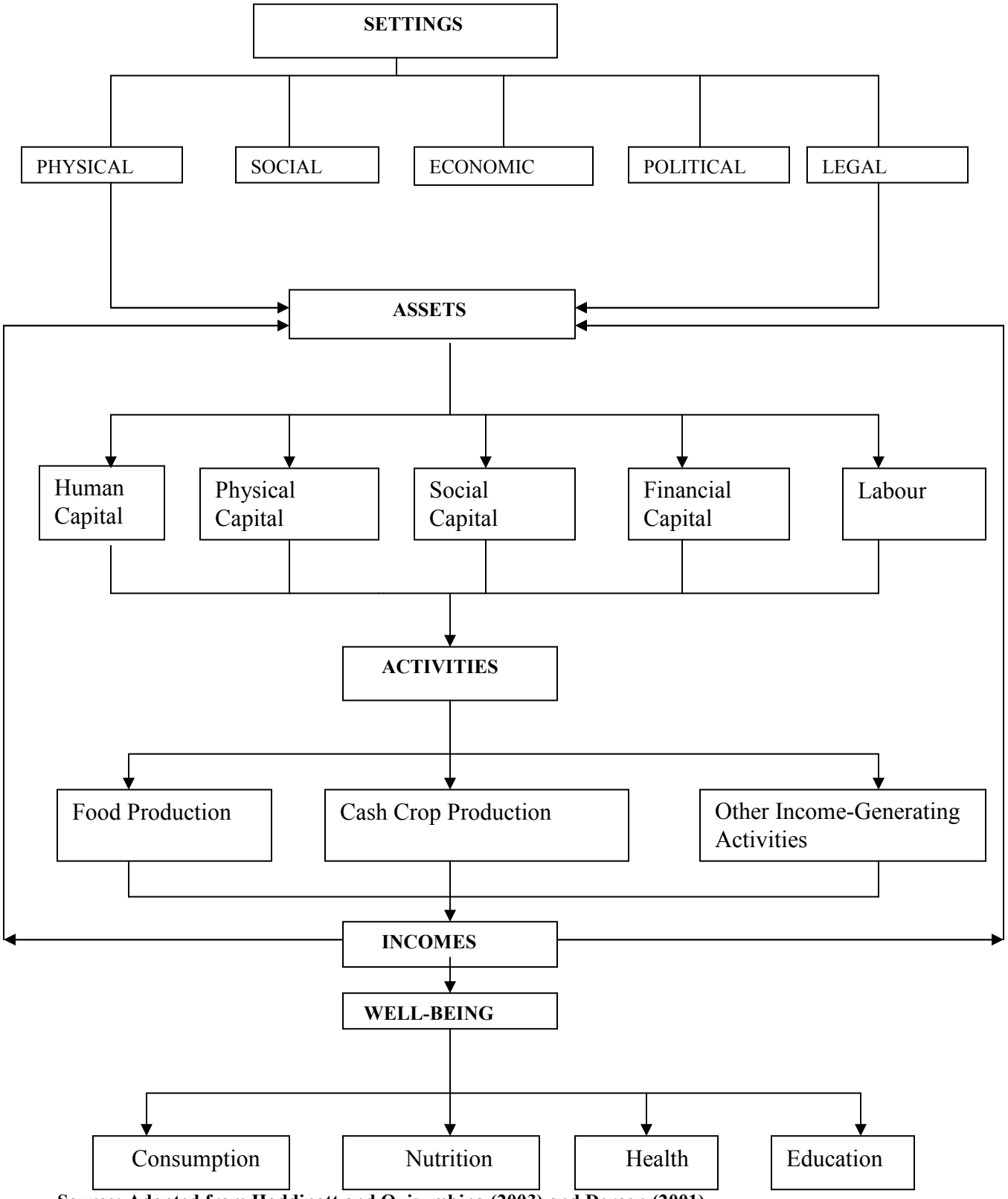
### 6.2.2 Settings, Assets, and Activities

The framework for analysis relates the risk chain to three other components: settings, assets and activities, as shown in figure 6.2. Settings define the environment in which the household operates. As shown in the diagram, these settings are divided into physical settings depicting the natural phenomena such as the variability of rainfall, the fertility of the soils, infrastructure, and distance to markets, among others. The social settings are influenced by societal values and norms. The economic settings capture policies that affect the level, returns and variability of returns on assets (Hoddinott and Quisumbing, 2003). The legal settings are thought of as rules governing the process by which exchange takes place. Finally, the political setting captures the mechanisms by which these rules are put in place.

Within this framework, households have assets within these settings. The assets, including human capital (in the form of knowledge, skills, health endowments, etc.), physical capital (livestock, agricultural equipment, etc.) labour, social capital (social networks and interactions, etc), and financial capital (cash, bank accounts, loans, etc) are at their disposal to make a living. In this analysis, holding assets is the main *ex-ante* risk management mechanism. These assets are transformed into different forms of income via activities. They may use the assets to get involved in food production or cash crop production or get involved in other income generating activities. Assets are also used to generate income in various forms, including earnings and returns to assets, sale of assets, transfers and remittances (Dercon, 2001). Finally, incomes enable households to attain a certain level of well-being that can be measured in terms of nutrition, consumption, health and education, among others.

As the figure 6.2 shows, households build up assets through their incomes. This can be thought of as household saving and investment. It should also be pointed out that the transformation of assets into incomes is constrained by households' access to information, the functioning of markets, and access to such markets, the functioning of non-market institutions, and public policy, among others (Dercon, 2001).

**Figure 6.2: Settings, Assets and Activities**




**Source: Adapted from Hoddinott and Quisumbing (2003) and Dercon (2001)**

Further, there are different degrees of risk at each step of the framework. The settings, whether physical, social, economic or political, are all subject to risk. Further, risks affect assets, their transformation into incomes and its manifestation into different aspects of welfare. As such, a better understanding of risk and how households manage in the presence of risk is crucial in evaluating households' vulnerability to poverty.

## 6.3 Methodology

### 6.3.1 Conceptual and Empirical Overview

The available literature on vulnerability to poverty seems to have reached a consensus that vulnerability is a risk of a shortfall in well-being. Although poverty and vulnerability are both multi-dimensional, poverty is an *ex-post* measure of a household well-being (or lack thereof), while vulnerability is an *ex-ante* measure of well-being. The concept of poverty is distinguished from the notion of vulnerability because of the presence of risk, which implies that the level of a household's future well-being is uncertain. Conceptually, the definition that vulnerability is the probability that a household would find itself consumption poor in the future, underscores the fact that vulnerability is a forward-looking measure of household welfare. It is in this respect that while estimates or inferences about whether a household is currently vulnerable to consumption poverty can be made, the current level of household's vulnerability cannot be directly observed.

At the empirical level, among the various indicators of household welfare that are mentioned in the literature, the most applied indicator in the empirical estimation of vulnerability is per capita consumption expenditure. Another empirical concern is the identification of a conceptual framework for analysing both the inter-temporal aspects and the cross-sectional determinants of household consumption patterns. The literature seems to suggest that in any period, consumption at a household level depends on its wealth, its current income level, its future income prospects, the degree of income volatility it faces, and its ability to maintain consumption and other aspects of well-being in the face of adverse income and livelihood shocks. These factors in turn depend on the household socio-economic characteristics (such as education levels of household members, dependency ratio, and the income levels), as well as a variety of aggregate

environment in which the household finds itself (such as macroeconomic and agronomic environments in which it operates).

### 6.3.2 Model Specification

The study will adopt the methodology for analyzing household vulnerability proposed by Christiaensen and Subbarao (2004). The model follows a vulnerability as expected poverty (VEP) approach and uses consumption as a measure of well-being. The definition of vulnerability under the VEP approach was presented in equation 2.4 of chapter 2.

Let the poverty index for person *i* at time *t* be denoted as $p_{it}(C_{it}, Z)$, where C is the level of consumption and Z is the poverty line. The vulnerability V of person *i* at period t = 0, with respect to his future consumption ($C_{i,t\geq 1}$) can be expressed as

$$\begin{aligned} V_{i,t=0} &= \mathrm{E}\left[p_{it}(C_{it}, Z) \mid F(C_{it})\right] \\ &= \int_{\underline{C}_t}^{Z} p_{it}(C_{it}, Z) dF(C_{it}) \\ &= F(Z) \int_{\underline{C}_t}^{Z} p_{it}(C_{it}, Z) \frac{f(C_{i,t})}{F(Z)} dC_{it} \end{aligned} \tag{6.1}$$

Where $\underline{C}_t$ is the lower bound of future consumption $C_t$ and F(.) is the cumulative distribution function associated with the density function f(.)

Equation 6.1 shows that the person *i*'s vulnerability is measured as the current probability of becoming poor in the future (F(Z)) multiplied by the conditional expected poverty. Based on the Foster-Greer-Thorbecke (FGT) measures of poverty, the poverty index can be expressed as:

$$p_{it}(C_{it}, Z) = \left[ \max\left(0, \frac{Z - C_{it}}{Z}\right) \right]^{\gamma}$$

Therefore (6.1) can be written as:

$$V_{i,t=0,\gamma} = F(Z)\int_{\underline{C}_t}^{Z}\left[\frac{Z - C_{it}}{Z}\right]^{\gamma}\frac{f(C_{i,t})}{F(Z)}dc_{it} \qquad (6.2)$$

From (6.2) it is apparent that a person's vulnerability is measured as a product of the probability that a person's consumption falls below the poverty line (F(Z)), and the weighted probability function of relative consumption shortfall. It should be pointed out that if $\gamma = 0$, equation (6.2) simplifies to F(Z), and vulnerability is measured as the probability of consumption shortfall ($V_0$). If $\gamma = 1$, vulnerability ($V_1$) is the product of the probability shortfall and the conditional expected gap (Christiaensen and Subbarao, 2004). When $\gamma>1$, larger shortfalls are converted into greater vulnerability, given the same conditional probability of occurrence.

In order to empirically estimate the vulnerability measure $V_\gamma$ provided in (6.2), the methodology involves the following steps:

1. There is need to determine the time horizon over which potential future shortfalls will be assessed. In this study it will be done for two years (2004 -2006) because of the data limitations;

2. Household consumption expenditure per capita is used as the indicator of well-being. The choice of consumption as a measure of welfare is guided by a number of reasons. Although welfare is measured by income in more developed countries, measuring income is a big challenge in developing countries, such as Malawi. First, many Malawians do not have a regular income, making it difficult to assess one's current income at one point in time. Second, income from farming activities may be hard to enumerate since households do not keep formal accounts of revenues and expenditure (Malawi Government and World Bank, 2006). Third, there is a tendency among households to deliberately under-report earnings from informal activities.

3. Consumption poverty line (Z) is used to define a threshold for well-being. In our study, the official poverty line for Malawi in 2006 (already described in great detail in chapter 4) is used.

4. A probability threshold θ = 0.5 is used, such that a household is considered vulnerable if that household's probability of shortfall exceeds θ[10].

5. An *ex-ante* probability distribution ($f_{t=0}(C_t)$) of *ex-post* consumption is then estimated.

The consumption generating process for the household depends on, among other things, its current endowments, its setting (environment) and the risk factors it faces. The risk factors, whether idiosyncratic or covariate, affect the level and variability of the household's endowments and income. In this respect, the level and variability of a household's future consumption stream depend on the risk factors which are stochastic, the risk exposure and the household's coping capacity. The household consumption can therefore be expressed in the following reduced form:

$$C_{ijt} = c\left(X_{ijt-1}, S_{ijt}, \varphi_{ij}, \theta_{ij}, u_{ijt}\right) \qquad (6.3)$$

Where: $X_{ijt-1}$ denotes the bundle of observed household and location-specific characteristics of household *i* in location j at time *t-1*;

$S_{ijt}$ denotes observed local covariate and idiosyncratic shocks that the household experiences between time *t* and *t-1*;

[10] θ is the threshold for vulnerability such that households whose probability of consumption shortfall exceeds the threshold are classified as vulnerable. Although the choice of θ is quite arbitrary, two threshold points are reported in the literature. The most common vulnerability threshold is 0.5, implying that a household whose probability shortfall is greater than 0.5 is more likely than not to end up poor. Most authors including Christiaensen and Subbarao (2004), Dercon (2001), Harrower and Hoddinott (2004) use this vulnerability threshold. The second threshold is setting θ equal to the observed current poverty rate in the population. The reasoning is that because the observed poverty rate represents the mean vulnerability level in the population, any household whose vulnerability level lies above this threshold faces a risk of poverty that is greater than the average risk in the population and can therefore be classified as vulnerable (Chaudhuri *et al.* 2002). In their study on vulnerability in Indonesia, Chadhuri *et al*. (2002) use both thresholds and they referred to the θ=0.5 threshold as high vulnerability threshold while the observed incidence of poverty threshold was referred to as relative vulnerability threshold.

φ represent a vector of parameters describing the returns to the locality and household; endowments, and the effect of the shocks $S_{ijt}$;

$\theta_{ij}$ denotes unobserved time invariant household and locality effects;

$U_{ijt}$ represent unobserved idiosyncratic shocks.

$X_{ijt-1}$ is a function of its initial endowment base and the shocks it experiences, such that:

$$X_{ijt-1} = x\left(X_{ij0}, S_{ijt-k}, \eta_{t-1}, \varepsilon_{t-1}\right) \tag{6.4}$$

Where: $X_{ij0}$ is the initial endowment base;

$S_{ijt-k}$ denote the series of shocks experienced by the household between time 0 and t-1, with k=1,…,t-1;

$\eta_{t-1}$ is the vector of coefficients relating the initial endowments and past shocks to the current asset base $X_{ijt-1}$;

$\varepsilon_{t-1}$ denote the different unobserved factors that contribute to changes in the asset base over time.

Putting equation (6.4) into (6.3) yields:

$$C_{ijt} = c\left(X_{ij0}, S_{ijt-k}, \phi_t^*, \theta_{ij}, u_{ijt}^*\right) \qquad \text{with k} = 0,..., \text{t} - 1 \tag{6.5}$$

### 6.3.3 Econometric Specification

Christiaensen and Subbarao (2004) extend the approach proposed by Just and Pope (1979) to specify the consumption function in equation 6.3 into a flexible heteroscedastic form:

$$\begin{aligned} \ln C_{ijt} &= X_{ijt-1}\beta + S_{ijt}\gamma + S_{ijt}\varphi' X'_{ijt-1} + \theta_{ij} + u_{ijt} \\ &= X_{ijt-1}\beta + S_{ijt}\gamma + S_{ijt}\varphi' X'_{ijt-1} + \theta_{ij} + h^{1/2}\left(X_{ijt-1};\alpha\right)^* e_{ijt} \end{aligned} \tag{6.6}$$

where $e_{ijt} \sim N(0,\sigma^2_e)$

The conditional mean and variance from equation 6.6 can be expressed as:

$$E\left(\ln C_{ijt} \mid X_{ijt-1}\right) = X_{ijt-1}\beta + E\left(S_{ijt}\right)\left[\gamma + \varphi' X'_{ijt-1}\right] + E\left(\theta_{ij}\right) \tag{6.7}$$

$$V\left(\ln C_{ijt} \mid X_{ijt-1}\right) = \left[\gamma + \varphi' X'_{ijt-1}\right] V\left(S_{ijt}\right)\left[\gamma + \varphi' X'_{ijt-1}\right] + \sigma^2_\theta + h\left(X_{ijt-1};\alpha\right) * \sigma^2_e \tag{6.8}$$

The heteroscedastic specification in equations 6.7 and 6.8 has special features:

1. It enables the variance of household consumption to differ across households depending on three factors. The first factor is the household and location-specific characteristics $h\left(X_{ijt-1};\alpha\right)*\sigma_e^2$ . The second factor is the variance of the shocks the household faces $\gamma^2 V\left(S_{ijt+1}\right)$. The third factor is the differential effect of the shock on the household expressed as $\left[\phi' X'_{ijt}\right]' V\left(S_{ijt+1}\right)\left[\phi' X'_{ijt}\right]$.

2. The explanatory variables do not have to affect the mean and variance of future household consumption in the same direction.

3. The shocks can be modelled explicitly by decomposing the variance of household consumption into idiosyncratic and covariate components, as shown below:

Let $s_i$ and $s_c$ denote idiosyncratic shock and covariate shock, respectively; and θ denote constant variance-unobserved household and locality characteristics. Then the variance in equation 8 can be split into:

$$V\left(\ln c_{ijt} X_{\partial ijt-1}\right)=\left[\gamma_{sc}+\phi_{sc}' X'_{ijt-1}\right]^2 \sigma^2{}_{sc}+\left[\gamma_{si}+\phi_{si}' X'_{ijt-1}\right]^2 \sigma^2{}_{si}+h\left(X_{ijt-1};\alpha\right)*\sigma^2{}_e \quad (6.9)$$

Where the first variance is that resulting from observed covariate shocks, the second is from observed idiosyncratic shocks, and the third variance is accruing from unobserved idiosyncratic shocks.

4. The interaction terms between household characteristics, location characteristics and the shock included in the specification would ensure that shocks do not affect all households in the same way, since households' incomes and their consumption smoothing capacity differ.

Equations 6.7 and 6.8 can then be used to estimate the *ex-ante* mean and variance of household's future consumption which depend on the *ex-ante* household and locality

characteristics,$X_{ijt-1}$, the mean, the variance and covariance of the observed covariate and idiosyncratic shocks, $S_{ijt}$, and the regression coefficients β, γ, φ, and α of the mean and variance equations (Christiaensen and Subbarao, 2004). However, the estimation of the regression parameters requires a three-step heteroscedastic correction procedure[11] proposed by Just and Pope (1979). This will enable one to obtain efficient estimates of β, γ, and φ.

Finally, the methodology requires combining the efficient estimates with the household and locality characteristics, $X_{ijt-1}$, and the mean, the variance and the covariance of the shocks to predict the household mean and variance of the future consumption. With the assumption of lognormality, one would then be able to estimate vulnerability for each household $V_\gamma$ two periods ahead due to data limitations.

The study used both primary and secondary data. The main source of the secondary data (the 2004 Malawi Integrated Household Survey (IHS2) conducted by the Malawi National Statistical Office) and the subsequent follow-up of 259 households from the IHS2 data were discussed at length in chapter 4. The analysis in this chapter uses real consumption expenditure in 2006, shock variables in 2006 and household and community variables in 2004.

## 6.4 Results

### 6.4.1. Descriptive Statistics

Table 6.1 presents the explanatory variables that are used in the vulnerability analysis along with their expected signs. The corresponding descriptive statistics are presented in table A1-1 of appendix A1. The measure of household welfare used in this study is real consumption per capita in 2006, whose mean is MK29,064[12].

[11] This is also known as a feasible generalized least squares (FGLS) method.

[12] This is equivalent to €130 (at the July 2008 exchange rate).

**Table 6.1: Variables and Expected Signs of the Vulnerability Model**

| Variable | Description | Expected Sign | |
|---|---|---|---|
| | | *Ex-ante* Mean | *Ex-ante* Variance |
| **Household Characteristics in 2004** | | | |
| Female headed household (1=yes) | Whether the household head is female | - | + |
| Age of head is <26 (1=yes) | Whether the household head is below 26 years old | + | - |
| Age of head is between 26 and 65 (1=yes) | Whether the household head is between 26 and 65 years old | + | - |
| Head's level of education: No schooling (1=yes) | The household head has no schooling at all | - | + |
| Head's level of education: Junior Primary (1=yes) | The head has between 1 and 4 years of schooling | - | + |
| Head's level of education: Secondary educ (1=yes) | The head has some secondary education ( 9-12 years of schooling) | + | - |
| Head's level of education: Post-secondary (1=yes) | The head has some post-secondary education (beyond 12 years of schooling) | + | - |
| Household enterprise (1=yes) | Whether the household has a non-farm income-generating activity in 2004 | + | - |
| #goats/sheep owned | Number of goats and sheep owned by the household in 2004 | + | - |
| Per capita land holding size | Land holding size (acres/capita) | + | - |
| Age of head | Age of the household head (years) | + | + |
| Household size | The size of the household | - | -/+ |
| Number of children | The number of children the household has | - | -/+ |
| Dependency ratio | Household dependency ratio | - | + |
| **Community Characteristics in 2004** | | | |
| Weekly market in community (1=yes) | Whether there is a weekly market in the community | + | - |
| Health clinic in community (1=yes) | Whether there is a clinic/dispensary/health centre/hospital in the community | + | - |
| Regular bus service in community (1=yes) | Whether there is a regular bus/transportation services in the | + | - |

| | | | |
|---|---|---|---|
| | community | | |
| Post office in community (1=yes) | Whether there is a post office within the community | + | - |
| MASAF project in community (1=yes) | Whether there is a Malawi Social Action Fund (MASAF) project within the community | + | - |
| Distance to tarmac road | Distance to the nearest tarmac road (Km) | - | + |
| Distance to district headquarters | Distance to the district headquarters (Km) | - | + |
| Distance to primary school | Distance to the nearest government primary school (Km) | - | + |
| Distance to secondary school | Distance to the nearest government secondary school (Km) | - | + |
| Distance to commercial bank | Distance to the nearest commercial bank (Km) | - | + |
| **Shock Variables in 2006** | | | |
| Drought 2006 (1=yes) | Whether the household reported experiencing drought between 2005 and 2006 | - | + |
| Food price rise 2006 (1=yes) | Whether the household reported experiencing a rise in the prices of food commodities between 2005 and 2006 | - | + |
| Illness 2006 (1=yes) | Whether the household reported experiencing an illness 7 days prior to the interview date | - | + |
| Fall in crop prices 2006 (1=yes) | Whether the household reported experiencing a fall in the sale prices for crops between 2005 and 2006 | - | + |
| Number of observations | 259 | | |

**Source: Own compilation**

The choice of the variables is based on the conceptual framework of settings, assets and activities which is guiding the study (see also Alayade and Alayade (2004), Chaudhuri *et al.* (2002), Christiaensen and Subbarao (2004), Dercon and Krishnan (2000) and Tesliuc and Lindert (2004)).

Several household characteristics that are usually correlated with poverty are used in the analysis, as they are expected to influence the *ex ante* mean and variance of household's future consumption. The descriptive statistics show that the average age of the household head in the sample was 43 years and around 26% of the sample was female-headed households. It is expected that the female-headed household variable would have a negative effect on the *ex-ante* mean and a positive sign on the *ex-ante* variance since about 59 percent of female-headed households in Malawi are poor (see chapter 5). The expected signs are therefore based on the premise that female-headed households in rural Malawi tend to have low mean but highly variable consumption levels.

While the average household size of 4.9 in the sample was higher than the estimated national average of 4.5 as obtained from IHS2 data, the number of children in the household among the sampled households was 3 which was higher than the national average of 2.1. It is expected that number of children reduces the *ex-ante* mean of future consumption while increasing the variability of future consumption. Further, about 80 percent of the sampled households were headed by an individual between 26 and 65 years of age and only 9 percent were over 65. The choice of the expected signs on the two categories of 'age of the household head' is influenced by the fact that households headed by young heads tend to be less poor than their counterparts in Malawi (see figure 5.5).

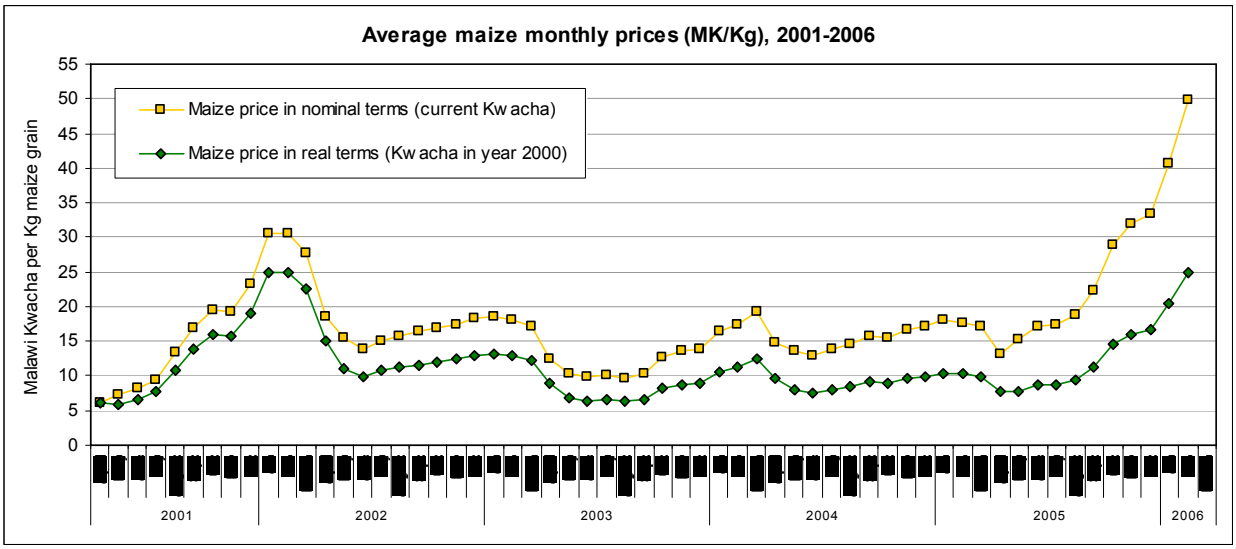
Since vulnerability is a function of the risks households face, their exposure and their ability to smooth consumption in the face of such risks, several variables are included to proxy risks, risk exposure and households' coping capacity. It is important to note that the study expects all the shocks to have a negative impact on the *ex-ante* mean while increasing the volatility of future consumption for the households. The main idiosyncratic risk included in the analysis is whether there was an illness in the household prior to the interview date. The descriptive statistics in the appendix A1-1 show that 38 percent experienced the illness shock. Other important idiosyncratic shocks such as deaths and births in the household are not included in the estimates of the household vulnerability because only few households reported encountering them (see chapter 7) and they had no significant effect on the *ex-ante* mean and variance of future consumption. Nevertheless,

they play an important role in the subsequent chapters that deal with consumption smoothing and household risk management strategies.

Several covariate shocks are included in the study based on the extent to which households reported experiencing them. Drought remains one of the most important shocks that have serious effects on household welfare not only in Malawi but the whole of Sub-Saharan Africa. Its effect on household poverty and vulnerability has been well documented by Benson *et al.* (2005), Christiaensen and Boisvert (2000), Dercon *et al.* (2005) and Dercon and Krishnan (2000), among others. The descriptive statistics show that drought was widely experienced between 2005 and 2006, with 80 percent of the sample reporting experiencing it. Falling sale prices for crops is another variable that has a downward effect on household welfare among the agricultural households in rural Malawi, especially those in tobacco growing areas of Mchinji, Kasungu and Lilongwe. About 31 percent reported experiencing a fall in prices for crops between 2005 and 2006.

Rising food prices was another covariate shock used in the estimation of vulnerability. In Malawi, maize is the staple crop and the majority of the population rely almost exclusively on maize for their livelihood (Malawi Government and World Bank, 2006). As such, maize price volatility has serious consequences on the welfare of the majority of households particularly the poor who may be especially vulnerable as their instruments to protect their consumption are limited. As figure 6.3 shows, the enormous inter-annual volatility of maize prices between 'crisis' years, such as 2001/02 and 2005/06 and 'normal' years (Malawi Government and World Bank, 2006). Since the timeframe considered in this study (2004 and 2005) falls between a 'normal' and a 'crisis' period, it is not surprising that 39 percent of the sampled households reported experiencing a rise in food prices between 2005 and 2006.

**Figure 6.3: Malawi Monthly Average Maize Price in Nominal and Real Terms, 2001-2006**




**Source: Malawi Government and World Bank (2006)**

Several variables are used in the analysis as proxies for household risk exposure. Since the studied areas are predominantly agricultural-based, land ownership has an important effect on the extent to which shocks negatively impact on the household welfare. In the study, household land holding is defined to include rain-fed plots, wetland plots, tree plots, uncultivated plots and plots rented out to others. The sample has an average land holding size of 0.59 acres/capita, which is higher than the national average of 0.82 acres/capita. It is expected that land holding size would increase the average of future consumption and reduce the volatility of consumption. The choice of the signs is based on both the literature such Christiaensen and Subbarao (2004) who found similar results and the fact that households with land landholdings are less poor than their counterparts in Malawi.

Another important variable in the risk exposure category is whether the household has a non-farm income generating activity. This is used in the study as a proxy for income diversification on the premise that households diversify their income sources to smooth their income *ex-ante* particularly when they are unable to their consumption *ex-post* (Christiaensen and Subbarao, 2004). Due to data limitations, a share of income derived from non-farm sources is not used in the study. Instead, a dummy variable to indicate

whether the household has non-farm sources is used. The descriptive statistics show that 38 percent of the sample reported having a non-farm activity in 2004. Appendix A3 shows the different non-farm activities that the households reported in the first round in 2004. As figure A3-1 shows, the most frequently reported activity was traditional beer brewing with over 32 percent of all the households that were engaged in some off-farm income generating activities being involved. Handicraft (such as weaving of baskets), selling of vegetables and operating a grocery shop were reported by around 14 percent of all the households that were involved in non-farm activities.

The demographic characteristics and community characteristics are used to proxy for consumption smoothing capacity of households. Larger households are usually associated with higher poverty rates, although their composition may have a positive impact on their ability to smooth consumption (Christiaensen and Subbarao, 2004). Educational status of the household head is also an important variable since, following the Schultz hypothesis of 1975, educated individuals may be less vulnerable as they adapt to change quickly, implying having a greater *ex-post* coping capacity to shocks. The study, therefore, expects education to have a positive impact on the *ex-ante* mean and a negative effect on the *ex-ante* variance. The average number of years of schooling in the sample is only 4.9, and while 28 percent of the household heads had no education at all, only 5 percent had post-secondary education. Furthermore, the descriptive statistics (table 6.1) show that many important infrastructure is lacking in the sampled areas. For instance 14 percent reported the existence of weekly markets within their communities and only 21 percent reported that they had a health facility in their communities. Commercial banks are important institutions that promote savings among households in Malawi. Such saving becomes very useful during periods of consumption shortfall. The descriptive statistics show that the average distance to a commercial bank within the sampled communities was around 27 Km. It is expected that community infrastructure such as markets and health centres would have a negative impact on household vulnerability, thus the expected signs on the *ex-ante* mean would be positive while on *ex-ante* variance would be negative.

Finally, it is assumed that livestock possession might be another important proxy for consumption smoothing, since studies have shown that animals are important consumption smoothing assets in Asia (Rosenzweig and Wolpin, 1993; and Kurosaki, 1995) although there is no conclusive evidence from Africa (McPeak, 2004). Animal husbandry is not a common agricultural activity in the sampled areas, as Malawi has a very low livestock ownership by regional standards (Malawi Government and World Bank, 2006). Since possession of cattle is extremely rare, only goats and sheep are used in this study as a proxy for consumption smoothing. It is expected that the goat/sheep variable would have a positive effect on the *ex-ante* mean while having a negative effect on the variance, thereby reducing vulnerability. The average goat/sheep ownership was slightly over 1 in 2004 in the sample. This observation is echoed by Devereux *et al.* (2007) who reported that 43 percent of Malawian households owned no livestock of any kind in 2004, with the remaining livestock being distributed very unequally.

### 6.4.2 Determinants of Vulnerability in Rural Malawi

The results of the model of the determinants of the *ex-ante* mean and variance of future consumption that are used in the estimation of household vulnerability are presented in table 6.2. Although both ordinary least squares (OLS) estimates and feasible generalized least squares estimates (FGLS) are presented, the discussion will dwell on the estimates from FGLS for the following reason: Since there is a greater likelihood that there might be some error in the measurement of per capita household consumption, the OLS estimates are more likely to overestimate the variance of consumption, leading to an overestimation of household vulnerability. However, the FGLS approach yields a consistent estimate of the true variance of household consumption even when it is measured with error unless the measurement error itself varies systematically with some household characteristics (Tesliuc and Lindert, 2004). This is however, not likely to be the case since the sample only considers rural households whose characteristics are similar. Estimates from OLS are, nevertheless presented just for comparison's sake.

**Table 6.2: Model for the Estimation of Vulnerability to Poverty**

| | OLS | | FGLS | |
|---|---|---|---|---|
| **Variable** | ***Ex ante* Mean** | ***Ex-ante* Variance** | ***Ex-ante* Mean** | ***Ex-ante* Variance** |
| **Household Characteristics (2004)** | | | | |
| *Education of household head* | | | | |
| Household head with no education | 0.27 | 0.57 | -0.29 | 0.26 |
| | (0.28) | (1.21) | (4.01)*** | (0.57) |
| Household head with junior primary education | 0.08 | 0.82 | -0.07 | 0.91 |
| | (0.94) | (1.55) | (1.03) | (2.01)* |
| Household head with secondary education | 0.15 | -0.08 | 0.12 | 0.03 |
| | (1.24) | (0.14) | (1.50) | (0.05) |
| Household head with post-secondary education | 1.03 | 1.47 | 0.76 | 0.08 |
| | (3.28)*** | (1.86)* | (3.00)*** | (0.05) |
| Household size | -0.17 | -0.16 | -0.13 | -0.25 |
| | (7.76)*** | (1.69)* | (9.68)*** | (2.75)** |
| *Age of Household Head* | | | | |
| Age of head is <26 (1=yes) | -0.22 | -0.85 | -0.21 | -1.69 |
| | (1.86)* | (1.98)* | (3.01)*** | (3.75)*** |
| Age of head is between 26 and 65 (1=yes) | -0.03 | -0.33 | 0.07 | -0.61 |
| | (0.29) | (0.66) | (0.73) | (0.92) |
| Female headed household (1=yes) | -0.18 | -0.15 | -0.06 | 0.13 |
| | (1.95)* | (0.37) | (1.00) | (0.32) |
| Per capita land holding size (acres) | 0.20 | 0.11 | 0.23 | 0.35 |
| | (2.44)** | (0.29) | (5.45)*** | (1.26) |
| Household enterprise (1=yes) | 0.17 | 0.25 | 0.13 | -0.14 |
| | (2.31)** | (0.68) | (2.56)** | (0.42) |
| #goats/sheep owned | 0.01 | -0.03 | 0.02 | -0.04 |
| | (1.18) | (0.61) | (1.55) | (0.55) |
| **Community Variables (2004)** | | | | |
| Community dummy 1 | -0.32 | 0.92 | -0.32 | -3.93 |
| *(Chikulamayembe*) | (1.84)* | (1.03) | (1.81)* | (3.39)*** |
| Community dummy 3 | -0.58 | -1.41 | -0.54 | 0.01 |
| *(Mwahenga)* | (2.43)** | (1.32) | (2.82)** | (0.01) |
| Community dummy 4 | 0.83 | 1.04 | 0.63 | 0.77 |
| *(Mwalweni)* | (3.40)*** | (1.26) | (2.83)** | (0.53) |

| | | | | |
|---|---|---|---|---|
| Community dummy 5 | 1.11 | 1.27 | 0.89 | -0.09 |
| *(Njombwa)* | (3.92)*** | (1.38) | (3.45)*** | (0.06) |
| Community dummy 7 | 0.45 | -1.06 | 0.52 | -2.05 |
| *(Chadza)* | (3.52)*** | (1.52) | (4.47)*** | (2.71)*** |
| Community dummy 9 | 0.42 | 0.27 | 0.40 | 0.30 |
| *(Mavwere)* | (1.96)* | (0.24) | (2.33)** | (0.27) |
| Community dummy 10 | -0.10 | -0.06 | 0.16 | 0.86 |
| *(Zulu-Simphasi)* | (0.53) | (0.04) | (1.12) | (0.92) |
| Community dummy 11 | 0.36 | -0.12 | 0.46 | -1.17 |
| *(Mkanda)* | (1.86)* | (0.14) | (2.53)** | (0.99) |
| Community dummy 19 | 0.23 | -1.00 | 0.27 | -3.57 |
| *(Kuntaja)* | (1.34) | (0.71) | (2.19)** | (4.47)*** |
| Community dummy 20 | 0.23 | 1.79 | 0.23 | 0.36 |
| *(Ngabu)* | (1.34) | (1.76)* | (1.17) | (0.28) |
| Existence of weekly market (1=yes) | 0.68 | -0.06 | 0.58 | 0.83 |
| | (4.07)*** | (0.08) | (4.23)*** | (0.92) |
| Existence of regular bus service (1=yes) | -0.22 | 0.97 | -0.17 | -0.58 |
| | (1.61) | (1.36) | (1.43) | (0.76) |
| Existence of post office (1=yes) | 0.14 | 0.03 | 0.25 | 0.51 |
| | (0.84) | (0.05) | (1.69) | (0.52) |
| Existence of health centre (1=yes) | 0.87 | 0.89 | 0.75 | 0.42 |
| | (4.55)*** | (1.55) | (4.75)*** | (0.40) |
| Distance to commercial bank (Km) | -0.01 | 0.01 | -0.02 | -0.03 |
| | (3.42)*** | (0.33) | (4.51)*** | (1.27) |
| Distance to district headquarters (Km) | 0.00 | 0.02 | 0.01 | 0.01 |
| | (1.62) | (1.52) | (1.24) | (0.62) |
| Distance to govt primary school (Km) | -0.02 | -0.10 | -0.01 | -0.01 |
| | (0.83) | (0.98) | (0.55) | (0.04) |
| Distance to govt secondary school (Km) | -0.01 | -0.02 | -0.00 | 0.01 |
| | (1.87)* | (1.39) | (0.91) | (0.34) |
| **Shock Variables (2006)** | | | | |
| Drought (1=yes) | -0.23 | -0.28 | -0.13 | -0.00 |
| | (2.62)*** | (0.60) | (2.12)** | (0.24) |
| Illness (1=yes) | -0.21 | -0.30 | -0.19 | -0.23 |
| | (2.44)** | (0.86) | (3.51)*** | (0.66) |
| Rising food prices (1=yes) | 0.06 | 0.16 | -0.07 | -0.74 |
| | (0.74) | (0.39) | (1.50) | (2.24)** |

| | | | | |
|---|---|---|---|---|
| Falling crop sale prices (1=yes) | 0.06 | -0.54 | 0.09 | -0.10 |
| | (0.82) | (1.04) | (2.12)** | (0.32) |
| Rising agricultural input prices | -0.04 | -0.59 | -0.03 | -2.17 |
| (1=yes) | (0.56) | (1.99)** | (0.56) | (6.07)*** |
| Constant | 10.80 | -2.50 | 10.55 | 0.34 |
| | (36.09)*** | (2.16)** | (56.84)*** | (0.28) |
| No of Observations | 259 | 259 | 259 | 259 |
| $R^2$ | 0.65 | 0.23 | 0.63 | 0.45 |
| Adjusted $R^2$ | - | - | 0.57 | 0.36 |
| F-Value | 9.61*** | 2.83*** | 10.93*** | 5.13*** |

**Source: Own compilation**

**Note:** 1. The dependent variable for the first estimation is the *ex-ante* mean = $E[(\log \text{real exp}_{2006}) \mid X_{2004}]$

2. The dependent variable for the second estimation is the *ex-ante* variance = Variance $\text{Log}[\text{var log}(\text{real exp}_{2006}) \mid X_{2004})]$

3. Absolute values of t-statistics in parentheses; ***significant at 1%; **significant at 5%; *significant at 10%

Most of the coefficients of the household characteristics are coming up with the expected signs. In terms of education of the household head, the results show that a household head with no education negatively affects average consumption (at 1 percent level of significance) thereby increasing vulnerability. It also increases the variance of consumption, although the result is not significant. Further, post-secondary education of the household head positively affects the mean of household consumption at 1 percent level of significance but it is also associated with an increase in the variance of future consumption, although this result is not significant. The results from the different components of the education variable confirm that households who are headed by a more educated individual are less vulnerable to future poverty. Similar results have been found elsewhere (see Alayande and Alayande, 2004).

Household size negatively affects average consumption, thereby increasing vulnerability. The result is significant at 1 percent level of consumption and it means that larger households are not only poorer on average but also more vulnerable. However, the results further show that a large family size may also reduce vulnerability, as it is associated with

a decrease in the variance of future consumption, at 5 percent level of significance. Christiaensen and Subbarao (2004) who also found this conflicting result argued that larger family size usually have larger supply of labour which may be useful in periods of consumption shortfall, as children may also participate in some income earning activities. Indeed, it is common in rural Malawi for children to participate in informal labour supply (*ganyu*) to meet household consumption requirements during periods of shortfall. Nevertheless, the reduction in mean of future consumption is more significant than the decrease in the variance such that the overall effect of large household size is that it increases vulnerability.

With regard to the age of the household head, while the age group of 26-65 has no significant effect on *ex-ante* mean and *ex-ante* variance of future consumption, the less than 26 years old age category has a negative impact on the ex-ante mean. The result shows that household heads that are less than 26 years old in the sample are associated with lower average consumption levels, thereby increasing vulnerability. On the other hand, the same age group reduces the *ex-ante* variance, thereby reducing vulnerability. The final effect of this variable on the household depends on whether the vulnerability-reducing effect on *ex-ante* variance is stronger than the vulnerability-increasing effect on the *ex-ante* mean. Although this result is inconclusive, results from other studies seem to suggest that households headed by young individuals are more vulnerable than their counterparts. For instance, Devereux *et al.* (2007) who used determinants of changes in the household durable asset index as a proxy for vulnerability due to data limitations, also finds that Malawian households with young heads are more vulnerable.

Although female headed households are associated with a reduction in average consumption and an increase in the variance of consumption with an overall effect of increasing household vulnerability, the result is not statistically significant. Further, per capita land holding size reduces vulnerability by enhancing the mean of future consumption at 1 percent level of significance. As expected, household enterprise enhances average consumption and the result is significant at 1 percent level, and it decreases the variance of future consumption, although the result is not statistically

significant. The result that non-farm household enterprises reduce vulnerability among the sampled households seems to suggest that diversification of household income sources does not only reduce levels of current poverty but also the current probability of future poverty. Further, although possession of goats and sheep positively affects average consumption and reduces the variance of future consumption as expected, the result is not statistically significant mainly because livestock ownership is still very low such that goats and sheep do not make a significant contribution to the household asset base.

With respect to the community variables, it can be seen that different community dummy variables that were included in the model to account for unique unobserved characteristics have different effects on the *ex-ante* mean and variance. The community dummies followed government's administrative structures at district level and were set at traditional authority (TA) level, which is a step above the village level. It should also be pointed out that other community dummies were dropped in the econometric estimation to avoid matrix singularity caused by collinearity. While some communities (Njombwa, Chadza, Mkanda, and Kuntaja) had unobserved characteristics that reduce household vulnerability by enhancing mean consumption and reducing the variance of future consumption, others had vulnerability-increasing characteristics (Mwahenga and Mwalweni).

Most of the community characteristics included in the model were only significant at improving the mean of future consumption. For instance, at 1 percent level of significance, weekly markets positively affect the mean of future consumption, as expected. This result is consistent with the findings of Christiaensen and Subbarao (2004) for rural Kenya. Indeed, the existence of rural markets within the communities in rural Malawi enhances the ease at which crops and some household assets (such as goats) can be turned into cash, which can then be used to supplement household consumption. Similarly, the existence of a government health facility is associated with an increase in average consumption at 1 percent level of significance. Government clinics and health centres in the rural communities are an important community infrastructure offering free medical services. As such, controlling for other factors, households residing in such

communities are likely to be less vulnerable. The results further confirm that distance to a commercial bank enhances household's vulnerability by reducing the *ex-ante* mean of future consumption. Lack of commercial banks within a walking distance limits the ways in which households can make money savings that can be used as an *ex-ante* risk management strategy.

The only idiosyncratic shock used in the model, illness within the household, increases vulnerability by reducing average household's future consumption as expected. The result is significant at 1 percent level. With regards to covariate shocks, only drought and falling sale prices for crops are significant in increasing household vulnerability by reducing *ex-ante* mean of future consumption. The result on drought is consistent with a lot of literature on the role of drought in influencing vulnerability in Ethiopia (see Dercon *et al.*, 2005) and Malawi (see Benson *et al.*, 2005; Devereux *et al.*, 2007; and Malawi Government and World Bank, 2006). Further, Households that reported being affected by rising food prices and rising agricultural input prices experience a significant reduction in the variance of their future consumption but the decrease in the average consumption is not significant.

It is important to note at this point that vulnerability is always a function of the expected mean and variance of household consumption. According to Günther and Harttgen (2006), the mean of expected consumption is determined by household and community characteristics while the variance in household consumption is determined by the occurrence and impact of covariate and idiosyncratic shocks. Since the vulnerability model did not retain many significant variables in the *ex-ante* variance, it can be concluded that vulnerability is more a function of low expected mean of household consumption than high volatility in consumption among the sampled households.

The vulnerability model was tested for multicollinearity using the variance inflation factor (VIF) and its associated tolerance factor. The derivation of VIF and tolerance factor is presented in appendix A2. The results, presented in great detail in appendix A2-

1, show that multicollinearity is not a severe problem in any of the explanatory variables since the highest VIF in the model is 4.07, with an associated tolerance index of 0.25.

It should be pointed out that an attempt was made to compare the VEP and the VEU approaches. The details are provided under the study limitations section in chapter nine.

### 6.4.3 A Profile of Household Vulnerability in 2004

As outlined in the methodology, each household's vulnerability was calculated as the current (2004) probability of future (2006) shortfall in consumption, implying a two-year time horizon due to data limitations. Further, since consumption poverty line is used to define a threshold of welfare, the official 2006 poverty line for Malawi of MK16,165 is adopted. Table 6.3 presents the vulnerability profiles of the studied areas.

The results show that there were no marked differences between the 2004 headcount poverty rate and the 2004 vulnerability headcount rate for the entire sample. While the poverty headcount rate was 47 percent, the vulnerability rate (i.e. the proportion of the population whose probability of future (2006) poverty was above the 0.5 threshold) was 45 percent. It should be pointed out that the mean probability of future poverty in 2004 for the entire sample was 0.44. The analysis further shows that although the 2004 vulnerability headcount index to 2006 poverty was 45 percent, the observed poverty headcount in 2006 was 50 percent.

A similar pattern also emerges if poverty and vulnerability are classified at district level. Districts with high poverty rates in 2004 also have high rates of vulnerability. For Rumphi, Kasungu, Mchinji, and Mangochi the 2004 vulnerability headcount is higher than the 2004 poverty headcount index, with the difference ranging from 0.03 in Rumphi to 0.14 in Mangochi. The vulnerability to poverty ratio for 2004 is highest in Kasungu and lowest in Chikwawa. Putting the observed poverty headcount index for 2006 in the picture, the results show that districts with higher vulnerability to 2006 poverty in 2004 reported significant reductions in the poverty headcount contrary to expectations. For instance, districts like Mchinji, Mangochi and Zomba which had vulnerability headcount

of above 50 percent, recorded a decrease in the headcount poverty index from 2004 to 2006. On the other hand, Kasungu, Lilongwe and Blantyre whose vulnerability headcount indices are lower than the vulnerability headcount of 45 percent for the whole sample, experienced an increase in the rates of poverty from 2004 to 2006.

A further classification of poverty and vulnerability profiles based on several household characteristics shows that in 2004 vulnerability rates were slightly higher among female-headed households than male-headed ones, with the vulnerability rate being even higher than the poverty rate for the female-headed households. A vulnerability to poverty ratio of 1.06 confirms this observation. The 2004 vulnerability headcount was also higher for widow-headed households where 49 percent of all such households were vulnerable to poverty in 2006, compared to 44 percent for households whose heads were not widowed.

Different classifications of the level of education of the household head show that the vulnerability headcount was decreasing with an increase in the number of school years. While 44 percent of those with no schooling were vulnerable in 2004, the rate fell to 17 percent among those with some secondary education and none of those with post-secondary education were vulnerable. The same pattern emerges when we consider vulnerability to poverty ratio for the different categories of education. The ratio was above 100 percent for the no schooling category, implying that the vulnerability rate was higher than the poverty rate, and it continued to fall until it reached 0 percent for those with post-secondary education.

**Table 6.3: Vulnerability and Poverty Profiles of the Sampled Areas**

| | Population Share | Poverty Headcount ($P_0$) in 2004 | Mean Vulnerability ($V_0$) in 2004 | Vulnerability Headcount ($V_0$>0.5) in 2004 | Vulnerability To Poverty Ratio in 2004 | Poverty Headcount ($P_0$) in 2006 |
|---|---|---|---|---|---|---|
| **Total** | **100** | **0.47** | **0.44** | **0.45** | **0.96** | **0.50** |
| | | **By Location** | | | | |
| Rumphi | 11.20 | 0.52 | 0.56 | 0.55 | 1.06 | 0.52 |
| Kasungu | 11.58 | 0.27 | 0.39 | 0.37 | 1.37 | 0.63 |
| Lilongwe | 15.44 | 0.43 | 0.33 | 0.33 | 0.77 | 0.50 |
| Mchinji | 11.58 | 0.60 | 0.59 | 0.70 | 1.17 | 0.50 |
| Mangochi | 11.58 | 0.53 | 0.61 | 0.67 | 1.26 | 0.51 |
| Zomba | 19.31 | 0.68 | 0.59 | 0.58 | 0.85 | 0.49 |
| Blantyre | 7.72 | 0.25 | 0.24 | 0.25 | 1.00 | 0.50 |
| Chikwawa | 11.58 | 0.67 | 0.53 | 0.50 | 0.75 | 0.49 |
| | | **By Household Characteristics** | | | | |
| Male-headed Household | 73.74 | 0.46 | 0.42 | 0.42 | 0.91 | 0.51 |
| Female-headed Household | 26.26 | 0.51 | 0.49 | 0.54 | 1.06 | 0.46 |
| Widow-headed | 16.23 | 0.44 | 0.43 | 0.49 | 1.11 | 0.50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Household | | | | | | | |
| Non-widow.headed | | 83.77 | 0.48 | 0.44 | 0.44 | 0.92 | 0.50 |
| Household | | | | | | | |
| No Schooling | | 28.19 | 0.61 | 0.60 | 0.68 | 1.11 | 0.50 |
| Junior Primary | | 22.25 | 0.55 | 0.49 | 0.52 | 0.95 | 0.51 |
| Senior Primary | | 30.77 | 0.50 | 0.41 | 0.39 | 0.78 | 0.59 |
| Secondary Education | | 13.56 | 0.20 | 0.24 | 0.17 | 0.85 | 0.47 |
| Post Secondary | | 5.22 | 0.00 | 0.09 | 0.00 | 0.00 | 0.00 |
| Education | | | | | | | |
| Household size>5: | Yes | 41.38 | 0.63 | 0.67 | 0.69 | 1.10 | 0.71 |
| | No | 58.62 | 0.36 | 0.28 | 0.28 | 0.78 | 0.35 |
| Non-farm | | | | | | | |
| Enterprise *:* | *Yes* | 38.28 | 0.43 | 0.37 | 0.36 | 0.84 | 0.44 |
| | *No* | 61.72 | 0.50 | 0.48 | 0.50 | 1.00 | 0.53 |
| Land size>0.59 acres per | | | | | | | |
| capita: | *Yes* | 28.96 | 0.32 | 0.26 | 0.20 | 0.63 | 0.31 |
| | *No* | 71.04 | 0.55 | 0.53 | 0.57 | 1.04 | 0.59 |
| Head aged<26 *:* | *Yes* | 10.88 | 0.28 | 0.23 | 0.16 | 0.57 | 0.39 |
| | *No* | 89.12 | 0.50 | 0.47 | 0.48 | 0.96 | 0.51 |
| Head aged>65: | *Yes* | 8.93 | 0.34 | 0.37 | 0.44 | 1.29 | 0.45 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *No* | 91.07 | 0.49 | 0.45 | 0.45 | 0.92 | 0.50 |
| | | | | **By Community Characteristics** | | | |
| Weekly Market | *Yes* | 13.53 | 0.32 | 0.22 | 0.20 | 0.63 | 0.41 |
| | *No* | 86.47 | 0.50 | 0.48 | 0.48 | 0.96 | 0.51 |
| Health Centre | *Yes* | 20.65 | 0.33 | 0.35 | 0.34 | 1.03 | 0.52 |
| | *No* | 79.35 | 0.51 | 0.47 | 0.48 | 0.94 | 0.49 |
| Post Office | *Yes* | 10.67 | 0.31 | 0.28 | 0.28 | 0.90 | 0.31 |
| | *No* | 89.33 | 0.49 | 0.46 | 0.47 | 0.96 | 0.52 |
| Bus service | *Yes* | 27.92 | 0.47 | 0.49 | 0.51 | 1.09 | 0.57 |
| | *No* | 72.08 | 0.47 | 0.42 | 0.42 | 0.89 | 0.47 |
| MASAF | *Yes* | 14.01 | 0.53 | 0.55 | 0.53 | 1.00 | 0.49 |
| | *No* | 85.99 | 0.46 | 0.42 | 0.44 | 0.96 | 0.50 |
| Distance to Primary | | | | | | | |
| School>1.52 Km | *Yes* | 28.02 | 0.58 | 0.47 | 0.48 | 0.83 | 0.56 |
| | *No* | 71.98 | 0.43 | 0.43 | 0.43 | 1.00 | 0.47 |
| | | | | **By 2006 Shock Variables** | | | |
| Drought | *Yes* | 80.35 | 0.51 | 0.47 | 0.47 | 0.92 | 0.52 |
| | *No* | 19.65 | 0.30 | 0.33 | 0.34 | 1.13 | 0.39 |
| Illness | *Yes* | 37.64 | 0.49 | 0.46 | 0.45 | 0.92 | 0.54 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *No* | 62.36 | 0.46 | 0.43 | 0.45 | 0.98 | 0.47 |
| Rising food prices | *Yes* | 39.05 | 0.55 | 0.52 | 0.53 | 0.96 | 0.54 |
| | *No* | 60.95 | 0.42 | 0.39 | 0.40 | 0.95 | 0.47 |
| Falling crop prices | *Yes* | 31.28 | 0.30 | 0.30 | 0.29 | 0.97 | 0.36 |
| | *No* | 68.72 | 0.55 | 0.51 | 0.52 | 0.95 | 0.56 |

**Source: Own compilation**

Taking the average household size of 5 for the sampled districts, another classification of poverty and vulnerability rates were based on whether the household is large (household size>5) or not. The result shows that, as expected, large households are far more vulnerable than small households. While 69 percent of all households with more than 5 members were vulnerable, only 28 percent of the small households had a probability of shortfall of above 0.5. Likewise, the vulnerability to poverty ratio for the large households is 0.32 higher than that of the small households. The result thus shows that not only did large households experience a higher rate of poverty in 2004 but also a higher vulnerability rate in 2004 and also a higher rate of poverty in 2006. A similar pattern emerges when one considers households with a non-farm income generating activities. While 50 percent of the households without a non-farm enterprise were vulnerable in 2004, the rate was 14 percent less for those with a non-farm enterprise. This confirms several studies such as Christiaensen and Subbarao (2004) and Dercon *et al*. (2005) who suggest that non-farm income generating activities is one way of diversifying sources of household income to act as an *ex-ante* risk management strategy.

Land size is also an important factor that may determine the degree of vulnerability for the sampled households since almost all of the households depend on smallholder agriculture for their livelihoods. Landholdings were classified into two groups: small and large. Large landholdings are those with more than the sample landholding mean of 0.59 acres per capita. The results show that the vulnerability rate is 37 percent lower for the households with larger farm size and the vulnerability to poverty ratio is also higher for those with a small farm size. The result is not surprising because land is one of the important variables that reduce risk exposure in the study areas. When there is an anticipation of, or actual, consumption shortfall, land may be sold or rented out, thereby acting as a risk management strategy, both *ex-ante* and *ex-post*.

The age of the household head is also another important variable used in the study. The results show that while only 16 percent of the households whose head was less than 26 years old were vulnerable in 2004, about 44 percent of the households with a head aged over 65 were vulnerable. The vulnerability to poverty ratio also shows that for the young

household heads, vulnerability index is lower than the poverty index and the opposite is true for the old household heads.

A classification of the poverty and vulnerability profiles based on community characteristics shows that most of community infrastructures are associated with lower rates of vulnerability. For instance, existence of weekly markets, health centres and a post office within the community is associated with a lower rate of vulnerability. The existence of markets within an economy is one indication of how well the community is integrated in the local economy and it acts as an important risk mitigation and risk coping instrument. It increases the ease at which the communities can turn their assets into cash to supplement household consumption, if needed. Further, taking the sample mean distance to the nearest government primary school of 1.52 Km, 48 percent of the households that were residing in communities where primary schools are located more than 1.52 Km were vulnerable compared to 43 percent of their counterparts. However, existence of a regular bus or any other transport service is not associated with reduced vulnerability. Furthermore, 53 percent of all households that were residing in communities where there was a Malawi Social Action Fund (MASAF[13]) project were vulnerable to poverty in 2004, compared to 44 percent of those in communities with no MASAF projects. Although MASAF projects are intended to uplift the economic status of the communities by providing community infrastructure (such as schools, health clinics, community fishing ponds and water reservoirs) and short-term employment to community members, they target the very poor and vulnerable communities. For instance, Chirwa *et al*. (2002) argued that the probability of participation in a MASAF project is higher for poor households, female-headed households, households with little education, and households with longer periods of food insecurity. Thus, the extent to which the MASAF projects have been effective in reducing the vulnerability of the households is difficult to quantify without any baseline information. It is possible that

[13] MASAF, a World Bank-funded project, finances self-help community projects and transfers cash through safety net activities. Since 1996, MASAF aims at empowering individuals, households and communities in the implementation of measures which can assist them to better manage risks, reduce food insecurity and vulnerability to poverty. It operates in phases: Phase 1: 1996-1999; Phase 2: 1999-2003; Phase 3: 2003-2015.

the vulnerability rates for communities with MASAF projects would have been much higher without the projects[14].

Vulnerability profiles of 2004 were also classified based on the households' exposure to several shocks in 2006. The results show that 47 percent of the households that reported experiencing a drought between 2005 and 2006 were vulnerable to poverty in 2004, compared to 34 percent of those who did not experience it. The same pattern emerges for rising food prices, where 53 percent who reported this shock were vulnerable in 2004, as compared to 40 percent of those who did not experience rising prices of food between 2005 and 2006. On the other hand, there is no difference in the vulnerability rates between the households who reported an illness at least seven days prior to the survey date in 2006 and those who did not. However, only 30 percent of the households that reported experiencing a fall in the sale prices of crops between 2005 and 2006 were vulnerable to poverty in 2004. The rate for those who did not report experiencing this shock is higher at 51 percent. This result is plausible and expected because poorer and more vulnerable households in Malawi do not have the resources to produce cash crops, as they are only involved in small-scale subsistence agriculture.

Table A8-1 in appendix A8 presents the vulnerability profiles by livelihood zones. Since 5 of the 8 studied districts lie in their own individual zones, the profiles are the same as those presented in table 6.3. Kasungu-Lilongwe plain, on the other hand, encompasses three of the sampled districts. As a major food growing area, the zone has one of lowest vulnerability rates among the studied zones.

## 6.5 Vulnerability and Poverty Transition

The two-period data enable us to show the movement of households in and out of poverty between 2004 and 2006. Table 6.4 presents a poverty transition matrix for the sample that

[14] Bloom *et al*. (2005) present an independent review of MASAF Phase I (1996-1999) which was worth US$ 56 million. The Review was carried out by a multidisciplinary team of researchers from the United Kingdom, Malawi and Norway. The team concluded that the impact of MASAF I on sustainable poverty reduction was difficult to assess because Malawi suffered from HIV/AIDS epidemic, periodic crop failures and food scarcity during the project period. However, one of the major findings was that while in most cases the funds did not leak to better-off people, neither were the poorest households targeted.

depicts the poverty dynamics between 2004 and 2006. The table shows that there was a lot of movement in and out of poverty, with around 24 percent of households that were non-poor in 2004 becoming poor in 2006. Around 22 percent of households that were poor in 2004 moved out of poverty in 2006. However, the majority of the poor (78 percent) in 2004 were still trapped in poverty in 2006.

This result can be analyzed further by classifying the poverty status into 'poor' (if real per capita household consumption is less than the poverty line) and 'ultra-poor' (if the per capita consumption expenditure is less than the food poverty line). Table 6.5 presents the poverty transition matrix that considers this classification. The results show that while around 76 percent of the non-poor in 2004 did not change their status in 2006, around 23 percent became poor and only 1 percent had their consumption below the food poverty line in 2006.

**Table 6.4: Poverty Transition Matrix (Percent)**

| | 2006 | | |
|---|---|---|---|
| **2004** | **Non-poor** | **Poor** | **TOTAL** |
| **Non-poor** | 75.55 | 24.45 | 100.00 |
| **Poor** | 21.94 | 78.06 | 100.00 |
| **TOTAL** | 50.24 | 49.76 | 100.00 |

**Source: Own compilation**

Table 6.5 further shows that the largest movement occurred among those that were poor in 2004, with 30 percent moving out of poverty in 2006 while around 26 percent drifted further into poverty in 2006. For the 2004 ultra-poor households, there was a significant improvement as the consumption levels for 28 percent were no longer below the food poverty line, and about 6 percent were *shooting stars*, moving from being ultra-poor to being non-poor in 2006.

**Table 6.5: Poverty Transition Matrix: Considering the ultra-poor (Percent)**

| | 2006 | | | |
|---|---|---|---|---|
| **2004** | **Non-poor** | **Poor** | **Ultra-poor** | **TOTAL** |
| **Non-poor** | 75.55 | 23.26 | 1.19 | 100.00 |
| **Poor** | 30.00 | 44.06 | 25.94 | 100.00 |
| **Ultra-poor** | 6.05 | 27.84 | 66.11 | 100.00 |
| **TOTAL** | 50.24 | 30.94 | 18.82 | 100.00 |

**Source: Own compilation**

This analysis is carried a step further by incorporating vulnerability in the matrix, as presented in table 6.6. While about 68 percent of the poor in 2004 were vulnerable in 2004 to 2006 poverty, about 32 percent were not vulnerable (even though they were poor). Like wise, around 79 percent of the non-poor households in 2004 were also non-vulnerable in 2004. On the other hand, around 21 percent of the non-poor in 2004 had more than a 50 percent chance of falling into poverty in 2006.

**Table 6.6: The Vulnerable and the Poor in 2004 (Percent)**

| | Vulnerability in 2004 (to 2006 Poverty) | | |
|---|---|---|---|
| **Poverty in 2004** | **Non-Vulnerable** | **Vulnerable** | **TOTAL** |
| **Non-poor** | 78.70 | 21.30 | 100.00 |
| **Poor** | 32.40 | 67.60 | 100.00 |
| **TOTAL** | 55.00 | 45.00 | 100.00 |

**Source: Own compilation**

The results therefore reveal that if poverty reduction strategies were to be based only on the poverty incidence in 2004, around 21 percent of the households who were likely to be poor in 2006 (even though they were non-poor in 2004) would not be considered. This result confirms the notion that effective poverty reduction strategies need to consider not only those households that are currently poor but also those that are vulnerable to poverty, even though they may not be currently poor.

A further breakdown of vulnerability and realized poverty in 2006 into "poor" and "ultra-poor" components yields the results presented in table 6.7. The results show that the majority of the non-vulnerable households in 2004 were non-poor in 2006, with around 28 percent being only poor and around 4 percent being ultra-poor. For the vulnerable households in 2004, about 38 percent were ultra-poor with their real consumption below the food poverty line, and about 34 percent had their consumption above the food poverty line but below the actual poverty line in 2006. However, about 28 percent of the vulnerable households in 2004 were actually non-poor in 2006. These results confirm the fact that this analysis only measures vulnerability as a probability of being poor in the future. Thus, although some households (28 percent) had more than a 50 percent chance of becoming poor in the future, the actual state of becoming poor did not occur to them in 2006.

**Table 6.7: The Vulnerable and the Poor in 2006 (Percent): Considering the Ultra-poor**

| | Poverty in 2006 | | | |
|---|---|---|---|---|
| **Vulnerable to future (2006) poverty in 2004** | **Non-poor** | **Poor** | **Ultra-poor** | **TOTAL** |
| **Non-vulnerable** | 68.70 | 27.75 | 3.55 | 100.00 |
| **Vulnerable** | 22.18 | 34.23 | 37.60 | 100.00 |
| **TOTAL** | 50.53 | 30.65 | 18.82 | 100.00 |

**Source: Own compilation**

## 6.6 Sources of Consumption Volatility

Table 6.8 presents the results of a variance decomposition using an analysis of variance (anova) approach. This approach is used to explain which shocks are the major contributors to consumption volatility among the surveyed households between the two survey rounds.

**Table 6.8: Sources of Consumption Volatility**

| Source of Variation | Percentage of Variance |
|---|---|
| Drought | 76.04 |
| Rising food prices | 12.47 |
| Illness | 7.51 |
| Falling crop sale prices | 1.84 |
| Rising agricultural input prices | 1.17 |
| Other idiosyncratic shocks | 0.97 |

**Source: Own compilation**

The decomposition of the variance into its sources in table 6.8 shows that drought was the major risk factor, accounting for around 76 percent of consumption volatility between 2004 and 2006. The result shows that the major covariate shocks (drought and rising food prices) explained around 88 percent of the variation in household consumption. The idiosyncratic shocks (such as illness, falling crop sale prices, and rising agricultural input prices) account for only 11 percent of consumption volatility. This result points to the fact that household consumption expenditures were volatile due to covariate shocks more than household-specific shocks.

## 6.7 Summary

This chapter analyzed the vulnerability of rural household to poverty in Malawi using a two-period panel dataset of 259 rural households. Following Christiaensen and Subbarao (2004), vulnerability was modelled as expected poverty and the results showed that while household size appeared to have vulnerability-increasing effects, level of education, per capita landholding size and running a non-farm income generating activity all appeared to reduce household vulnerability.

The study has also shown that several community characteristics such as the existence of weekly markets and health centres had vulnerability-reducing effects of increasing mean consumption, while distance to commercial bank had a vulnerability-increasing effect of reducing average consumption. Further, apart from rising agricultural input prices

between 2005 and 2006, all the other shock variables had vulnerability-increasing effects of reducing average consumption. However, rising food prices and rising agricultural input prices also showed signs of having a vulnerability-reducing effect of reducing the *ex-ante* variance of 2006 consumption.

The results further showed that the sampled households had a mean vulnerability of 0.44, implying that in 2004, the households had an average probability of 0.44 of becoming consumption poor in 2006. This probability ranged from 0.24 in Blantyre to 0.59 in Mchinji and Zomba. The results have shown that the 2004 vulnerability headcount ranged from 0.25 in Blantyre to 0.7 in Mchinji. With respect to the correlates of vulnerability, the study has shown that higher levels of educational attainment for the household head are associated with low vulnerability. Likewise, running a non-farm income generating activity and large landholdings have vulnerability-reducing effects. On the other hand, larger households are associated with higher rates of vulnerability. Further, community infrastructure such as markets and health clinics are associated with low vulnerability. Finally, with regard to the shock variables, the study has shown that more vulnerable households were more likely to report experiencing drought and rising food prices. On the other hand, experiencing falling crop prices was associated with low vulnerability. Correlates of vulnerability are exceedingly similar to correlates of poverty among the sampled households.

Overall, this study has shown that the major source of vulnerability among the surveyed households is that the mean of their expected consumption is low rather than high consumption volatility. The decomposition of the variance of consumption has shown that household consumption volatility was mainly due to covariate shocks, such as drought and rising food prices.

# Chapter 7

# RISK MANAGEMENT STRATEGIES IN RURAL MALAWI

## 7.1 Introduction

Agricultural households live in risky environments in many parts of the developing world. In particular, smallholder farmers who are dependent on rain-fed agriculture, such as in Malawi, must often cope not only with severe poverty but also with extremely variable incomes (Bardhan and Udry, 1999). Fluctuations in household consumption usually imply relatively high levels of transient poverty while high income risk may also be a cause of persistent poverty (Dercon, 2000). As a result, households in risky environments often use sophisticated *ex-ante* risk management and *ex-post* risk-coping strategies (Dercon, 2000) since a failure to cope with income risk may not only lead to fluctuations in household consumption but may also affect the health, nutrition and other aspects of household welfare.

The aim of this chapter is three-fold: first, to document the incidence of shocks among rural households in Malawi; second, to assess both the *ex-ante* risk management and the *ex-post* coping strategies that rural households use to cope with shocks; and third, to analyze the determinants of the risk management strategies that households employ. This chapter proceeds as follows: after this introduction, section 2 will analyze the extent of risk in rural Malawi by examining the different shocks that households experienced between 1999 and 2006[15]. This will be followed by an in-depth examination of the way in which households cope with shocks, both *ex-ante* and *ex-post*. Section 4 will examine the determinants of risk-management and risk-coping strategies in rural Malawi, and section 5 will conclude the discussion.

## 7.2 Incidence of Shocks

In this study, shocks are defined as adverse events that lead to a loss of household welfare, such as a reduction in consumption, income, and/or a loss of productive assets

[15] The period 1999-2006 is split into two: first survey round covered shocks occurring between 1999 and 2004. The second round considered shocks between 2004 and 2006.

(Dercon *et al*., 2005). The approach in this section is descriptive in the sense that it documents the different shocks that households experienced in the two study periods, which among the shocks were most important, and who was affected by them. The data on shocks were obtained by asking respondents whether their households were severely affected negatively by a set of 16 shocks during the five years (1999-2004) preceding the date of the survey in 2004. The same question was asked in 2006 but the time considered was two years, covering the time between the date of the survey and that of the previous survey (2004-2006). It is important to note that the respondent was asked to rank the three most severe shocks encountered in both rounds and that this chapter only considers the shocks that were ranked first by each household.

Shocks are classified into a number of broad categories in this study: climatic, economic, health, crime and agricultural production shocks. Similar classifications are made in other studies such as in Ethiopia (Dercon *et al.*, 2005), Malawi (Malawi Government and World Bank, 2006) and in Tanzania (Christiaensen and Sarris, 2007). Table 7.1 provides the incidence of various shocks among the sampled households between 1999 and 2006. The incidence of shocks is defined as the proportion of households affected by various shocks which gives an indication of the riskiness of the environment in which the studied households reside (Christiaensen and Sarris, 2007). As table 7.1 shows, drought is the most common shock affecting households to such an extent that in both 2004 and 2006, over 45 percent of the surveyed households reported experiencing it at least once. Drought may be defined as a deficiency of precipitation over an extended period of time. The second most commonly reported shock in both survey rounds was large rises in food prices, although the percentage of households that reported this shock was less in the second round (9.7 percent) than in the first round (15.8 percent). In 2004, around 9 percent of the households reported an illness or accident at least seven days prior to the survey date, while in 2006 the figure was around 6 percent.

**Table 7.1: Percentage of Households Affected by Different Shocks between 1999 and 2006**

| Shock | Percentage (2004) | Percentage (2006) |
|---|---|---|
| **Climatic** | | |
| Drought | 45.9 | 49.4 |
| **Economic** | | |
| Large rise in food prices | 15.8 | 9.7 |
| Large fall in sale prices for crops | 8.1 | 6.6 |
| Rise in farm input prices | 1.9 | 6.9 |
| Household business failure | 5.0 | 5.4 |
| Loss of salaried employment | 2.7 | 0 |
| **Health** | | |
| Illness or accident | 9.3 | 6.2 |
| Death of household head | 0.4 | 0 |
| Death of household working member | 1.5 | 2.7 |
| Death of other family member | 1.5 | 2.3 |
| Birth in the household | 0.8 | 2.7 |
| **Agricultural Production** | | |
| Crop diseases or crop pests | 0.8 | 2.7 |
| Loss of livestock | 6.2 | 1.9 |
| **Crime** | | |
| Theft | 0 | 1.9 |
| N = 259 | | |

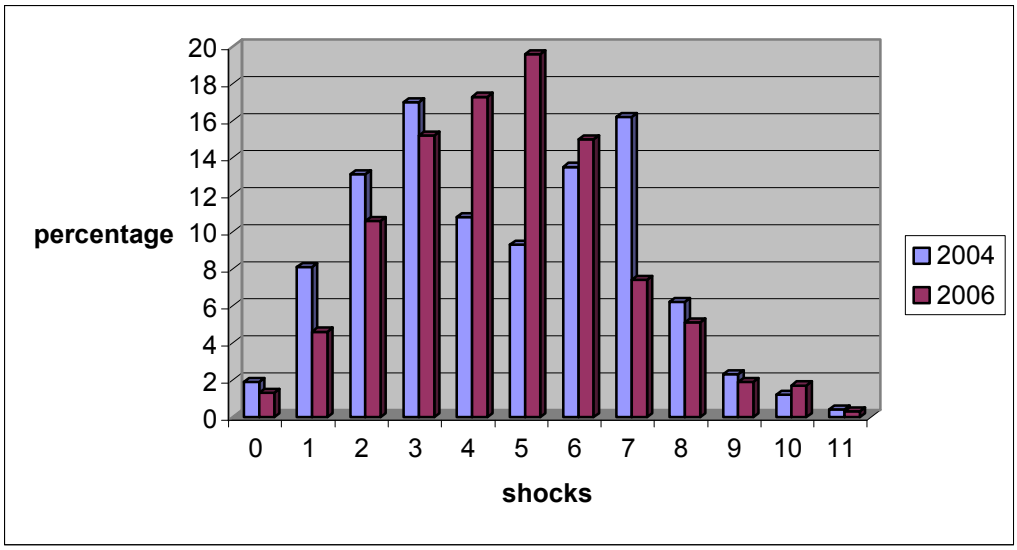
**Source: Own compilation**

**Notes:** 1. 2004 covers shock that households experienced between 1999 and the survey date in 2004
2. 2006 covers the shocks between the first survey date (2004) and the second survey date (2006)
3. The question that respondents had to answer in IHS2 was "*Over the past 5 years, was your household severely affected negatively by any of the following events?"* In the second round, the recall period was two years (see the questionnaire attached in the appendix).

Falling sale prices for cash crops was another important economic shock reported in both rounds, with over 8 percent of households experiencing it at least once between 1999 and 2004 and close to 7 percent encountering it at least once between 2004 and 2006[16].

Among the significant shocks reported in 2006 which had a very low incidence rate in 2004 include rising prices for farm inputs. Around 7 percent of the sample reported experiencing this shock in the second round (covering 2004-2006) while only 2 percent reported it in the first survey round (covering 1999-2004). On the other hand, loss of livestock affected more households in the first round than in the second round. The major health shocks reported include deaths and births in the households and these were reported in both rounds with low frequency.

**Figure 7.1: Number of Shocks Affecting Households as Reported in 2004 and 2006 (Percent of Households Reporting)**




**Source: Own compilation**

Literature on risk and vulnerability in developing countries indicates that rural households are usually faced with multiple shocks (see Dercon, 2000; Christiaensen and Sarris, 2007; Hoddinott and Quisumbing, 2003). Similarly, households endure multiple

[16] Using the whole IHS2 dataset, Malawi Government and World Bank (2006) reported that the major shocks that affected households between 1999 and 2004 include large rise in price of food (reported by 77 percent of all households), drought (reported by 62.5 percent), and illness (reported by 45.7 percent)

shocks in Malawi, as figure 7.1 shows. The majority of the households experienced multiple shocks both between 1999 and 2004, as well as between 2004 and 2006. Only a few households reported experiencing no shock at all during the two rounds (1.9 percent in 2004 and 1.3 percent in 2006) and very few also reported being affected by at least 10 shocks. The majority of the households experienced between 2 and 7 shocks in both rounds. This result suggests that even if risk exposure to the most prevalent shocks is significantly reduced, households will remain exposed to the other shocks- in other words, that there is no easy way of reducing vulnerability of the studied households.

**Table 7.2: Average Number of Shocks Reported in 2004 and 2006**

| | Expenditure Quintiles | | | | |
|---|---|---|---|---|---|
| **Average number of shocks** | **Poorest 20 %** | **2** | **3** | **4** | **Richest 20 %** |
| **2004** | 4 | 4 | 5 | 5 | 5 |
| **2006** | 5 | 5 | 4 | 5 | 4 |

**Source: Own compilation**

A further examination of the average number of shocks that households experienced by household expenditure quintiles in the two rounds shows that wealthier households experience as many shocks as poorer households (Table 7.2). In both rounds, the average number of shocks that households reported ranged between 4 and 5, regardless of the household wealth status. However, the type of shocks that poor households experience are often different from those experienced by wealthier households, as shown in Table 7.3 where only the major shocks reported in 2004 are considered.

As table 7.3 shows, the prevalence of drought becomes less frequent as one moves from the poorest expenditure quintile to the richest quintile. This finding is not surprising as wealthier households tend to have different means of protecting their consumption from such shocks, as will be discussed later. As a result, the consequences of such shocks on household welfare are less severe among the non-poor.

**Table 7.3: Number of Households Reporting a Particular Shock in 2006 (Percentage)**

| | Expenditure Quintiles | | | | | |
|---|---|---|---|---|---|---|
| **Shock** | **Poorest 20%** | **2** | **3** | **4** | **Richest 20%** | **All** |
| Drought | 60.8 | 50.0 | 42.3 | 53.8 | 40.4 | 49.4 |
| Rise in food prices | 7.8 | 7.7 | 9.6 | 7.7 | 15.4 | 9.7 |
| Illness | 5.9 | 5.8 | 7.7 | 7.7 | 3.8 | 6.2 |
| Falling crop sale prices | 3.9 | 3.8 | 5.8 | 9.6 | 9.6 | 6.6 |
| Rise in farm input prices | 3.9 | 9.6 | 5.8 | 5.8 | 9.6 | 6.9 |

**Source: Own compilation**

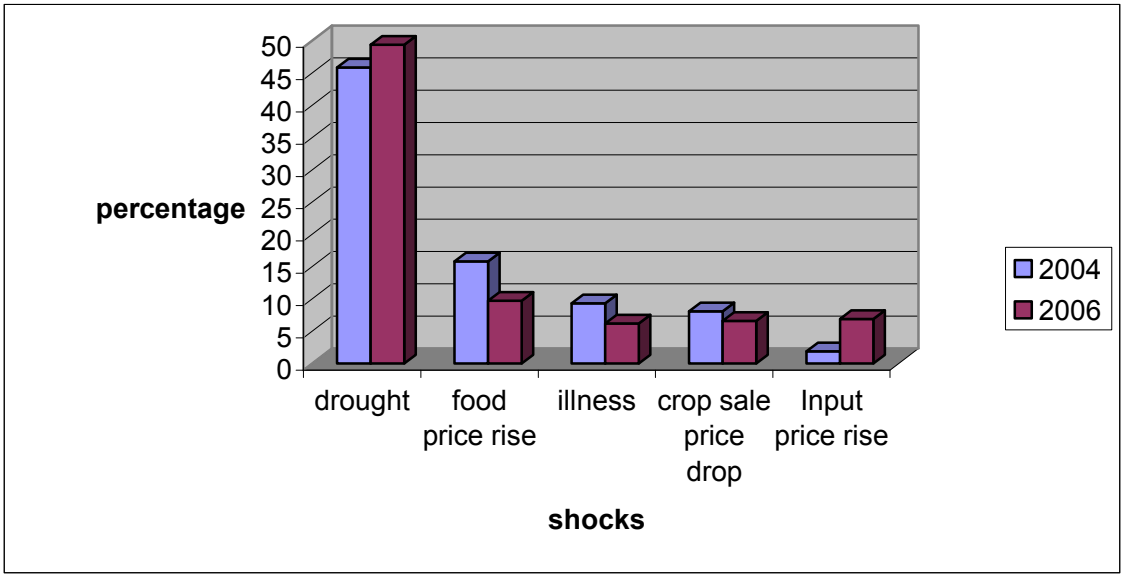
A surprising finding, however, is that the richest quintile reported rising food prices more than any other quintile in table 7.3. The *a priori* expectation was that rising food prices would affect the poor households more than the non-poor. A plausible explanation is that between 2004 and 2006, many poor households received free maize from the Government and non-governmental organizations, as a response to drought. Since such a safety net programme is targeted at poor households only, their participation in the local food market where prices were rising was very low.

Falling crop sale prices and rising farm input prices are the few shocks that are highly correlated with wealth. Falling crop sale prices were more often reported by wealthier households because they were usually the ones who were engaged in cash crop production. In most of the sampled areas, the major cash crop is tobacco, although cotton is also grown in two of the districts under investigation. The majority of the poor, on the other hand, are mainly involved in food crop production at subsistence level. As such, falling sale prices for crops would not have a direct significant impact on their welfare. Similarly, rising farm input prices as a shock appears to be more prevalent among wealthier households due to their involvement in cash crop production which requires a lot of inputs. Additionally, most of the poor households have benefited from the Government's agricultural input subsidy programme that has been running since 2005.

Through the programme, most of the poor and vulnerable households are issued with vouchers that enable them to buy seeds and fertilizer[17] at subsidized prices. This could be one explanation for the poorer households to be less likely to report a rising input price shock in the second round.

Figure 7.2 compares the severity of the five important shocks between the two survey rounds. It can be seen that drought remained the most prevalent shock reported by households in both rounds, with the numbers affected slightly rising from 46 percent in 2004 to 49 percent in 2006. Droughts usually have disastrous effects on the welfare of the majority of farming households in Malawi due to their dependence on rain-fed agriculture. This shock also has spill-over effects to non-farm households, as they harm consumers through increased prices of food commodities in general, and maize in particular (Malawi Government and World Bank, 2006).

**Figure 7.2: Households Affected by Major Shocks as Reported in 2004 and 2006 (Percentage of Households Reporting)**




**Source: Own compilation**

[17] According to DFID (2007), the price for subsidized fertilizer in 2007 was only US$7 per 50 kg bag, which was less than a third of the market price.

Droughts also reduce employment opportunities in rural areas, where a significant proportion of the population supplements its household income by selling temporary agriculture labour (*ganyu*). Further, price volatility that affects food, cash crops and agricultural inputs continues to negatively impact on the rural households' welfare, as the shocks depicted in figure 7.2 show.

In both survey rounds, large rises in food prices (shown as food rise in figure 7.2) was the second most important shock reported. This shock is closely associated with the prices of maize, the country's staple crop. Maize price volatility is usually very disruptive to economic activities and living standards because the majority of the population relies almost exclusively on maize for their livelihood (Malawi Government and World Bank, 2006). There is usually an enormous inter-annual volatility of maize prices between years of maize shortfall and normal years. However, the price usually varies substantially even in normal years (see figure 6.3).

Around 5 percent reported experiencing large falls in the selling prices for crops in both rounds. A further analysis shows that 62 percent of the households that reported this shock in 2004 were involved in the production of tobacco, which is Malawi's major cash crop. Since a third of Malawi's tobacco output is produced by smallholder farmers (Diao *et al.*, 2002), the impact of falling tobacco prices are much felt by such households which often renders them vulnerable to poverty. Further, rising prices for agricultural inputs was reported by more households in 2006 (7 percent) than in 2004 (2 percent), the majority of whom are non-poor tobacco farmers (see table 7.3). Illness was the only health shock among the five most reported shocks in the two rounds, with 9 percent of households reporting experiencing the shock within seven days prior to the survey date in 2004 and around 6 percent in 2006. Among the severe health risks in rural Malawi include illnesses associated with HIV/AIDS, malaria and diarrhoea.

Studies have shown that an estimated 25 percent of the total population in Malawi suffered from malaria in 2000 alone (Malawi Government and World Bank, 2006). Such a widespread health shock has large negative economic impacts on households not only

because it compromises the labour supply of households, but also through the costs of treatment which are sometimes considerable for poor households with limited resources.

**Table 7.4: Major Shocks by Districts in 2006 (Percentage of Households Reporting)**

| | Shock | | | | |
|---|---|---|---|---|---|
| **District** | **Drought** | **Rise in food price** | **Illness** | **Falling crop sale prices** | **Rise in farm input prices** |
| Rumphi | 34.5 | 13.8 | 3.4 | 13.8 | 17.2 |
| Kasungu | 83.3 | 3.3 | 3.3 | 13.3 | 0.0 |
| Lilongwe | 30.0 | 20.0 | 5.0 | 2.5 | 5.0 |
| Mchinji | 46.7 | 0.0 | 6.7 | 10.0 | 30.0 |
| Mangochi | 33.3 | 6.7 | 10.0 | 0.0 | 0.0 |
| Zomba | 60.0 | 8.0 | 6.0 | 6.0 | 4.0 |
| Blantyre | 40.0 | 15.0 | 10.0 | 10.0 | 0.0 |
| Chikwawa | 63.3 | 10.0 | 6.7 | 0.0 | 0.0 |
| **TOTAL** | **49.4** | **9.7** | **6.2** | **6.6** | **6.9** |

**Source: Own compilation**

An analysis of how the various sampled districts were affected by the different shocks in 2006 is presented in table 7.4. Kasungu was worst hit by drought where around 83 percent of all households reported it as the most severe shock encountered between 2004 and 2006. Chikwawa, Zomba and Mchinji were also severely affected. Rising food prices, on the other hand, were encountered more in Lilongwe, Blantyre and Rumphi than the other districts. Although the data used were collected in the rural areas, it is not surprising that rural residents of Lilongwe (where the capital city of Malawi is located) and Blantyre (which is home to the biggest commercial city of Malawi) were affected by rising food prices. Urban food prices must have been spilling over to the rural areas since rural and urban markets in Malawi are highly inter-connected.

Table 7.4 also shows that non-tobacco growing areas appeared to be less affected by falling sale prices for crops as well as rising agricultural input prices. Indeed, no

household reported these two shocks as being the most important in Chikwawa and Mangochi. On the other hand, the tobacco growing districts of Rumphi and Mchinji appeared to be affected by these two shocks.

## 7.3 Risk Management Strategies

There is evidence from literature that households living in risky environments devise strategies to deal with the risk both before the shock occurs (*ex-ante* risk management) and after the shock has manifested itself (*ex-post* coping strategies) (see Dercon, 2000; Alderman and Paxson, 1994; Holzmann, 2001). In this section, we explore the *ex-ante* risk management strategies and the *ex-post* coping strategies that the surveyed households use.

### 7.3.1 Ex-ante Risk Management Strategies Used in Rural Malawi

*Ex-ante* risk management strategies are prevention or mitigation strategies that are implemented in an anticipation of a shock (Dercon, 2000; Alderman and Paxson, 1994; Holzmann, 2001). Studies to quantify the degree of effectiveness of the *ex-ante* risk management strategies in Malawi are still lacking due to data limitations. Nevertheless, a study by the Malawi Government and World Bank (2006) outlined some observed drawbacks to the effectiveness of households' own risk management strategies in Malawi. First, the strategies employed by Malawian households, such as diversification of economic activities, only achieve partial insurance at high costs. Second, they are too localized and limited in scope. Third, informal insurance options usually marginalize the poor because of lack of access to such mechanisms. Fourth, informal insurance is associated with high hidden costs.

The goal of *ex-ante* risk management measures is to prevent the shock from occurring, or if prevention is not possible, to mitigate the effects of the risk. In Malawi, the most common risk management strategy is income diversification (Malawi Government and World Bank, 2006). Since the majority of the sampled households are smallholder farmers, income diversification is achieved mainly through crop diversification. Households are engaged in a variety of activities, including farm and non-farm activities

in order to diversify their sources of income. Table 7.5 indicates the different sources of income earnings of the surveyed households by household expenditure quintiles in 2004. As table 7.5 shows, around 48 percent of the sampled households reported earning some income from non-tobacco crop sales. The crops include hybrid maize (reported in all the 8 districts), groundnuts (reported in Lilongwe and Kasungu), cotton (reported in Chikwawa), pigeonpeas (reported in Zomba, Blantyre, Mangochi and Chikwawa), cassava (reported in Lilongwe, Kasungu and Mangochi) and rice (reported in Zomba).

For all the households, it can be seen that non-tobacco crop sales, temporary sale of labour and tobacco sales are the important sources of income. Apart from the sale of temporary labour, all the income sources appear to be more important for the wealthier households, as more households in upper expenditure quintiles reported earning their income through these sources than poorer households. On the other hand, sale of temporary labour (usually in the form of agricultural labour) is the most important source of income for the poorest households.

**Table 7.5: Sources of Income Earnings in 2004 (Percentage of Households Reporting)**

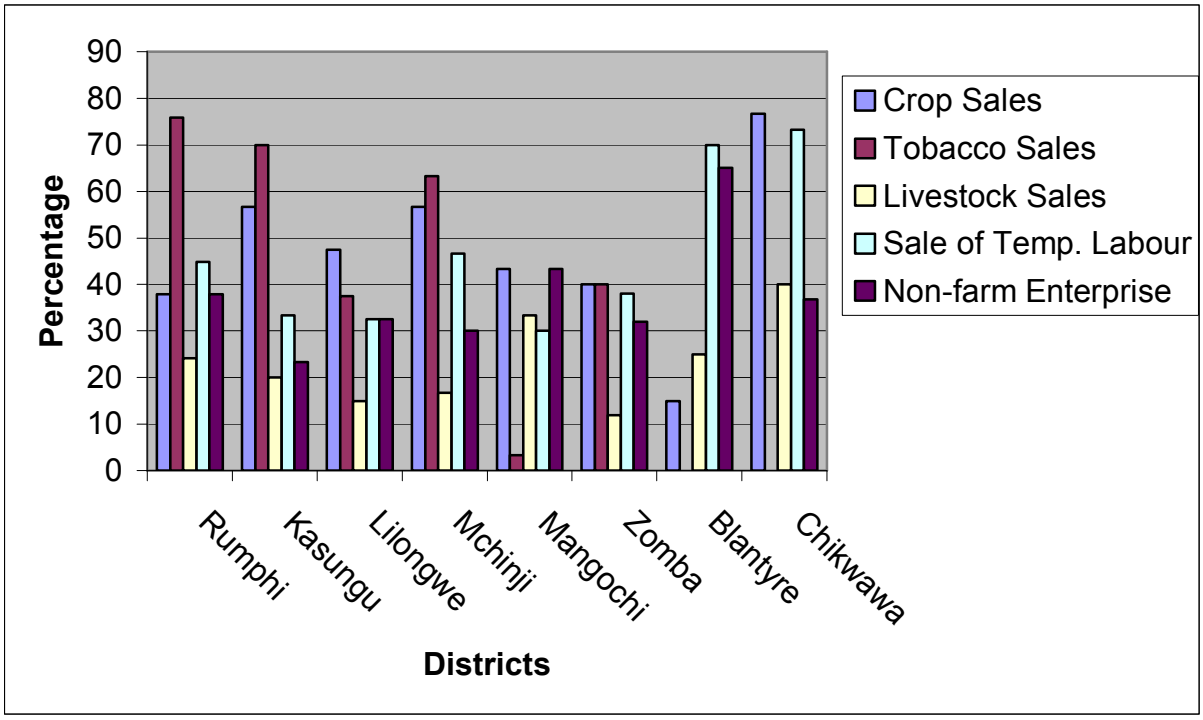
| | Expenditure Quintiles | | | | | |
|---|---|---|---|---|---|---|
| **Source** | **Poorest 20 %** | **2** | **3** | **4** | **Richest 20 %** | **All** |
| Crop Sales (Non-tobacco) | 28.9 | 53.6 | 48.1 | 57.4 | 46.2 | 47.5 |
| Tobacco Sales | 33.3 | 39.3 | 38.5 | 35.2 | 42.3 | 37.8 |
| Livestock Sales | 8.9 | 15.6 | 21.2 | 31.5 | 32.7 | 22.0 |
| Temporary labour sale (*ganyu*) | 51.1 | 41.1 | 44.2 | 48.1 | 36.5 | 44.0 |
| Non-farm activity | 20.0 | 30.4 | 42.3 | 44.4 | 40.4 | 35.9 |

**Source: Own compilation**

These results show that crop diversification (non-tobacco), tobacco production, rearing of livestock and operating a non-farm income generating activities are *ex-ante* risk management strategies that are undertaken by the non-poor households more than the poor households. This is the case because these strategies depend on access to land,

labour, capital and knowledge (Malawi Government and World Bank, 2006) and the majority of the poor lack access to these important factors of production. Among the few poor households that run a non-farm income generating activity, it is usually in the form of fishing and handicrafts, both of which require very little capital. On the other hand, sale of temporary labour appears to be the major strategy used by poorer households because it is only dependent on the availability of labour at household level. Since poorer households tend to have large family sizes in Malawi, they can allocate some labour to their own farms, while other household members work on other people's farms for a wage. However, it is difficult to clearly distinguish between the use of temporary labour as an *ex-ante* strategy and its use as an *ex-post* strategy, since most of the households continuously endure multiple shocks. Likewise, temporary migration and the use of remittances can be done *ex-ante* and/or *ex-post*, and will be considered in the next section.

**Figure 7.3: Income Sources by District in 2004 (Percentage of Households Reporting)**




**Source: Own compilation**

The distribution of the different income sources in the sampled districts is presented in figure 7.3. As expected, tobacco sales remain the most important income source for the majority of households in tobacco-growing districts of Rumphi, Kasungu and Mchinji and it is also one of the most important sources of income in Lilongwe and Zomba. On the other hand, non-tobacco crop sales are very important in Chikwawa (where around 77 percent of households reported being the main income source), in Mchinji (with 57 percent of households) and in Kasungu (with 57 percent of households). These non-tobacco crops include cotton (mainly produced in Chikwawa), maize and groundnuts (mainly produced in Mchinji and Kasungu), among others.

As explained earlier, almost every smallholder household allocates some land to cotton production in Chikwawa. On the other hand, Mchinji, Kasungu and Lilongwe are the 'food basket' for the whole Malawi with farmers producing a variety of crops including hybrid maize, groundnuts, cassava, and sweet potatoes, both for own food consumption and for sale. Further, as expected, livestock sales are very low in Malawi, with 40 percent being the highest recorded for Chikwawa followed by Mangochi (33 percent). It is important to note that livestock ownership remains very low even in these two districts. In fact, the average number of cattle owned in 2004 was 1.2 for Chikwawa and none for Mangochi while that for goats/sheep was 3.0 for Chikwawa and 1.9 for Mangochi. Thus livestock sales in Mangochi take the form of small ruminants such as sheep and goats. Further, although Rumphi had a higher average number of cattle per household (0.6) than the total sample average (0.3) in 2004, livestock sales were not as an important source of income as it were in Chikwawa and Mangochi due to the fact that livestock markets are less integrated in the northern region of Malawi.

Temporary sale of labour (*ganyu*) is an important income source in all the eight districts with at least 30 percent of the households acknowledging it as an important income source in all the districts. This shows that the activity is not restricted to tobacco growing areas only. Instead, it is widespread and more common to non-tobacco growing areas such as Chikwawa and Blantyre. Further, non-farm income generating activities are common in all the districts but they are most common in Blantyre where 65 percent of all

the households reported it as an income source. This is the case because land pressure is highest in the southern region (see chapter 5) and households resort to operating non-farm activities due to lack of access to arable land.

### 7.3.2 *Ex-post* Coping Strategies used in Rural Malawi

In the face of shocks, households in rural Malawi use a variety of strategies to maintain their level of consumption. Figure 7.4 groups the different *ex-post* strategies into eight categories and presents the percentage of households that reported using them as their first response to cope with a particular shock in the two survey rounds. While only around 2 percent of all households reported receiving help from safety net programmes[18] as the first response to the most severe shock encountered in 2004, the figure rose to 25 percent in 2006.

These safety net programmes can be seen as social protection interventions which are designed to assist individuals, households and communities to better manage income risks (Holzmann and Jorgensen, 1999). The literature defines social protection as a collection of measures that include social assistance, social investment and development funds, labour market interventions, and pensions and other insurance-type programmes. According to Holzmann and Jorgensen (1999), social protection interventions are aimed at reducing the vulnerability of low-income households with regard to consumption and access to basic services; and allowing for better consumption smoothing and promoting equity especially among households that are exposed to shocks.

The 'safety net programme' variable in this study incorporates all households that reported receiving help from government, religious institutions, local and international non-governmental organizations. Government's safety net programmes[19] in Malawi have four components, namely public works programme (PWP), targeted inputs programme (TIP), targeted nutrition programme (TNP) and direct transfer programme (DTP).

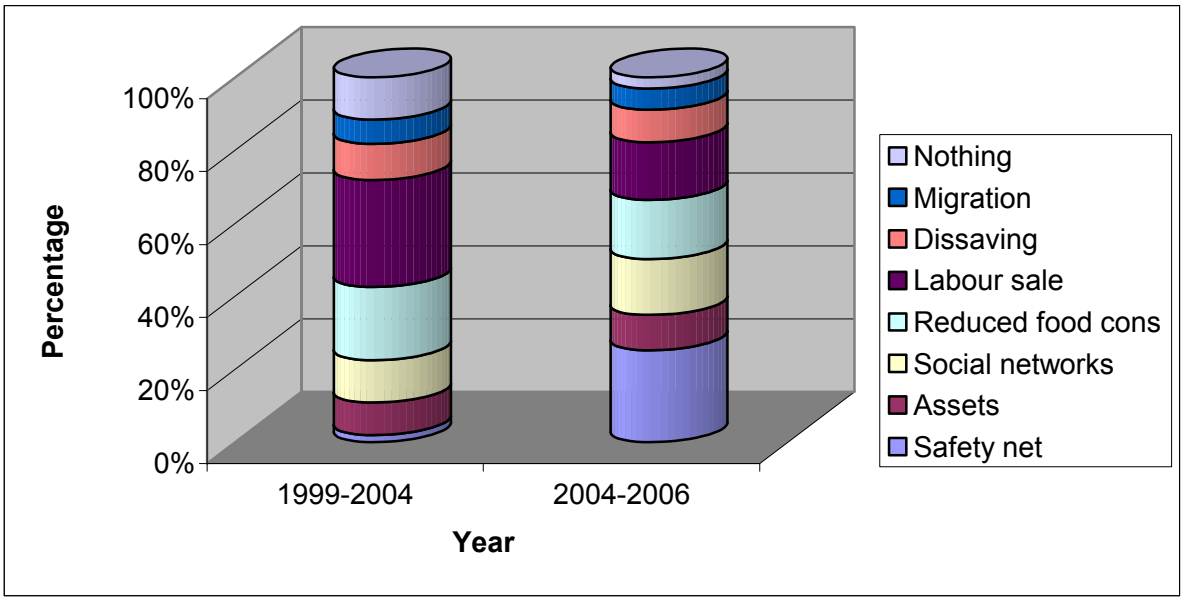
[18] These can also be referred to as direct welfare transfers

[19] For a review of the Malawi safety net programmes and their impact, see Malawi Government and World Bank (2006), and for a review of social protection instruments in Malawi refer to Devereux *et al*. (2007).

However, free food distribution is the most common and it is managed by the World Food Programme (WFP). Support from government in the form of safety nets as the first way in which households coped with shocks was reported more in 2006 than in 2004. Several factors could be at play including improved targeting through the rationalization of the allocation of food aid[20] in Malawi.

Since 2004, food aid is only distributed in areas that are in great need of assistance based upon the findings from livelihoods analyses by the Malawi Vulnerability Assessment Committee (MVAC) that are conducted when food shortages are anticipated. The 'use of household assets' variable encompasses responses ranging from sale of household assets, sale of farmland, sale of more crops, to sale of livestock. The number of households that reported selling assets as a first response to a particular shock was fairly constant in both rounds (around 9 percent in 2004 and 10 percent in 2006).

**Figure 7.4: *Ex-post* Coping Strategies in 2004 and 2006 (Percentage of Households Reporting)**




**Source: Own compilation**

[20] Dercon and Krishnan (2000) and Quisumbing (2003) found that food aid was effective in reducing household vulnerability in Ethiopia. Hoddinott *et al.* (2003) argued that food aid was important in consumption smoothing and in the protection of assets among households facing food stress.

Households that employ this mechanism to respond to a shock are those that had been building up household assets in 'good' years to deplete in 'bad' years – a form of self insurance. Such households include those with large landholdings, livestock and other household assets. These are typically less vulnerable households (see chapter 6). However, it is important to note that the sale of productive assets (such as land) can put households on a long term lower earning path as it undermines the households' future productive capacity (Christiaensen and Sarris, 2007).

Support from social networks include those households that borrowed money from relatives, neighbours or local money lenders, those that sent their children to live with their relatives and those that responded to a particular shock by prayer and spiritual effort. While around 12 percent reported receiving help from social networks as a first response to a particular shock in 2004, the number rose to 15.4 percent in 2006. Studies from elsewhere in Africa has shown that social networks remain an important way of responding to idiosyncratic shocks (see Dercon (2000) on Ethiopia; Christiaensen and Sarris (2007) on Tanzania; Christiaensen and Subbarao (2004) on Kenya; and Kazianga and Udry (2004) for Burkina Faso). Further, the 'reduced food consumption' variable incorporates households that reported reducing their food consumption and those that reported changing their dietary patterns as a way of coping with a particular shock. Around 20 percent of all the sampled households reported using this strategy in 2004 while 16 percent reported using it in 2006.

A small proportion of the households reported using their cash savings to cope with a particular shock (10 percent in 2004 and 9 percent in 2006). For households that have cash savings, it is the quickest way of trying to deal with a shock. Furthermore, use of liquid savings does not disrupt households' productive resource base (Christiaensen and Sarris, 2007). While some households responded to their respective shocks by selling temporary labour (29 percent in 2004 and 16 percent in 2006), other households resorted to temporary migration (7 percent in 2004 and 6 percent in 2006). It can be seen that both these strategies can be used *ex-ante* as well as *ex-post*. Finally, a significant proportion of households responded that they did not do anything to deal with their respective shocks in

2004 (12 percent) but the numbers fell to around 3 percent in 2006. These households include those that did not have any means to deal with a particular shock and the figure fell in the second round because of the increase in the availability of safety nets.

An analysis of the distribution of the *ex-post* responses to shocks across wealth groups is important to assess whether certain responses are correlated with wealth. As table 7.6 shows, assistance from safety net programmes was the most important way of coping with shocks among the households in the poorest quintile in 2006. This result shows the extent to which targeting ensured that safety nets reach the intended beneficiaries. The results show that significant proportions of households in the fourth and fifth wealth quintiles were benefiting from the safety net programs. A large proportion of households in the same quintile (around 29 percent) reported supplying temporary labour as the first response to cope with shocks. Surprisingly, the households in the richest quintile reported reducing their food consumption more than all the other households in 2006.

**Table 7.6: *Ex-post* Responses to Shocks in 2006 (Percentage of Households Reporting)**

| | Expenditure Quintiles | | | | | |
|---|---|---|---|---|---|---|
| | **Poorest** | **2** | **3** | **4** | **Richest** | **All** |
| ***Ex-post* Response** | **20 %** | | | | **20 %** | |
| Safety net program | 39.2 | 38.5 | 25.0 | 15.4 | 7.7 | 25.1 |
| Use of household assets | 3.9 | 7.7 | 3.8 | 21.2 | 11.5 | 9.7 |
| Social networks | 11.8 | 9.6 | 19.2 | 15.4 | 21.2 | 15.4 |
| Reduced food consumption | 7.8 | 17.3 | 13.5 | 13.5 | 28.8 | 16.2 |
| Sale of temporary labour | 29.4 | 7.7 | 11.5 | 19.2 | 11.5 | 15.8 |
| Dissaving | 2.0 | 5.8 | 9.6 | 15.4 | 11.5 | 8.9 |
| Temporary migration | 2.0 | 5.8 | 13.5 | 0.0 | 7.7 | 5.8 |
| Did not do anything | 3.9 | 7.7 | 3.8 | 0.0 | 0.0 | 3.1 |

**Source: Own compilation**

The *a priori* expectation was that poorer households would reduce their food consumption more than the wealthier households as a response to a particular shock. Nevertheless, richer households resorted to changing their dietary patterns as a first

response to particular shocks. It should be noted from table 7.6 that most of the strategies are used more by households in the upper expenditure quintiles.

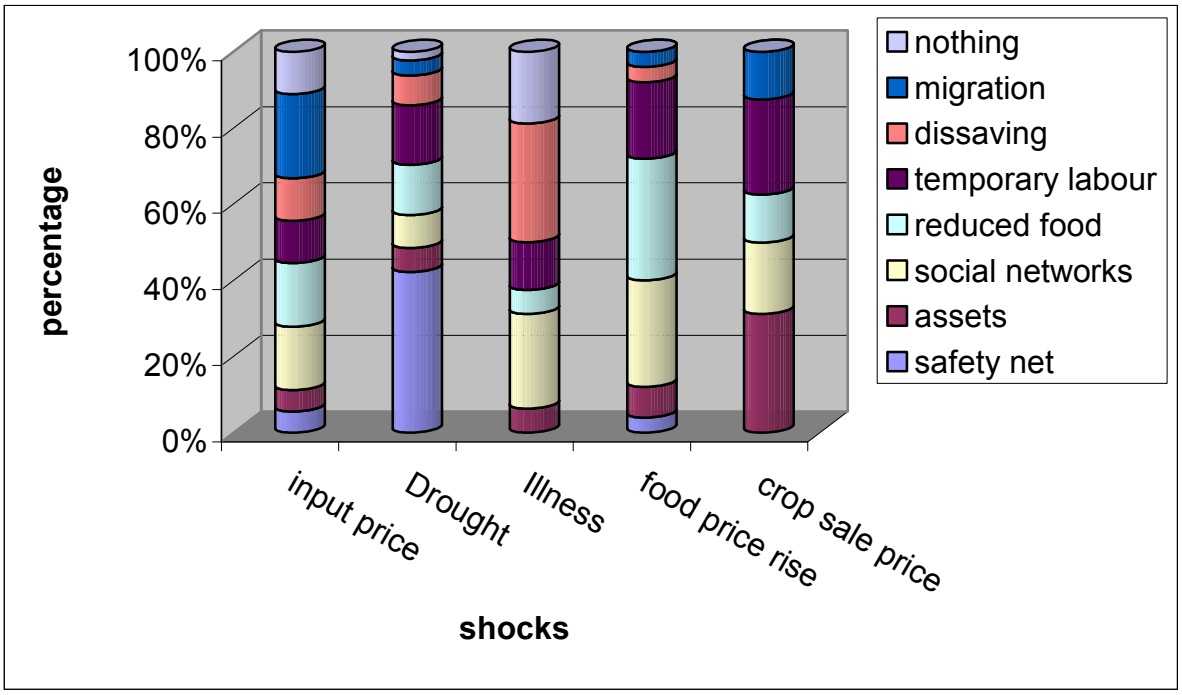
As expected, use of household assets and use of cash savings were reported by wealthier households more than households in the lower quintiles. Further, wealthier households also reported using social networks and temporary migration more than poorer households in 2006. It is easier for non-poor households to borrow money from relatives, neighbours and local moneylenders. Wealthier households also tend to have more relatives in urban areas and can afford to send their children to live with their relatives as a coping mechanism. Furthermore, a small proportion of households reported not responding in any way to the most significant shocks that they faced between 2004 and 2006. It is important to note, however, that all the households that did not do anything in the face of shocks belong to the lowest three expenditure quintiles.

Since the sampled households face multiple shocks, it is important to identify the particular strategies that households employ when faced with a specific shock. This information is presented graphically in figure 7.5. It can be seen from the figure that each of the major shocks in 2006 attracted a variety of responses. Temporary migration was used as a major response to rising agricultural input prices (22 percent) and to large falls in sale prices for crops (12 percent). While support from social networks was an important strategy to cope with rising food prices, illness, large falls in sale prices for crops and rising input prices, it was less important in dealing with the main covariate shock, namely drought. Figure 7.5 further shows that the majority of households that reduced their food consumption did so to address the problem of rising food prices (32 percent), rising input prices (17 percent) and drought (13 percent), among others.

Use of cash savings was an important ex-post strategy to cope with illness which is the main idiosyncratic shock among the major shocks. Use of household assets appeared to be the major response to deal with falling crop sale prices in 2006. Since the 'use of household assets' variable encompasses a range of strategies including sale of farmland,

livestock and sale of more crops, it is the latter that the majority of households used to cope with low prices for crops between 2004 and 2006.

**Figure 7.5: Major Shocks Reported and Households' *Ex-post* Responses in 2006 (Percentage of Households that Reported Each Shock)**




**Source: Own compilation**

Further, safety nets were clearly the major response to drought (42 percent) with sale of temporary labour and reduced food consumption being the second and third important strategies, respectively. Finally, a number of households did not have any strategy to cope with illness (19 percent of all households that reported illness as the most important shock) and rising input prices (11 percent).

## 7.4 Determinants of Risk Management Strategies

Although the previous sections have laid the foundations to enable one to understand the different shocks that rural households face in Malawi and how they cope with them, it is very important to analyze the factors that determine the households' choice of the strategies employed. This section will therefore derive a multinomial logit model that will

be used to analyze the determinants of the ex-post coping strategies and present the important findings. It will also run a fixed effects logit model to test whether experiencing a particular shock increases the likelihood that a household would undertake any of the eight strategies available.

### 7.4.1 Multinomial Logistic Regression

Based on Scott Long (1997), the MNLM as a probability model can be derived as follows:

Let $y$ be the dependent variable with $J$ nominal outcomes. Although the categories are numbered *1* to $J$, they are not assumed to be ordered.

Let $pr(y = m \mid x)$ be the probability of observing a particular outcome m given $x$. The probability model for $y$ can now be constructed as follows:

- Assume that $pr(y = m \mid x)$ is a function of the linear combination $x\beta_m$. The vector $\beta_m = (\beta_{om} ... \beta_{km} ... \beta_{Km})'$ includes the intercept $\beta_{0m}$ and coefficients $\beta_{km}$ for the effect of $x_k$ on outcome $m$
- To ensure that the probabilities are nonnegative, we take the exponential of $x\beta_m$ : $\exp(x\beta_m)$. Although the result is nonnegative, the sum $\sum_{j=1}^{J} \exp(x\beta_j)$ does not equal 1, which it must for probabilities.
- The third step, therefore, involves setting restrictions in order to make the probabilities sum to 1. We thus divide $\exp(x\beta_m)$ by $\sum_{j=1}^{J} \exp(x\beta_j)$:

$$pr(y_i = m \mid x_i) = \frac{\exp(x_i \beta_m)}{\sum_{j=1}^{J} \exp(x_i \beta_j)} \qquad (7.1)$$

This normalization ensures that $\sum_{m=1}^{J} pr(y = m \mid x) = 1$

- However, the model is unidentified since more than one set of parameters generates the same probabilities of the observed. By multiplying equation 7.1 by

$\frac{\exp(x\xi)}{\exp(x\xi)}$ it can be shown that the model is not identified. Since the operation is the same as multiplying by 1, the value of the probability remains the same:

$$pr(y_i = m \mid x_i) = \frac{\exp(x_i\beta_m)}{\sum_{j=1}^{J}\exp(x_i\beta_j)} \times \frac{\exp(x_i\xi)}{\exp(x_i\xi)}$$

$$= \frac{\exp(x_i\beta_m + x_i\xi)}{\sum_{j=1}^{J}\exp(x_i\beta_j + x_i\xi)}$$

$$= \frac{\exp(x_i[\beta_m + \xi])}{\sum_{j=1}^{J}\exp(x_i[\beta_j + \xi])} \qquad (7.2)$$

- Although the values of the probabilities have not changed, the original parameters $\beta_m$ have been replaced by $\beta_m + \xi$ . Thus, for every $\xi \neq 0$ there is a different set of parameters that results in the same predictions. Clearly, the model is not identified.

- In order to solve the identification problem, restrictions are imposed on the $\beta's$, such that for any nonzero $\xi$ the constraints are violated. This is achieved by constraining one of the $\beta's$ to equal 0, such as $\beta_1 = 0,$ or $\beta_2 = 0,$ or $\beta_J = 0.$ The choice is arbitrary. In the study we set $\beta_J = 0.$ Clearly, if a nonzero $\xi$ is added to $\beta_J,$ the assumption that $\beta_J = 0$ is violated.

- Adding this constraint to the model results in the probability equation given as:

$$pr(y_i = m \mid x_i) = \frac{\exp(x_i\beta_m)}{\sum_{j=1}^{J}\exp(x_i\beta_j)} \qquad \text{where } \beta_J = 0. \qquad (7.3)$$

Based on the above derivation, the model that is used in the study is given as:

$$pr(y_i = m \mid x_i) = \frac{\exp(x_i \beta_m)}{\sum_{j=1}^{8} \exp(x_i \beta_j)} \qquad \text{where } \beta_8 = 0 \qquad (7.4)$$

Where: $x_i$ = the vector of covariates for household *i*

$\beta_m$ = the coefficient vector for choice of an *ex-post* strategy

j = the number of *ex-post* strategies

The multinomial logit estimates of the household *ex-post* coping strategies with use of household assets as the comparison group are presented in table 7.7. In this respect, the results can be thought of as arising from simultaneously estimating binary logits for each strategy against use of household assets (see Scott Long and Freese, 2006). The McFadden's $R^2$ value of 0.28, as a measure of the goodness of fit of the model, is acceptable for a multinomial logit model. Further, the Wald $\chi^2$ test for the stability of the model is highly significant such that the null hypothesis that all the coefficients associated with the independent variables are simultaneously equal to zero is rejected. The results of the Small-Hsiao Test for independence of irrelevant alternatives (IIA), which is an inherent assumption of a multinomial logit model are presented in appendix A4. The Small-Hsiao test results, reported in table A4-1, support the use of the multinomial logit since the assumption of IIA holds.

There are a number of significant variables that influence whether a household gets support from safety net programs as compared to household asset use. For example, household size has the effect of increasing the likelihood that a household ends up getting support from safety net programs rather than using household assets. Indeed, the data being used in this study show that larger households tend to be not only consumption-poor but also asset-poor (see a discussion on livelihood profiles in chapter 5). As a result, they are more likely to get support from safety net programs (such as food aid) than to sale their household assets. Further, as expected, landholding size appears to reduce the likelihood that a household chooses to receive support from safety net programs rather than to sell its assets. This result is significant at the 5 percent level. It was already

discussed in chapter 6 that less vulnerable households have larger farm sizes and since the 'use of household assets' variable also encompasses sale of farmland, it is not surprising that landholding is seen to reduce the likelihood of using safety net programs rather than selling household assets. It is also important to note that most of the safety net programs such as free food distribution and public works program in Malawi are targeted at the poorest members of the community. In most cases, these are also the same households with very low landholdings. Similarly, possession of goats/sheep reduces the likelihood of using safety nets rather than the use of household assets at the 1 percent level of significance. However, one surprising result is that access to markets, as proxied by existence of a weekly market within a community, increases the likelihood that a household would use safety net programs (which usually take the form of food aid) over the use of household assets. This is contrary to the *a priori* expectations but one plausible explanation is that although households close to markets have the ease of selling their assets in the face of shocks, support from safety net programs is preferred because it usually comes in the form of free food distribution.

It was also expected that the distance to the district centre (a proxy for remoteness of the community) would increase the likelihood of using safety net programs over the use of household assets but the findings are contrary to this expectation. The result shows that, at 10 percent level of significance, distance to district headquarters reduces the likelihood of using safety nets instead of using assets. This could be explained by the fact that very remote areas may not benefit from safety net programs as much as areas that are accessible by roads. Among the major five shocks considered in this chapter, only drought has a significant impact. The positive sign of the drought coefficient implies that it increases the probability of using safety net programs rather than using household assets. This result was already alluded to in figure 7.5. Since most of the safety net programs in Malawi are put in place as a direct response to drought, this result is expected.

The results from the second set of binary logits (comparing support from social networks against use of household assets) show that, apart from drought, all the five variables

discussed above remain significant and retain the signs of their coefficient. Among these is the number of economically active individuals in a household. At 5 percent level of significance, economically active members reduce the likelihood that a household would choose to get support from social networks over use of household assets. A quick look at the data shows that there is a positive correlation[21] between the number of economically active household members and asset portfolio (proxied by number of goats/sheep). This result is therefore plausible. The only shock variable that is significant is large rises in food prices and, at 5 percent significance level, it increases the likelihood that a household would get support from social networks rather than use its assets. Since around 60 percent of the households did not consider this shock as a covariate one[22], informal arrangements through social networks is seen to be preferable to use of household assets, as figure 7.5 also shows.

With regard to reduced food consumption, all the five significant variables were also significant as in the previous case. In particular, the results show that household size, the number of economically active members of the household, access to weekly markets and experiencing large rises in food prices increase the likelihood that a household chooses to reduce its consumption of food rather than to sell its assets. On the other hand, at 1 percent level of significance, possession of goats/sheep reduces the likelihood that a household would opt to reduce its food consumption instead of selling its assets. For the fourth comparison, most of the same variables remain significant and they also retain their signs. In particular, household size increases the likelihood that a household would choose to supply temporary labour instead of selling its assets, as larger households tend to have more labour supply available. As expected, landholding size reduces the likelihood that a household supplies more temporary labour rather than selling its assets. In most cases, households with large farm sizes tend to be labour-constrained households such that supplying temporary labour for a wage in someone else' farmland is rare.

[21] The variables 'economically active' and 'number of goats/sheep' have a Pearson correlation coefficient of 0.12 indicating a very weak correlation between the two variables and it is significant at 10 percent.

[22] In the shock module, respondents were asked to indicate whether a particular shock affected their own households, or a few other households, or every household in the community in order to determine whether the household perceived the shock as covariate or idiosyncratic.

**Table 7.7: Multinomial Logit Estimates on Household *Ex-post* Coping Strategies in 2006**

| Variable | Support from safety net programs | Support from social networks | Reduced food consumption | Sale of temporary labour | Use of cash savings | Temporary migration | Do not do anything |
|---|---|---|---|---|---|---|---|
| Household size | 1.16*** | 0.73*** | 0.68*** | 1.02*** | 0.67** | 1.18*** | 0.92*** |
| | (0.26) | (0.25) | (0.26) | (0.26) | (2.72) | (0.29) | (0.29) |
| Female headed household (1=yes) | 0.31 | 0.15 | 0.47 | 1.07 | 0.23 | 1.94** | -0.62 |
| | (0.82) | (0.84) | (0.81) | (0.78) | (0.90) | (0.89) | (1.20) |
| Age of household head<26 (1=yes) | 2.19 | -0.57 | 0.93 | 1.97 | 1.20 | -35.60*** | 1.92 |
| | (1.88) | (2.11) | (1.95) | (1.87) | (1.90) | (1.99) | (2.20) |
| Age of household head>65 (1=yes) | 0.86 | -0.27 | 0.91 | 1.29 | 2.67** | 3.09** | 1.62 |
| | (1.16) | (1.18) | (0.97) | (1.04) | (1.16) | (1.21) | (1.44) |
| Household head with no education at all (1=yes) | -0.07 | 0.46 | -0.93 | -0.50 | -1.64 | -1.49 | -0.51 |
| | (1.17) | (1.19) | (1.21) | (1.18) | (1.39) | (1.43) | (1.43) |
| Head with junior primary educ (1=yes) | 0.38 | 0.71 | -0.71 | -0.21 | -0.62 | 1.07 | 0.22 |
| | (1.08) | (1.03) | (1.08) | (1.10) | (1.19) | (1.26) | (1.36) |
| Head with secondary education (1=yes) | -0.86 | 0.33 | -1.44 | -0.37 | 0.30 | 1.06 | -38.71*** |
| | (0.97) | (0.98) | (0.95) | (0.94) | (0.98) | (1.17) | (1.04) |
| No. of economically active in households | -0.61** | -0.81** | -0.74** | -0.66* | -0.72** | -0.67** | -0.88* |
| | (0.31) | (0.32) | (0.33) | (0.34) | (0.36) | (0.34) | (0.48) |
| Number of goats/sheep owned | -0.42*** | -0.52*** | -0.66*** | -0.71*** | -0.38*** | -0.66*** | -0.58* |
| | (0.14) | (0.15) | (0.20) | (0.20) | (0.12) | (0.16) | (0.30) |
| Landholding size (acres/capita) | -0.44** | -0.33* | -0.03 | -0.46** | -0.47** | -0.09 | -0.39* |
| | (0.17) | (0.18) | (0.13) | (0.18) | (0.23) | (0.13) | (0.22) |
| Weekly market (1=yes) | 1.18*** | 0.71*** | 0.66*** | 1.97 | 1.02*** | 1.44 | 0.89*** |
| | (0.25) | (0.24) | (0.27) | (1.87) | (0.26) | (1.07) | (0.27) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Distance to district headquarters (Km) | -0.03* | -0.00 | -0.01 | -0.00 | -0.06** | 0.01 | -0.01 |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) |
| Drought in 2006 (1=yes) | 3.35*** | 0.41 | 0.90 | 1.22 | 1.38 | 0.86 | 0.75 |
| | (0.88) | (0.81) | (0.83) | (0.85) | (0.92) | (1.05) | (1.03) |
| Illness in 2006 (1=yes) | 2.95 | 2.24 | 0.43 | 2.27 | 4.18* | -35.65*** | -37.44*** |
| | (2.14) | (2.07) | (2.96) | (2.24) | (2.15) | (2.25) | (2.20) |
| Rising food prices (1=yes) | 1.63 | 3.25** | 3.20** | 2.80** | 2.06 | 2.24 | -36.03*** |
| | (1.72) | (1.37) | (1.46) | (1.42) | (1.61) | (1.91) | (1.61) |
| Falling crop sale prices in 2006 (1=yes) | -1.36 | -0.84 | -1.28 | -0.29 | -39.42*** | -0.32 | -39.59*** |
| | (1.46) | (1.08) | (1.14) | (1.11) | (1.07) | (1.31) | (1.33) |
| Rising agricultural input prices in 2006 (1=yes) | 1.59 | 0.93 | 1.02 | 0.90 | 2.29 | 2.88 | 2.84 |
| | (2.23) | (1.93) | (1.88) | (1.99) | (1.94) | (1.88) | (2.05) |
| Constant | -2.46 | 0.39 | 0.11 | -1.10 | 1.16 | -5.56** | -1.40 |
| | (1.71) | (1.54) | (1.60) | (1.69) | (1.74) | (2.30) | (1.85) |

**Source: Own compilation**

| | |
|---|---|
| Number of observations | 259 |
| Wald $\chi^2$ (126) | 41924.04 |
| Prob> $\chi^2$ | 0.000 |
| Pseudo $R^2$ | 0.2767 |

Notes: 1. The reported figures are estimated coefficients with their standard errors reported in brackets.

2. *** denotes confidence at 1 percent level, ** denotes confidence at 5 percent level and * denotes confidence at 10 percent level.

3. Standard errors are corrected for heteroscedasticity using Huber-White Method

4. 'Use of household assets' is the comparison group.

The results further show that households that are likely to use their past savings rather than use their assets tend to be larger in size (at 5 percent significance level) than their counter-parts, those with young household heads (at 5 percent level), those close to markets (at 1 percent level), and those reporting an illness (at 10 percent level). The analysis has already shown that the major *ex-post* strategy to cope with illness among the sampled households was by using cash savings (figure 7.5). In this particular case, distance to district centre is carrying a negative sign as expected, implying that the further away the household is from the district centre the less likely it will use its cash savings to respond to a shock rather than sell assets. This was expected because households in remote areas do not have access to commercial banks where they can maintain savings accounts. As a result, they may not be able to accumulate cash savings to be used in periods of household welfare downfall.

Another way in which households respond to a shock *ex-post* is by migrating. The comparison between temporary migration and use of household assets has yielded interesting results: at 1 percent level of significance, household size increases the likelihood that a household chooses that at least one member migrates rather than to sell its assets. This result seems logical as larger households tend to have a larger pool of labour such that if one individual decides to migrate temporarily, it would still have enough supply of labour to be used on its farm. Further, households that are headed by females tend to be more likely to let at least one of its members to migrate rather than to sell its assets. One explanation is that female-headed households appear to be less engaged in farming than male-headed ones such that it is easier for a member of a female-headed household to leave farming and temporarily migrate in search of salaried employment. The data seem to confirm this assertion as 44 percent of male-headed households were involved in tobacco production in 2006 compared to 22 percent of female-headed households. Likewise, 52 percent of male-headed households made some non-tobacco crop sales in 2006 compared to 36 percent of the female-headed households.

While households with young heads were less likely to choose temporary migration instead of using its assets, the result is opposite for households with old heads. The

difference lies in the availability of the economically active individuals in the household. In the sampled households, the average number of the economically active among households with young heads was 1.9 while for those with old heads was 2.5. As a result, households with old heads can afford to let some members migrate more than households headed by individuals that are less than 26 years old.

Finally, it is important to analyze the factors that would make a household to have no specific response to a shock instead of using its assets. As the results show, household size and weekly markets are the only two significant variables that increase the likelihood that a household would do nothing rather than sell its assets. On the other hand, landholding size, household head's possession of some secondary education, ownership of goats/sheep, as well as encountering illness, falling sale prices for cash crops and rising food prices all reduce the likelihood that a household would opt to do nothing rather than sell its assets.

In summary, the major determinants of a choice of an *ex-post* strategy include household size, number of economically active individuals in the household, land holding size, livestock possession, and the shocks encountered, among others.

### 7.4.2 Household Fixed Effects Logit Model

A fixed effects logit model is used to test the effect that a particular shock has on the probability that a household will engage in a particular coping strategy. This is achieved by constructing dummy variables indicating whether a household reported undertaking a particular coping strategy. The model allows one to estimate whether experiencing a shock $S$ increases the likelihood that household $h$ at time $t$ located in community $v$ pursue a particular strategy.

Following Harrower and Hoddinott (2004), the fixed effects logit model to be estimated is:

$$\Pr ob(Y_{htv} = 1) = \frac{\exp(\mu_h + \beta S_{htv} + \gamma X_{htv})}{1 - \exp(\mu_h + \beta S_{htv} + \gamma X_{htv})} \quad (7.5)$$

Where: $Y_{htv}$ denotes use of any of the *ex-post* coping strategies, such as use of household assets, support from safety net programmes, and sale of temporary labour, among others. $S_{htv}$ is a vector denoting occurrence of the five important shocks discussed above; $X_{htv}$ is a vector of household time-varying characteristics (such as age and household size) and $\mu_h$ denotes household-specific, time-invariant observed and unobserved characteristics. The advantage of the model is that it is able to capture unobserved heterogeneity that causes inconsistency in the OLS cross-sectional regression (Deaton, 1997). In particular, the model allows for the role of household-specific, time-invariant observed and unobserved factors to be taken account of (Harrower and Hoddinott, 2004).

The estimation strategy involves dropping all the households whose coping strategies did not vary between the two rounds. Following this exercise the sampled households were reduced from 259 to 204 and the estimated results are reported in table 7.8. It is important to note that since the dependent variable ($Y_{htv}$) denotes whether a household used a specific *ex-post* coping strategy or not, each column in table 7.8 represents a separate logistic regression. The estimation also included using regressors depicting the interaction between the shocks and some fixed household characteristics (such as the gender of the household head and the educational level of the household head) in order to see whether different types of households are more likely to use a given *ex-post* risk coping strategy. The results of the interaction terms are not reported here as they turned out not to be significant.

The results show that, at 1 percent significance level, drought increases the likelihood that a household experiencing it would get support from safety net programs. Likewise, drought also increases the probability that a household would reduce food consumption as a coping strategy.

**Table 7.8: Household Fixed Effects Logit Estimates of *Ex-post* Responses to Shocks**

| | *SHOCKS* | | | | | |
|---|---|---|---|---|---|---|
| **EX-POST RESPONSE ($Y_{htv}$)** | **Drought** | **Rising input prices** | **Rising food prices** | **Illness** | **Falling sale prices for crops** | **Number of groups** |
| Support from | 3.26*** | 3.18** | 2.35*** | 1.12 | 1.53 | 64 |
| safety net program | (0.99) | (1.25) | (0.85) | (0.92) | (1.44) | |
| Asset use | -0.48 | 0.35 | -1.55 | 1.13 | -1.10 | 27 |
| | (0.60) | (0.90) | (0.95) | (0.93) | (1.06) | |
| Support from | 0.38 | 0.07 | 0.31 | 0.38 | 0.07 | 56 |
| social networks | (0.38) | (0.44) | (0.47) | (0.46) | (0.57) | |
| Reduced food | 0.75** | -0.55 | 0.29 | 0.39 | 0.45 | 76 |
| consumption | (0.83) | (0.39) | (0.42) | (0.44) | (0.48) | |
| Sale of temporary | 0.11 | -0.81* | -0.71 | -1.60*** | -0.62 | 73 |
| labour | (0.42) | (0.46) | (0.50) | (0.58) | (0.48) | |
| Use of cash | 0.75 | -0.86 | -1.36 | 1.92** | -0.17 | 39 |
| savings | (0.53) | (0.67) | (0.91) | (0.83) | (0.62) | |
| Temporary | -0.78 | 0.41 | -2.69** | 0.09 | 0.75 | 30 |
| migration | (0.64) | (0.69) | (1.21) | (0.78) | (0.90) | |
| Do not do | -1.34** | -0.57 | -0.83 | -0.27 | -0.50 | 36 |
| anything | (0.68) | (0.78) | (0.59) | (0.69) | (0.89) | |

**Source: Own compilation**

| | |
|---|---|
| Number of observations | 204 |
| LR $\chi^2$ (17) | 38.09 |
| Prob>$\chi^2$ | 0.000 |
| Pseudo R2 | 0.2458 |

Notes: 1. The reported figures are estimated coefficients with their standard errors reported in brackets.

2. *** denotes confidence at 1 percent level, ** denotes confidence at 5 percent level and * denotes confidence at 10 percent level.

3. Additional variables included in the model but not reported include time-varying regressors such as household size and the age of the household head.

On the other hand, at 5 percent level of significance, drought reduced the likelihood that a household reported having no specific coping strategy. As pointed out earlier, this is the

case because most of the poor households (who would otherwise have no means to cope with drought) benefit from free food distribution and other safety net programs during drought periods.

For the agricultural input price rise case, the results show that the shock increases the likelihood of using safety net program (at 5 percent significance level) while reducing the probability of selling temporary labour (at 10 percent confidence level). Further, rising food prices increased the likelihood of the affected households to get support from safety net programs. This is logical since periods of large rises in food prices coincide with drought periods when food is in short supply. However, it also reduced the likelihood of the members of affected households to use temporary migration as a coping strategy probably because rural-urban migration would not be effective as food price rises are even higher in the urban than rural areas.

With regard to households that reported an illness within a period of seven days prior to the survey date, the results show that illness increased the likelihood that a household would use cash savings as a strategy. On the other hand, illness decreases the probability of selling temporary labour as a coping strategy. Finally, for the falling prices for cash crops, no *ex-post* coping strategy retained a significant result although most of them had the expected signs.

## 7.5 Summary

This chapter has analyzed different ways in which households respond to risk. In particular, it has shown that the sampled households faced multiple shocks during the study period (1999 and 2006) with prominent shocks being drought, rising food prices, illness, falling sale prices for crops and rising agricultural input prices. The chapter has also shown that income diversification, which is the major *ex-ante* risk management strategy, takes the form of crop diversification among rural households in Malawi. The analysis has shown that wealthier households tend to have a more diversified source of income than poor households.

This chapter has also shown that households use a variety of *ex-post* coping mechanisms to deal with shocks. These include getting support from safety net programs, using social networks and asset depletion, among others. However, most of the strategies available tend to be beyond the reach of most of the poor households and as a result they are used more by wealthier households. Safety net programs and sale of temporary labour are the only exceptions. This important finding led to the discussion of analysing the determinants of households' *ex-post* coping strategies. The results have shown that the choice of a particular strategy depends on household size, the number of economically active individuals in the household, livestock ownership, landholding size, access to markets, remoteness of the location, and the types of shocks faced, among others. Finally, the fixed effects logit estimation has shown that some shocks (such as drought and rising food prices) increase the likelihood of using safety net programs, while others (such as illness) increase the probability that a household would use its cash savings.

# Chapter 8

# EVIDENCE OF CONSUMPTION SMOOTHING IN RURAL MALAWI

## 8.1 Introduction

There is a vast set of literature that suggests that, in the face of shocks, rural households adopt a variety of risk management strategies and instruments in order to protect their consumption from fluctuations in their income (see Alderman and Paxson, 1994; Fafchamps and Lund, 2003; Jalan and Ravallion, 1999; Townsend, 1994). Tests of consumption smoothing arise from the assumption that households attempt to spread their lifetime earnings evenly across time, through the use of different risk management strategies when faced with shocks (Harrower and Hoddinott, 2004). The overall conclusion of this research is that most households in poor developing areas succeed in protecting their consumption from the full effects of the income shocks to which they are subject, but full insurance is not achieved[23].

This chapter aims to provide evidence of the ability of the surveyed households to smooth their consumption. In particular, it examines the effectiveness of the different formal and informal risk management strategies (discussed in detail in chapter 7) in smoothing household consumption. This evidence is highly relevant for policy-making in the case of Malawi where poverty levels remain high and where social safety-net programmes play a critical role. Studies have shown that improved consumption smoothing due to better arrangements to manage risk for all households does not only increase household and societal welfare, but also improves the welfare distribution in society (Holzmann and Jorgensen, 1999). The remainder of the chapter is organized as follows: section 2 presents the methodology used, including the theoretical framework and the strategy used to empirically test for consumption smoothing in the case where income data are not available. The results are presented and discussed in section 3, and section 4 concludes the discussion.

[23] The leading authors on consumption smoothing include Alderman and Paxson (1994), Bardhan and Udry (1999), Skoufias (2003), and Jalan and Ravallion (1999). The available literature on consumption smoothing is reviewed in great detail by Dercon (2004).

## 8.2 Methodology

### 8.2.1 Theoretical Framework

The theoretical model that is used to analyze consumption smoothing in the literature is based on the consumer's optimization problem in the context of a complete market for state-contingent commodities (Deaton, 1992). Following Skoufias (2003), the model assumes that there exists a market for state-contingent commodities so that formal and informal risk management strategies across space and over time that households use to protect themselves from risk are taken into account. A further assumption is that households live in communities where risk is shared. Risk-sharing implies that any unpredicted event (shock) that a household faces is covered by a state-contingent transfer from other members of the community (Dercon, 2000). Under this framework, the model assumes that households within a given risk-sharing community purchase state-contingent commodities so as to maximize their utility:

$$V^h = \sum_{s=1}^{S}\sum_{t=1}^{T} \pi_s v_t\left(c_{ts}^h\right) = \sum_{s=1}^{S}\sum_{t=1}^{T} \pi_s \left(1+\delta\right)^{-t} v\left(c_{ts}^h\right) \qquad (8.1)$$

Where: $v_t(c^h_{ts})$ is the felicity function of the constant relative risk aversion (CRRA) type for household *h* in period *t* as a function of its state *s* consumption in period *t*. $\pi$ is the probability of occurrence of state *s* and it is assumed to be the same for all households in a given risk-sharing community. The period-specific felicity function is assumed to be discounted to the present by a subjective discount rate $\delta$.

The model assumes that households in the community purchase a unit of consumption in period *t* and state *s* at the price $p_{st}(1+r)^{-t}$. It is important to note that the prices of these state-contingent commodities are also state-specific. Now, assuming that in the state of the world *s* and period *t*, household *h* has an initial asset base $A^h_1$ and labour income $y^h_{st}$, then the household aims at maximizing its utility function subject to the lifetime budget constraint:

$$\sum_{s=1}^{S}\sum_{t=1}^{T} p_{st} c_{st}^h \left(1+r\right)^{-t} = A_1^h + \sum_{s=1}^{S}\sum_{t=1}^{T} p_{st} y_{st}^h \left(1+r\right)^{-t} \qquad (8.2)$$

The existence of the market in contingent claims for the risk-sharing community allows the household's optimization problem to be written as the maximization of expected utility subject to an expected value budget constraint (Skoufias, 2003). Thus, the first-order optimization condition for (8.1) subject to (8.2) is given as:

$$\lambda_t\left(c_{st}^h\right) = v_t'\left(c_{st}^h\right) = \theta^h\left(\frac{1+\delta}{1+r}\right)^t \frac{p_{st}}{\pi_s} = \theta^h \mu_t \tag{8.3}$$

Where θ is the Lagrange multiplier and $\mu_t = \left(\frac{1+\delta}{1+r}\right)^t \frac{p_{st}}{\pi_s}$. Further, $\lambda_t\left(c_{st}^h\right)$ is the marginal utility of consumption in period *t*.

The important result from (8.3) is that the marginal utility of consumption consists of a household-specific component $\theta^h$ and a time-specific component $\mu_t$. Skoufias (2003) assumes that the felicity function takes a special functional form such as an isoelastic utility function $v\left(c_t\right) = \frac{1}{1-\rho} c_t^{1-\rho} f\left(z_t\right)$, where $f(z_t)$ is a function allowing for the influence of time-varying preference factors. Following this specification, after logarithmic transformation, equation 8.3 can be expressed as:

$$\ln c_t^h = -\rho^{-1}\left(\ln \theta^h - \ln f\left(z_t\right) + \ln \mu_t\right)$$

which, after first-differencing over time, yields:

$$\Delta \ln c_t^h = -\rho^{-1}\left(-\Delta f\left(z_t\right) + \Delta \ln \mu_t\right) \tag{8.4}$$

The implication of (8.4) is that the growth rate in household consumption between time t-1 and t, after controlling for time-varying preference factors, is a function of the growth rate in aggregate shocks only summarized by the term $-\rho^{-1}(\Delta \ln \mu_t)$.

However, the version of equation 8.4 which is used more in empirical work takes the form of:

$$\Delta \ln c_{htv} = \sum_{tv} \delta_{tv}\left(CD_{tv}\right) + \beta \Delta \ln y_{htv} + \gamma X_{htv} + \Delta \varepsilon_{htvt} \tag{8.5}$$

Where: $\Delta \ln c_{htv}$ is the change in the log of consumption, which is also the growth rate in total consumption per capita of household *h* in period *t*, located in community *v*.

$\Delta \ln y_{htv}$ is the growth rate of income

$X_{htv}$ is a vector of time-varying household or household head's characteristics

$\delta$, $\beta$ and $\gamma$ are the parameters to be estimated

$\Delta \varepsilon_{htv}$ is a household specific error term to capture changes in unobservable components of household preferences.

$CD_{tv}$ is a set of community dummies interacted by survey round to control for covariate shocks at community level

### 8.2.2 Empirical Strategy

Based on (8.5), it is apparent that testing for consumption smoothing does not only require consumption data but income data as well. In particular, when consumption is fully insured against shocks (complete consumption smoothing), one would expect changes in income to have no effect on consumption (Skoufias, 2003; Harrower and Hoddinott, 2004; Irac and Minoiu, 2007). Due to lack of household income data in both survey rounds, the study uses information on household asset ownership to construct a welfare index for each of the two rounds, which is then used as a proxy for household income. In both rounds, the respondents were asked about their ownership of individual assets, types and number of livestock, the monetary value of the assets, and their intra-household control.

To construct the asset index, a methodology proposed by Rutstein and Johnson (2004) was used. The same methodology was used by Devereux *et al*. (2007) in their study of vulnerability and social protection in Malawi. Although information was collected on 19 types of durable assets in both rounds, only 10 types of durable assets were considered in the analysis (see table 8.1), as the ownership of the excluded assets was lower than 1 percent of the sampled households, and thus played a negligible role among households. The asset index also includes information on ownership of important livestock, as

reported in table 8.1. The asset score for each household was then calculated by assigning to each listed asset a weight equal to the reciprocal of the proportion of the sampled households that owned that particular item. The next step was to multiply that weight by the number of units of any particular asset owned by the household and summing the product over all possible assets[24].

**Table 8.1: Changes in Household Asset Ownership**

| Type of Asset | Level of ownership (percent of households) | | Weight |
|---|---|---|---|
| | 2004 | 2006 | |
| Bed | 30.1 | 29.6 | 3.33 |
| Bicycle | 31.0 | 33.2 | 3.23 |
| Chair | 43.0 | 40.6 | 2.33 |
| Pounding Mortar/Pestle | 48.7 | 50.9 | 2.05 |
| Radio (wireless) | 51.0 | 52.8 | 1.96 |
| Sewing machine | 2.6 | 1.9 | 38.46 |
| Tape/CD player | 3.9 | 3.1 | 25.64 |
| Table | 34.3 | 35.1 | 2.92 |
| Television | 1.9 | 2.2 | 52.63 |
| Cattle | 6.2 | 5.0 | 16.19 |
| Goats | 6.2 | 7.8 | 3.81 |

**Source: Own compilation**

The calculated asset index was highly correlated with real household expenditure ($r = 0.699$, $p<0.001$) in 2004.

This section builds on the discussion on shocks and strategies that households use to deal with them, as presented in chapter 7. The test for consumption smoothing in this study is done in three stages. In the first stage, the study explores whether consumption is affected by idiosyncratic shocks. The second stage determines the extent to which households

[24] For a review of the validity of the asset-based approach as a proxy for household welfare when income data are lacking, see Morris *et al*. (1999) who used data from Malawi, Mali and Cote d'Ivoire.

protect their consumption from changes in income. The final stage investigates whether partial insurance and risk sharing takes place among households within the same community.

## 8.3 Results and Discussion

The summary statistics for the data that are used in the estimation are the same as those for the vulnerability model reported in table A1-1 (in appendix A1). The different aspects of consumption expenditure that are used are also explained in detail in chapter 4.

**Table 8.2: Mean and Median Per Capita Consumption, by Survey Round**

| | 2004 | | 2006 | |
|---|---|---|---|---|
| **Type of consumption** | **Mean** | **Median** | **Mean** | **Median** |
| Total consumption/capita (*All)* | 22,468 | 15,738 | 23,795 | 15,554 |
| (*Poor*) | 10,936 | 10,749 | 12,019 | 11,072 |
| (*Non-Poor*) | 34,640 | 24,812 | 36,226 | 21,165 |
| Food consumption/capita (*All*) | 12,829 | 9,246 | 12,360 | 9,704 |
| | (57%) | | (52%) | |
| (*Poor*) | 6,622 | 6,414 | 7,576 | 6,998 |
| | (61%) | | (63%) | |
| (*Non-Poor*) | 19,381 | 14,595 | 17,409 | 13,124 |
| | (56%) | | (48%) | |
| Non-food consumption/capita (*All*) | 9,572 | 5,954 | 11,394 | 5,312 |
| | (43%) | | (48%) | |
| (*Poor)* | 4,314 | 3,915 | 4,442 | 3,905 |
| | (39%) | | (37%) | |
| (Non-poor) | 15,123 | 10,978 | 18,731 | 8,362 |
| | (44%) | | (52%) | |

**Source: Own compilation**

Notes: 1. All figures are annual per capita amounts in Malawi Kwacha.
2. Percentages of total consumption are reported in parentheses.
3. N= 259
4. The Malawi consumption poverty line during the two survey rounds was MK 16,164 per capita

The means and medians of food, non-food, and total household real expenditure per capita between the survey rounds are presented in table 8.2. The results show that among the sampled households, more than 50 percent of household expenditure is devoted to food. This food share was more than 60 percent among the poor households in both rounds. There is evidence from the results that households try to protect food consumption more than the non-food consumption between the survey rounds. For instance, the median food consumption varies by less than 5 percent in the whole sample while non-food consumption is more volatile (around 12 percent). A breakdown of the sample into poor and non-poor households shows that median food consumption is considerably less volatile among the poor (around 5 percent) than for non-poor households (around 11 percent).

### 8.3.1 Effects of Idiosyncratic Shocks on Consumption

In order to determine whether consumption was affected by specific idiosyncratic shocks, the following model is estimated:

$$\Delta \ln c_{htv} = \sum \delta_{tv}\left(CD_{tv}\right) + \beta S_{htv} + \gamma X_{htv} + \Delta \varepsilon_{htv} \qquad (8.6)$$

where $S_{htv}$ is a set of dummy variables indicating the occurrence of an idiosyncratic shock and the rest of the variables are as defined in (8.5). Using (8.6) and following Harrower and Hoddinott (2004), three models are run. In the first model, only idiosyncratic shocks are used in the model. This is achieved by imposing the restriction that $\delta_{tv}$ and $\gamma$ are equal to zero. In the second model, only $\gamma$ is restricted to zero so that community-wide shocks are considered. In the third model there are no restrictions and time-varying household characteristics are introduced.

The results from the estimation of (8.6) are reported in table 8.3. In model 1, where shocks are entered without other covariates, only falling sale prices for cash crops appear to have a negative effect on consumption, but the result is not statistically significant. Rising input prices, on the other hand, appear to have a positive effect on consumption.

**Table 8.3: Least Squares Determinants of Change in Total Per Capita Consumption**

| | 1<br>Idiosyncratic Shocks | 2<br>Idiosyncratic and Covariate Shocks | 3<br>All Shocks and Socio-Economic Characteristics |
|---|---|---|---|
| Illness | 0.89 | 0.06 | 0.06 |
| | (0.07) | (0.08) | (0.08) |
| Falling sale crop prices | -0.04 | -0.07 | -0.08 |
| | (0.07) | (0.08) | (0.08) |
| Rising input prices | 0.14** | 0.11 | 0.08 |
| | (0.07) | (0.08) | (0.08) |
| Drought | | -0.04 | -0.05 |
| | | (0.06) | (0.06) |
| Food Price Rise | | -0.01 | -0.02 |
| | | (0.10) | (0.10) |
| Community[25] dummies interacted with survey round (F-test) | | 5.04** | 4.38** |
| Female | | | 0.12** |
| | | | (0.05) |
| Household Age 1 (<24) | | | -0.09 |
| | | | (0.06) |
| Household Age2 (>65) | | | -0.12** |
| | | | (0.06 |
| F-Statistic | 2.12* | 1.43 | 2.45* |
| $R^2$ | 0.02 | 0.02 | 0.06 |

**Source: Own compilation**

Notes:
1. Dependent variable is change in log per capita consumption between rounds
2. Standard errors are reported in parentheses
3. N = 259
4. ** significant at the 5 percent level; * significant at 10 percent level.
5. Standard errors are corrected for heteroscedasticity using Huber-White method.

[25] In this study a community coincides with an enumeration area (EA) in Malawi IHS2 data. The surveyed households come from 20 different communities.

However, the results change in model 2 and 3, as common shocks are taken care of by the introduction of the community dummies. In both cases, none of the idiosyncratic shocks has a significant impact on changes in households' total consumption. On the other hand, $\delta_{tv}$ is statistically significant (as shown by the F test), implying that community-wide shocks are important in explaining fluctuations in household consumption. The significance of this result is that group-based insurance mechanisms and risk-sharing are likely to be less effective to protect the surveyed households from income shocks since covariate shocks cannot be insured within a community.

### 8.3.2 Consumption Smoothing using Household Asset Index

The results so far give an indication of whether households protect their consumption from income shocks (as reported in table 8.2) and which types of shocks are important in explaining fluctuations in household consumption. The first two analyses are referred to as weak tests for consumption smoothing by Harrower and Hoddinott (2004). This section considers a stronger test of consumption smoothing by considering the impact of changes in household asset index (as a proxy for income) on changes in consumption.

The model to be estimated is given as:

$$\Delta \ln c_{htv} = \sum \delta_{tv} \left( CD_{tv} \right) + \beta \Delta \ln A_{htv} + \gamma X_{htv} + \Delta \varepsilon_{htv} \qquad (8.7)$$

Equation (8.7) is similar to 8.5 apart from the fact that income has been replaced by household assets ($A_{htv}$), due to data constraints. As before, $CD_{tv}$ is used to control for the role of covariate shocks that are common to all households within any given community. Under conditions of complete consumption smoothing, changes in income is supposed to have no effect on household consumption (Skoufias, 2003). In the similar vein, complete consumption smoothing would imply that $\beta = 0$.

The results from specification (8.7) are reported in table 8.4. Three specifications of the dependent variable were used - the change in log of total consumption, change of log of food consumption and change of log of non-food consumption, respectively.

**Table 8.4: The Impact of Changes in Household Asset Index (and other variables) on Consumption**

| | Δ ln Total Consumption | Δ ln Food Consumption | Δ ln Non-Food Consumption |
|---|---|---|---|
| Δ ln Asset Index | 0.59*** | 0.59*** | 0.61*** |
| | (0.09) | (0.12) | (0.12) |
| Δ ln Family Size | -0.00 | -0.03 | 0.04 |
| | (0.02) | (0.02) | (0.03) |
| Household Head is Female | 0.05 | 0.02 | 0.16*** |
| | (0.03) | (0.04) | (0.06) |
| Household Head is <26 years old | -0.01 | -0.03 | 0.06 |
| | (0.04) | (0.07) | (0.06) |
| Household Head is >65 years old | -0.08 | 0.00 | -0.17** |
| | (0.04) | (0.06) | (0.08) |
| F test | 8.46*** | 2.58*** | 4.53*** |
| $R^2$ | 0.55 | 0.38 | 0.42 |
| N | 259 | 259 | 259 |

**Source: Own compilation**

Notes:
1. Dependent variables are change in log per capita consumption, change in log food consumption per capita, change in log non-food consumption per capita between rounds, respectively
2. Standard errors are reported in parentheses
3. N = 259
4. *** significant at 1 percent level; ** significant at the 5 percent level; * significant at 10 percent level.
5. Standard errors are corrected for heteroscedasticity using Huber-White method.
6. Additional regressors included but not reported include a set of community dummies interacted with survey round.

Although the model includes household characteristics, the concern is only on the asset index variable. The results show that in all the three components of household consumption $\beta>0$ and it is highly significant. This shows that complete consumption smoothing is not practiced among the sampled households. Thus, neither total consumption nor its two components are completely insured from income shocks. It should be pointed out that the results show that a 10 percent reduction in asset index is accompanied by a 5.9 percent decrease in total consumption, a similar 5.9 percent

reduction in household food consumption and a slightly higher (6.1 percent) decline in household non-food consumption. The results thus show that the level of protection of food and non-food consumption from changes in income is similar, among the surveyed households, with food consumption being only slightly more protected from income changes. It should be pointed out that multicollinearity among the variables is not a problem in the consumption smoothing model as the VIF and Tolerance results presented in table A5-2 (in the appendix) show.

### 8.3.3 Partial Consumption Insurance and Risk Sharing

This section examines the extent to which partial consumption smoothing and risk sharing take place among households within the same community. In order to achieve this, a new variable, $\Delta\left(\overline{\ln A_{tv}}\right)$, is introduced to capture the change or growth rate in the average asset index for the community. The model to be estimated now becomes:

$$\Delta \ln c_{htv} = \alpha + \beta \Delta \ln A_{htv} + \lambda \Delta\left(\overline{\ln A_{tv}}\right) + \gamma X_{htv} + \Delta \varepsilon_{htv} \qquad (8.8)$$

The specification in (8.8) implies that $\lambda=0$ when income shocks are not shared at all among community members, while $\lambda\neq0$ when partial insurance and risk sharing take place among households within the same community. The results of the estimation (reported in table 8.5) show some evidence of mutual insurance among the surveyed households. In particular, estimates of $\lambda$ show that a 10 percent increase in community mean asset index raises total household consumption by 3 percent. The raise in food consumption is similar (3.3 percent) while that of non-food consumption is substantially larger (at 5.6 percent). This shows that the growth rate in average community asset index has a significant role in the growth rate of household consumption (Skoufias, 2003).

Although the *a priori* expectation was that there would be stronger community risk sharing in food consumption than in non-food consumption, the results are contrary to this expectation. The change in growth rate of community assets seems to have a more positive and significant role in the growth rate of household non-food consumption than

in food consumption. This result is logical because most households rely on free food distribution to deal with the major shock that affects food consumption (drought), as explained in chapter 7. The widespread use of safety net programmes between the two survey rounds meant that risk sharing through social networks was used more for non-food related shocks than for food related shocks.

**Table 8.5: Evidence of Partial Consumption Insurance**

| | **Δ ln Total Consumption** | **Δ ln Food Consumption** | **Δ ln Non-food Consumption** |
|---|---|---|---|
| Δ ln Household Asset Index | 0.59*** | 0.59*** | 0.61*** |
| | (0.09) | (0.13) | (0.13) |
| Δ ln Community Asset Index | 0.30** | 0.33* | 0.56** |
| | (0.12) | (0.18) | (0.24) |
| Δ ln Family Size | 0.01 | -0.02 | 0.06 |
| | (0.01) | (0.02) | (0.03) |
| Female Headed Household | 0.05 | 0.00 | 0.17** |
| | (0.03) | (0.05) | (0.06) |
| Household Head is <26 | -0.01 | -0.03 | 0.05 |
| | (0.04) | (0.07) | (0.06) |
| Household Head is >65 | -0.07** | -0.02 | -0.11 |
| | (0.08) | (0.05) | (0.08) |
| F test | 24.73*** | 7.71*** | 9.40*** |
| $R^2$ | 0.51 | 0.30 | 0.34 |
| N | 259 | 259 | 259 |

**Source: Own compilation**

Notes: 1. Dependent variable is change in log per capita consumption.
2. Standard errors are reported in parentheses
3. N = 259
4. *** significant at 1 percent level; ** significant at the 5 percent level
5. Standard errors are corrected for heteroscedasticity using Huber-White method.
6. Additional regressors included but not reported include a set of community dummies interacted with survey round.

## 8.4 Summary

This chapter was aimed at examining the extent to which the surveyed households smooth their consumption against income shocks. The results can be summarized as follows: First, the variation in median food and non-food consumption between the two rounds has shown that households try to protect food consumption more than their non-food consumption. In particular, food consumption is protected more among the poor than the non-poor households. Second, unlike idiosyncratic shocks, community-wide shocks have significant impacts on changes in households' total consumption. Third, using the asset-based approach, there is no evidence that consumption is perfectly protected from fluctuations in income among the surveyed households. However, there is evidence of partial consumption smoothing with food consumption being protected from income changes slightly more than non-food consumption. Fourth, there is evidence of risk sharing taking place at the community level, with community risk sharing strategies used more to protect household non-food than food consumption.

# Chapter 9

# SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

## 9.1 Introduction

Poverty reduction remains a challenging task for the Government of Malawi and its development partners because poverty rates are considerably high. The growing consensus among development researchers and practitioners that effective poverty reduction programmes should be forward-looking has brought with it challenges on how to effectively measure household future poverty. The lack of panel data on households in Malawi has been a major draw-back in the quest to understand how vulnerable rural households in Malawi are.

Against this background, this study was aimed at understanding the impact of risk on households' vulnerability and poverty in Malawi. Using a two-period panel dataset on 259 households the study addresses the central research issue of the role of risk in influencing households' vulnerability to poverty in rural Malawi. Specifically, the study has addressed three objectives: first, it has identified the determinants of household vulnerability in rural Malawi. Second, it has analyzed households' risk management strategies and identified the determinants of these strategies. Third, household consumption smoothing was tested. Apart from addressing these three issues, the environment in which the studied households live was put into context by presenting Malawi poverty profiles and the livelihood profiles of the study areas in chapter 5. The aim of this chapter is three-fold. First, to summarize the results presented in the preceeding chapters. Second, to provide conclusions and suggest the major policy recommendations based on the findings. Third, to outline the limitations of the study and suggest the direction for future research. This chapter is, therefore, organized as follows: section 9.2 provides summaries and conclusions from the three empirical chapters in the study. The main policy implications, presented in section 9.3, are followed by a section on study limitations and areas for future research (section 9.4).

## 9.2 Summary and Conclusions

This section summarizes the major findings from the study and provides the conclusions that are drawn from the findings. In order to understand the environment in which the studied households operate, the study presented poverty profiles for Malawi in chapter 5. The profiles have shown that the poor in Malawi have large families, high numbers of children, and a higher dependency ratio than their counter-parts. The poverty profiles have also revealed that more than 50 percent of the poor in Malawi are individuals who are less than 15 years of age and that female-headed households are more likely to be poor than male-headed households. On a different note, the livelihood profiles of the study areas (presented in chapter 5) have shown that the majority of the households grow their own food, which is supplemented by purchased food during periods of shortfall. A small proportion of poor households also sell temporary labour (*ganyu*) in exchange for food in all the livelihood zones. Further, the major sources of income in all the study areas include crop sales, livestock sales and temporary sale of labour.

### 9.2.1 Determinants of Vulnerability to Poverty in Rural Malawi

A detailed analysis of household vulnerability to poverty was presented in chapter 6. Under the framework of vulnerability as expected poverty, household vulnerability was analyzed following Christiaensen and Subbarao (2004) methodology using a two-period panel data. The results have shown that, in 2004, 44 percent of the studied households were vulnerable to poverty. Vulnerability was lowest in Blantyre (25 percent) and highest in Mchinji (70 percent). While 25 percent of the poor in 2004 were not vulnerable to 2006 poverty, 18 percent of the non-poor in 2004 had more than a 50 percent chance of falling into poverty in 2006. The results further showed that low mean levels of consumption was a more significant source of vulnerability than high variability in levels of consumption in the study areas.

The results further showed that the major determinants of vulnerability at household level are level of education of household head, undertaking a non-farm income generating activity and per capita landholdings, all of which have vulnerability-reducing effects of increasing *ex-ante* mean consumption. On the other hand, household size has a

vulnerability-increasing effect of reducing average consumption. At the community level, the results have shown that access to markets and health centres reduce vulnerability among the studied households, while distance to commercial banks had a vulnerability-increasing effect of reducing average consumption. With regards to the different shocks that households encountered between 2004 and 2006, the results showed that drought, rising food prices, illness and falling sale prices for crops were all associated with increasing vulnerability. On the other hand, rising agricultural input prices showed signs of reducing vulnerability, through its positive impact on *ex-ante* mean consumption.

### 9.2.2 Risk Management Strategies in Rural Malawi

The second empirical chapter of the study has analyzed the determinants of risk management strategies in rural Malawi (chapter 7). The study has shown that the surveyed households faced multiple shocks between 1999 and 2006. Among the major shocks reported include drought, rising food prices, illness, falling sale prices for crops and rising prices of agricultural inputs. The study has also shown that households have a variety of ways of responding to shocks. In particular, the results have shown that income diversification, which is the major *ex-ante* risk management strategy, took the form of crop diversification among the surveyed households. Further, the major *ex-post* coping strategies used by the studied households include getting support from safety net programs, sale of household assets, use of cash savings and getting support from social networks.

The study has further shown that the major determinants of the choice of the *ex-post* coping strategy among the studied households include the size of the household, the number of economically active individuals in the household, per capita landholdings, ownership of livestock, access to markets and the type of shocks that households face.

### 9.2.3 Consumption Smoothing in Rural Malawi

The major findings from the analysis on consumption smoothing in rural Malawi (chapter 8) are that the studied households try to protect their consumption from shocks, with food

consumption being protected more than non-food consumption. However, the study found no evidence of complete consumption smoothing. The study has further shown that risk sharing was taking place among households within a given community. In particular, the results showed that community risk sharing strategies were used more to protect household non-food consumption than food consumption.

### 9.3 Implications for Policy

The results from this study point to a number of policy issues that need to be addressed if household vulnerability to poverty is to be significantly reduced among rural households in Malawi. First, poverty reduction strategies and programmes need to consider not only the currently poor but also those at risk of being poor in the future. If, for example, the government were to put in place some poverty reduction measures based only on the poverty incidence among the sampled households in 2004, the program would not include the 21 percent of the households that were non-poor in 2004 but had more than a 50 percent chance of being poor by the time the programme is being implemented. It is that group that needs to be incorporated in poverty reduction strategies.

Second, since the study has shown that the major source of vulnerability is low mean consumption levels (as opposed to consumption volatility), interventions that reduce consumption volatility may not be sufficient. Policymakers need to institute strategies that reduce consumption volatility by reducing households' exposure to risk or by enhancing their *ex-post* coping capacity (Hoddinott and Quisumbing, 2003). However, these should be accompanied by interventions to increase household mean consumption. These require strategies to protect and build households' productive assets. As suggested by Devereux *et al*. (2007), human capital development in the form of improved health services to reduce illness and raise labour productivity, improved education to build skills and broaden livelihood opportunities beyond agriculture could be effective in reducing household vulnerability[26]. Further, promotion of livestock ownership among the rural

[26] Such interventions are currently being promoted by the World Bank, through the Malawi Social Action Fund (MASAF). At the end of June 2008, the World Bank Board of Directors approved an additional US$50 million to support the second phase of MASAF III (known as MASAF 3 APL II) which is expected to run from 2008 to 2013. This second phase of MASAF III will aim to reach the poor with public works

population, coupled with infrastructural development at community level in the form of improved roads to integrate markets would be necessary if households are to build asset buffers to protect themselves against shocks.

The study has shown that drought remains the most prevalent shock and that most of the rural households depend on safety net programs to cope with it. It is in this respect that targeted direct welfare transfers, especially in the form of direct food transfer, should be promoted as a short-term intervention to help poor households to be able to smooth their consumption in the face of drought. However, development practitioners agree that social protection interventions should go beyond direct welfare transfers to incorporate productivity-enhancing safety nets. These interventions, which are targeted at economically active, input-constrained farmers in the case of Malawi, are important because they do not only transfer resources to the poor and the vulnerable but they also build household assets. The agricultural input subsidy program[27] that the Government of Malawi has been running since 2005 should therefore be encouraged as a short-term strategy. In the long-term, however, small and medium scale irrigation schemes need to be promoted in order to enhance food crop production. As it is acknowledged in the Malawi Growth and Development Strategy for 2006-2011, irrigation would contribute towards the reduction in the overall dependence on rain-fed agriculture. It is therefore imperative that irrigation should continue to be promoted, especially among poor communities where the impact of drought is most severe.

The use of weather-indexed insurance, which is being piloted in Malawi since 2005/6 agricultural season should also be promoted. The insurance, whose payout is based on the deficit in cumulative rainfall at specific dates in the crop growth cycle, is being piloted

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earnings, infrastructure improvements, savings mobilization, and public and social accountability tools, in the context of increased local governance and public sector management.

[27] Imperial College London *et al*. (2007) evaluates the Malawi Input Subsidy Program 2005-2007 and also undertook a livelihood impact of the program. The study concluded that the incremental maize production that is attributed to the subsidized fertilizer was between 300,000 and 400,000 metric tonnes in 2005/6 season and between 600,000 and 700,000 metric tonnes in 2006/7. Further, a cost-benefit analysis of the programme shows that the value of the extra maize production in 2006/7 was between US$ 100 million and US$ 160 million, which far exceeds the US$ 70 million cost of the seed and the fertilizer subsidy in 2006 (DFID, 2007).

for groundnut farmers in Malawi (Alderman and Haque, 2007). The potential for linking a social protection payout to an index-based insurance which was initiated by World Bank researchers should be explored further[28].

### 9.4 Study Limitations and Areas for Future Research

While the study provides an exposition on the risk management strategies in rural Malawi, it is important to keep in mind that these findings are based on surveyed households' subjective assessments and recall of shock events. While the shock module had a 2-year recall period in the second round, it had a 5-year recall period in the first round. As such, it is likely that the quality of data might have been compromised by the length of the recall period[29], particularly in the 2004 round. Further, self-reported shocks represent attributions of causality by respondents rather than the events themselves (Hoddinott and Quisumbing, 2003). For instance, some poor households who are frequently affected by a particular shock may not report it during a survey as they would consider the situation 'normal'.

The second limitation of the study pertains to data availability. Due to a lack of panel data, the study only used a two-period panel data on 259 households. However, effective household vulnerability assessments require panel data of sufficient length and richness. Further, the analysis of consumption smoothing was undertaken using household assets due to a lack of income data. It is therefore not clear whether the same results would be obtained if actual income data were used.

Further, a comparison of the vulnerability as expected poverty (VEP) and vulnerability as low expected utility (VEU) approaches was attempted but could not be completed because of this small sample size. Since the econometric estimation of the vulnerability using the VEU approach requires a variation in the shocks that households report in the two rounds, all the households that reported the same shocks in both rounds were

[28] Alderman and Haque (2007) describe simulation exercises on how the index-based insurance can be linked to social protection in the face of drought.

[29] There is a wide debate in literature on the effect of the length of the recall period on the quality of survey data. See Mathiowetz (2006) for a review of the literature for the past 50 years.

dropped. As a result, the sample size changed from 259 households to around 120 households. Since any meaningful comparison could not be done with such a small sample to examine the differences in estimates of vulnerability from the two approaches, the exercise could not be completed.

A possible extension of this study is to analyze the impact on household vulnerability of agricultural input subsidy program that the Government of Malawi has been running. Although the programme has led to a significant improvement in fertilizer utilization leading to a three-fold increase in maize production between 2005 and 2007, the impact of the programme on household's vulnerability to poverty has not been ascertained. Since a significant proportion of the surveyed households benefited from subsidized fertilizer and seeds in 2005/6 and 2006/7 crop seasons, it is possible to examine the extent to which the program is reducing household vulnerability. Further, the study could be extended to undertake a thorough examination of the households that use migration as a coping strategy. It is important to analyze whether this migration, especially as an *ex-post* response to drought, is an effective tool to cope with the shock or whether it should be perceived as a failure to adapt to the environmental change.

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# APPENDICES

## A1: Descriptive Statistics for the Vulnerability Model

### Table A1-1: Summary Statistics

| Variable | Description | Mean | Standard Deviation |
|---|---|---|---|
| **Dependent variable** | | | |
| 2006 real expenditure per capita | Real consumption expenditure per capita in Malawi Kwacha in 2006 | 29,064.47 | 80,775.93 |
| **Household Characteristics in 2004** | | | |
| Female headed household (1=yes) | Whether the household head is female | 0.26 | 0.44 |
| Age of head is <26 (1=yes) | Whether the household head is below 26 years old | 0.11 | 0.31 |
| Age of head is between 26 and 65 (1=yes) | Whether the household head is between 26 and 65 years old | 0.80 | 0.40 |
| Head' level of education: No schooling (1=yes) | The household head has no schooling at all | 0.28 | 0.45 |
| Head's level of education: Junior Primary (1=yes) | The head has been 1 and 4 years of schooling | 0.22 | 0.42 |
| Head's level of education: Secondary educ (1=yes) | The head has some secondary education ( 9-12 years of schooling) | 0.14 | 0.34 |
| Head's level of education: Post-secondary (1=yes) | The head has some post-secondary education (beyond 12 years of schooling) | 0.05 | 0.22 |
| Per capita land holding size | Land holding size (acres/capita) | 0.59 | 0.54 |
| Household enterprise (1=yes) | Whether the household has a non-farm enterprise in 2004 | 0.38 | 0.49 |
| #goats/sheep owned | Number of goats and sheep owned by the household in 2004 | 1.20 | 3.17 |
| Age of head | Age of the household head (years) | 43.23 | 14.36 |
| Household size | The size of the household | 4.92 | 2.28 |
| Number of children | The number of children the household has | 2.96 | 1.97 |
| Dependency ratio | Household dependency ratio | 2.62 | 1.66 |
| 2004 real expenditure per capita | Real consumption expenditure per capita in Malawi Kwacha in 2004 | 25,943.03 | 34,378.16 |
| **Community Characteristics in 2004** | | | |

| | | | |
|---|---|---|---|
| Weekly market in community (1=yes) | Whether there is a weekly market in the community | 0.14 | 0.34 |
| Health clinic in community (1=yes) | Whether there is a clinic/dispensary/health centre/hospital in the community | 0.21 | 0.41 |
| Regular bus service in community (1=yes) | Whether there is a regular bus/transportation services in the community | 0.28 | 0.45 |
| Post office in community (1=yes) | Whether there is a post office within the community | 0.11 | 0.31 |
| MASAF project in community (1=yes) | Whether there is a Malawi Social Action Fund (MASAF) project within the community | 0.14 | 0.35 |
| Distance to tarmac road | Distance to the nearest tarmac road (Km) | 15.39 | 18.09 |
| Distance to district headquarters | Distance to the district headquarters (Km) | 29.87 | 19.51 |
| Distance to primary school | Distance to the nearest government primary school (Km) | 1.52 | 2.32 |
| Distance to secondary school | Distance to the nearest government secondary school (Km) | 17.81 | 13.58 |
| Distance to commercial bank | Distance to the nearest commercial bank (Km) | 27.04 | 17.03 |
| **Shock Variables in 2006** | | | |
| Drought 2006 (1=yes) | Whether the household reported experiencing drought between 2005 and 2006 | 0.80 | 0.40 |
| Food price rise 2006 (1=yes) | Whether the household reported experiencing a rise in the prices of food commodities between 2005 and 2006 | 0.39 | 0.49 |
| Illness 2006 (1=yes) | Whether the household reported experiencing an illness 7 days prior to the interview date | 0.38 | 0.49 |
| Fall in crop prices 2006 (1=yes) | Whether the household reported experiencing a fall in the sale prices for crops between 2005 and 2006 | 0.31 | 0.46 |
| Number of observations | 259 | | |

## A2: Test for Multicollinearity among Variables Used in Vulnerability Analysis

Multicollinearity is one of the major potential problems with the type of data that are used in the above analysis. This section attempts to test for multicollinearity in the vulnerability model. In particular, the variance inflation factor (VIF) and its associated tolerance are used to detect multicollinearity in the explanatory variables. The variance inflation factor can be defined as:

$$VIF = \frac{1}{1 - R_j^2}$$

where $R^2_j$ is an unadjusted $R^2$, the coefficient of multiple determination. The VIF measures the impact of collinearity among the explanatory variables in a regression model on the precision of estimation. It expresses the degree to which collinearity among the regressors degrades the precision of an estimate (Lynch, 2003). If $X_j$ is highly correlated with the other X variables, then $R^2_j$ will be large, making the denominator of VIF small, and hence the VIF very large. Tolerance = 1/VIF, is another measure of multicollinearity.

As the definitions show, the higher the VIF, the lower the tolerance index. VIF ranges from 1 to infinity, while the tolerance index ranges from 0 to 1. VIF=1 or Tolerance =0 indicates the absence of multicollinearity. A VIF value of greater than 10 indicates that multicollinearity is a problem with that particular X variable.

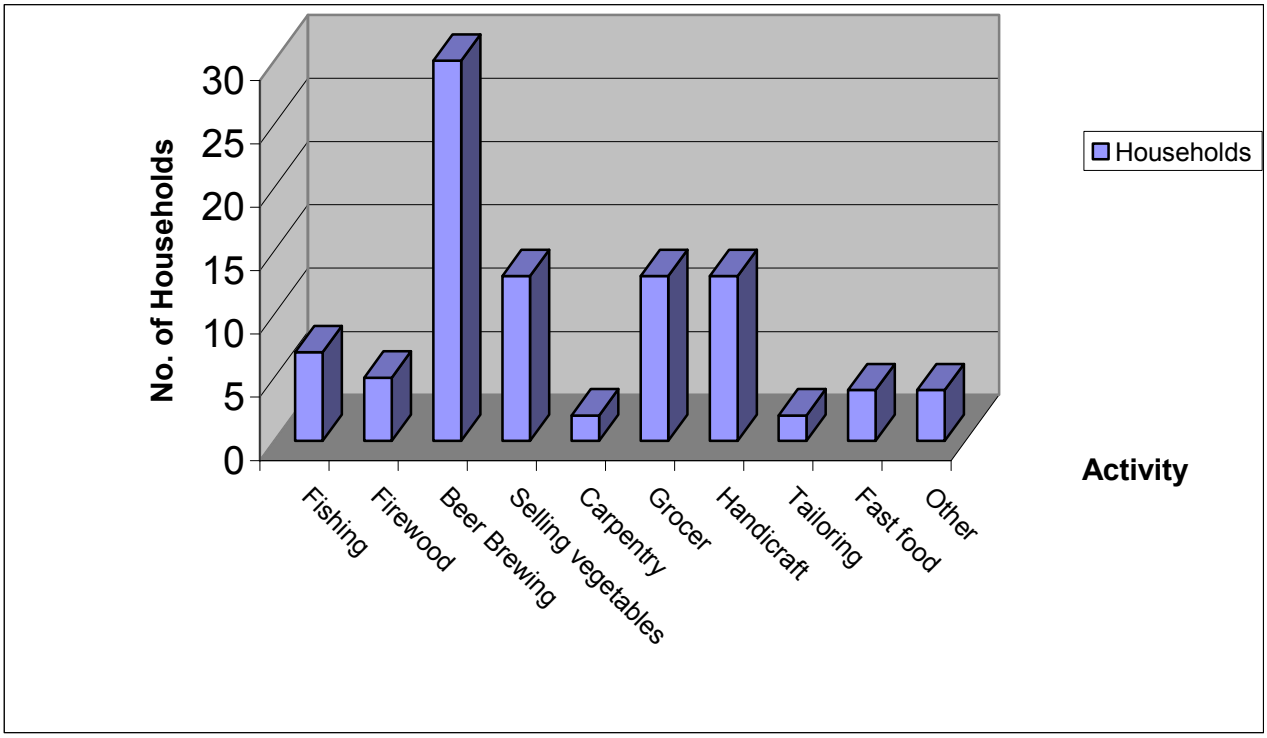
**Table A2-1: VIF and Tolerance Results for the Vulnerability Model**

| VARIABLE | VARIANCE INFLATION FACTOR (VIF) | TOLERANCE (1/VIF) |
|---|---|---|
| Distance to commercial bank | 4.07 | 0.25 |
| Distance to district centre | 3.63 | 0.28 |
| Health centre in community (1=yes) | 3.24 | 0.31 |
| Secondary school in community (1=yes) | 2.95 | 0.34 |
| Regular bus service in community (1=yes) | 2.84 | 0.35 |
| Community dummy 19 (*Kuntaja*) | 2.70 | 0.37 |
| Post office in community (1=yes) | 2.14 | 0.47 |
| Community dummy 7 (*Chadza*) | 2.14 | 0.47 |
| Community dummy 20 (*Ngabu*) | 2.04 | 0.49 |
| Household head with no education | 1.92 | 0.52 |
| Drought in 2006 (1=yes) | 1.84 | 0.54 |
| Primary school (1=yes) | 1.69 | 0.59 |
| Household size in 2004 | 1.59 | 0.63 |
| Household head with secondary education | 1.50 | 0.67 |
| Household head with junior primary educ | 1.50 | 0.67 |
| Community dummy 4 (*Mwalweni*) | 1.49 | 0.67 |
| Rising food prices in 2006 (1=yes) | 1.40 | 0.72 |
| Community dummy 11 (*Mkanda*) | 1.38 | 0.72 |
| Household head with post-secondary educ | 1.38 | 0.73 |
| Rising agricult input prices 2006 (1=yes) | 1.36 | 0.73 |
| Age of household head>65 (1=yes) | 1.34 | 0.75 |
| Female headed household (1=yes) | 1.33 | 0.75 |
| Age of household head<26 (1=yes) | 1.32 | 0.76 |
| Community dummy 3 (*Mwahenga*) | 1.30 | 0.77 |
| Community dummy 1 (*Chikulamayembe*) | 1.29 | 0.77 |
| Per capita landholding size | 1.29 | 0.78 |
| Falling crop sale prices 2006 (1=yes) | 1.28 | 0.78 |
| Community dummy 5 (*Njombwa*) | 1.27 | 0.78 |
| Illness in 2006 (1=yes) | 1.26 | 0.80 |
| Community dummy 9 (*Mavwere*) | 1.23 | 0.81 |
| #goats/sheep | 1.22 | 0.82 |
| Community dummy 10 (*Zulu-Simphasi*) | 1.21 | 0.83 |
| Household enterprise (1=yes) | 1.19 | 0.84 |
| MEAN VIF | 1.80 | |

**Source: Own compilation.**

## A3: Non-farm Income Generating Activities in 2004

**Figure A3-1: Non-farm Income Generating Activities in 2004**




**Source: Own compilation**

## A4: Small-Hsiao Test of Independence of Irrelevant Alternatives (IIA)

An important property of a multinomial logit model is the independence of irrelevant alternatives (IIA)[30]. The IIA property assumes that the odds of outcomes in the model do not depend on the other available choices. The IIA property can be stated as follows: The ratio of the probabilities of any 2 alternatives in the model is independent from the choice set. In particular, for any choice set B and H, such that $B \subseteq H \subseteq C$, for any alternative $a_1$ and $a_2$ in B, then $\frac{P_B(a_1)}{P_B(a_2)} = \frac{P_H(a_1)}{P_H(a_2)}$.

According to Long and Freese (2006), tests of IIA compare the estimated coefficients from the full model to those from a restricted model that excludes at least one of the alternatives. If the test statistic is significant, the assumption of IIA is rejected, indicating that a multinomial logit model is not appropriate. In such cases, other alternatives such as a nested logit model could be used. The two common tests for IIA are the Hausman-McFadden (HM) test of 1984 and the Small-Hsiao (SH) test of 1985. The study uses the Small-Hsiao Test described below.

Long and Freese (2006) present an elaborate exposition of the Small-Hsiao IIA test. The Small-Hsiao Test randomly divides the sample into two equal sub-samples. The unrestricted multinomial logit model is applied to both sub-samples, where $\hat{\beta}_u^{S_1}$ contains estimates from the unrestricted model on the first sub-sample and $\hat{\beta}_u^{S_2}$ is for the second sub-sample. A weighted average of the coefficients $\hat{\beta}_u^{S_1 S_2}$ is then computed, where:

$$\hat{\beta}_u^{S_1 S_2} = \left(\frac{1}{\sqrt{2}}\right)\hat{\beta}_u^{S_1} + \left[1 - \left(\frac{1}{\sqrt{2}}\right)\right]\hat{\beta}_u^{S_2}$$

The test then creates a restricted sample from the second sub-sample by eliminating all cases with a chosen value of the regressand. The multinomial logit is then fitted using the restricted sample and estimates $\hat{\beta}_r^{S_2}$ and the likelihood $L\left(\hat{\beta}_r^{S_2}\right)$ are obtained.

[30] The IIA property is illustrated by the red bus/blue bus paradox by Ben-Akiva and Lerman (1985).

The Small-Hsiao test statistic, which follows a $\chi^2$ distribution, is given as:

$$SH = -2\left\{L\left(\hat{\beta}_u^{S_1 S_2}\right) - L\left(\hat{\beta}_r^{S_2}\right)\right\}$$

The results of the Small-Hsiao Test are reported below in stata output format, where the null hypothesis being tested is:

**$H_0$**: Odds (outcome-J vs Outcome-K) are independent of other alternatives

**Table A4-1: Small-Hsiao Test of IIA**

| **Ommitted Choice** | **lnL (full)** | **lnL (omit)** | **Chi2** | **df** | **P>chi2** | **Evidence** |
|---|---|---|---|---|---|---|
| Safety net | -576.016 | -96.349 | 959.335 | 17 | 0.000 | For $H_0$ |
| Asset depletion | -607.624 | -150.044 | 915.160 | 17 | 0.000 | For $H_0$ |
| Reduced food | -754.615 | -120.084 | 1269.063 | 17 | 0.000 | For $H_0$ |
| Social network | -741.616 | -108.031 | 1267.169 | 17 | 0.000 | For $H_0$ |
| Sale of assets | -737.413 | -122.083 | 1270.184 | 17 | 0.000 | For $H_0$ |
| Dissaving | -738.864 | -135.814 | 1206.100 | 17 | 0.000 | For $H_0$ |
| Temporary labour | -565.227 | -143.430 | 843.593 | 17 | 0.000 | For $H_0$ |

**Source: Own compilation**

The results provide support for the use of the multinomial logit model since the Small-Hsiao test does not reject the null hypothesis that the IIA assumption holds.

## A5: Test for Multicollinearity among Variables Used in Consumption Smoothing Analysis

**Table A5-1: Correlation Coefficients for Variables on Consumption Smoothing**

| | Δln household Assets | Δln community Assets | Δln household size | Female headed household | Household head aged<26 | Household head aged>65 |
|---|---|---|---|---|---|---|
| Δln household Assets | 1 | | | | | |
| Δln community Assets | 0.39 | 1 | | | | |
| Δln household size | 0.05 | 0.23 | 1 | | | |
| Female headed household | 0.09 | 0.13 | 0.08 | 1 | | |
| Household head aged<26 | -0.12 | -0.07 | 0.21 | -0.06 | 1 | |
| Household head aged>65 | -0.05 | -0.06 | -0.07 | 0.14 | -0.12 | 1 |

**Source: Own compilation**

**Table A5-2: VIF and Tolerance Results for the Consumption Smoothing Model**

| VARIABLE | VARIANCE INFLATION FACTOR (VIF) | TOLERANCE (1/VIF) |
|---|---|---|
| Δln community Assets | 1.26 | 0.79 |
| Δln household Assets | 1.19 | 0.84 |
| Δln household size | 1.13 | 0.89 |
| Household head aged<26 | 1.09 | 0.92 |
| Female headed household | 1.05 | 0.95 |
| Household head aged>65 | 1.04 | 0.96 |
| MEAN VIF | 1.13 | |

**Source: Own compilation**

## A6: Components of Household Consumption Expenditure

**Table A6-1: Components of Consumption Expenditure from IHS2 Data**

| Component | COICOP Code | Description |
|---|---|---|
| Food/Beverage | 11 | Food |
| | 12 | Beverage |
| Alcohol/Tobacco | 21 | Alcohol |
| | 22 | Tobacco |
| Clothing/Footwear | 31 | Clothing |
| | 32 | Footwear |
| Housing/Utilities | 41 | Actual rents for housing |
| | 42 | Estimated rents for housing |
| | 43 | Regular maintenance and repair of dwelling |
| | 45 | Electricity, gas, other fuels |
| Furnishing | 51 | Decorations, carpets |
| | 52 | Household textiles |
| | 53 | Appliances |
| | 54 | Dishes |
| | 55 | Tools/equipment for home |
| | 56 | Routine home maintenance |
| Health | 61 | Health drugs |
| | 62 | Health out-patient |
| | 63 | Health hospitalization |
| Transport | 71 | Vehicles |
| | 72 | Operation of vehicles |
| | 73 | Transport |
| Communications | 81 | Communications |
| Recreation | 91 | Audio-visual |
| | 92 | Major durables for recreation and culture, including repairs |
| | 94 | Recreational and cultural services |
| | 95 | Newspapers, books, stationery |
| Education | 101 | Education |
| Vendors/Cafes | 111 | Vendors/cafes/restaurants |
| | 112 | Accommodation services |
| Miscellaneous Goods and Services | 121 | Personal care |
| | 122 | Personal effects |
| | 124 | Insurance |

**Source: World Bank (2006a)**

## A7: STATA Program for Calculating Household Vulnerability

**** CALCULATING EX-ANTE MEAN AND VARIANCE OF FUTURE CONSUMPTION****

*2006 consumption expenditure regressed on 2004 variables and 2006 shock variables*

***STEP 1: Calculating ex-ante mean***

1. reg lnrexpcapita06 noeduchead jnrprimary secondaryedu postsecondary hhsize2004 hhage1 hhage2 female hhentrprse cap_landsize goats_sheep comm_dummy1 comm_dummy3 comm_dummy4 comm_dummy5 comm_dummy7 comm_dummy9 comm_dummy10 comm_dummy11 comm_dummy19 comm_dummy20 busservce distboma postoffce prmryschll secschll hlthcentre distbank drought06 illness06 foodrise06 cropprice06 inputprice06 [pw=hhwght]

2. predict res, residuals

***STEP 2: Calculating ex-ante variance***

1. gen res2=res^2
2. gen lnres2=ln(res2)
3. label var lnres2 "log of squared residuals"
4. reg lnres2 noeduchead jnrprimary secondaryedu postsecondary hhsize2004 hhage1 hhage2 female hhentrprse cap_landsize goats_sheep comm_dummy1 comm_dummy3 comm_dummy4 comm_dummy5 comm_dummy7 comm_dummy9 comm_dummy10 comm_dummy11 comm_dummy19 comm_dummy20 busservce distboma postoffce prmryschll secschll hlthcentre distbank drought06 illness06 foodrise06 cropprice06 inputprice06 [pw=hhwght]

5. predict plnres2
6. label var plnres2 "predicted ln squared predicted residuals"
7. gen eplnres2=exp(plnres2)
8. drop res
9. predict res if e(sample), residuals

***STEP 3: Correcting mean regression for heteroskedasticity***

1. reg lnrexpcapita06 noeduchead jnrprimary secondaryedu postsecondary hhsize2004 hhage1 hhage2 female hhentrprse cap_landsize goats_sheep comm_dummy1 comm_dummy3 comm_dummy4 comm_dummy5 comm_dummy7 comm_dummy9 comm_dummy10 comm_dummy11 comm_dummy19 comm_dummy20 busservce distboma postoffce prmryschll secschll hlthcentre distbank drought06 illness06 foodrise06 cropprice06 inputprice06 [aweight=1/eplnres2]

2. drop res
3. predict res if e(sample), residuals

***STEP 4: Calculating Vulnerability (The Probability of Shortfall)***

```
1.  predict plnhhexpcapita06 if e(sample)
2.  gen sdeplnres2=sqrt(eplnres2)
3.  gen v0U=normprob((lnpovline04-plnhhexpcapita06)/sdeplnres2)
4.  label var v0U "probability of expenditure shortfall in future"
```

## A8: Vulnerability and Poverty Profiles by Livelihood Zones

**Table A8-1: Poverty and Vulnerability by Livelihood Zone**

| | Population Share | Poverty Headcount ($P_0$) in 2004 | Mean Vulnerability ($V_0$) in 2004 | Vulnerability Headcount ($V_0$>0.5) in 2004 | Vulnerability To Poverty Ratio in 2004 | Poverty Headcount ($P_0$) in 2006 |
|---|---|---|---|---|---|---|
| **Total** | **100** | **0.47** | **0.44** | **0.45** | **0.96** | **0.50** |
| | | **By Livelihood Zones** | | | | |
| Western Rumphi and Mzimba | 11.20 | 0.52 | 0.56 | 0.55 | 1.06 | 0.52 |
| Kasungu-Lilongwe plain | 38.60 | 0.43 | 0.39 | 0.38 | 0.88 | 0.54 |
| Southern Lakeshore | 11.58 | 0.53 | 0.61 | 0.67 | 1.26 | 0.51 |
| Lake Chilwa and Phalombe | 19.31 | 0.68 | 0.59 | 0.58 | 0.85 | 0.49 |
| Middle Shire Valley | 7.72 | 0.25 | 0.24 | 0.25 | 1.00 | 0.50 |
| Lower Shire Valley | 11.58 | 0.67 | 0.53 | 0.50 | 0.75 | 0.49 |

**Source: Own compilation.**