Poverty Dynamics, Income Inequality and Vulnerability to Shocks in Rural Kenya

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Thesis

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Introduction

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1.1 Background

Global poverty rates have been declining. In developing countries, poverty rate decreased from 28% in 1993 to 22% in 2002. The decline has been mainly as a result of falling rural poverty from 37% to 29% over the same period (World Bank, 2008). Urban poverty rates have remained nearly constant at 13%.[1] Recent estimates show that the number of people in the developing world living in poverty decreased from 1.9 billion in 1981 to 1.4 billion in 2005 (Chen and Ravallion, 2009).

Although poverty rates are declining, there are mixed regional trends in reducing poverty. Much of the progress in poverty reduction has been confined to East Asia and the Pacific (Chen and Ravallion, 2009; World Bank, 2008). The rate of decline in poverty has been much slower in Sub-Saharan Africa and South Asia. Absolute poverty remains high and persistent in many countries in Sub-Saharan Africa including Kenya. Official statistics estimated the poverty headcount ratio (per cent of population) to be 51% for Sub-Saharan Africa in 2005 and 46% for Kenya in 2005/2006 and (KNBS, 2007; World Bank, 2010). Sub-Saharan Africa is not only poor, but also the region with the highest share of its population living in chronic poverty.[2] Estimates indicate that half of the Chronically Deprived Countries[3] in the world are found in Africa, with about one-quarter of the world's chronically poor living in Sub-Saharan Africa (CPRC, 2009). Panel data estimates show that between 30% and 40% of the absolute poor population in Sub-Saharan Africa is chronically poor — between 90 and 120 million people (CPRC, 2005). Whereas, the annual GDP growth rate in Sub-Saharan Africa increased from 3.6% in 2000 to 6.4% in 2007, per capita GDP annual growth rates have been lower, increasing from about 1% to 4% over the same period.

The Sub-Saharan Africa region faces other challenges that include civil strife, lack of political accountability, institutional, and geographical challenges. A rapidly growing literature exploring factors underlying income inequalities across countries identify geographical factors and institutions as key drivers of long-term economic growth. Empirical evidence from global samples studies points to institutions as the main determinant of income

[1] The poverty rates refer to the proportion of the population living on less than $ 1-day. The World Bank's global poverty measures have been based on an international poverty line that is representative of the national poverty lines found in the world's poorest countries. Initially these were based on US$ 1 a day, however, they have been revised to US$1.25 a day at 2005 purchasing power parity (PPP) for the consumption expenditures of households.

[2] The distinguishing feature of chronic poverty is its extended duration. In general chronic poverty describes extreme poverty that persists over long periods of time, but can also apply to shorter time periods.

[3] Chronically Deprived Countries are characterized by relatively low GDP per capita, and relatively high mortality, fertility and undernourishment and by relatively slow rates of progress over time across all available indicators.

inequality across countries (e.g. Acemoglu *et al.*, 2001; Bhattacharyya, 2009a; Easterly and Levine, 2003; Rodrik *et al.*, 2004). However, for Africa evidence by Bhattacharya (2009b) suggests that geographical factors (notably malaria prevalence) matters most. Malaria and other infectious diseases have fatal as well as debilitating effects on the human population in Africa, and negatively influence productivity, savings and investments in physical and human capital and directly affects economic performance of the continent (see Gallup and Sachs, 2001; Gallup *et al.*, 1999). Other studies relate Africa's economic performance to political culture, with many of the economic problems of Africa having their roots in public-choice impediments (Rowley, 2000). The African leaders, the elites supporting them, and the evolving governance system appears to promote rent-seeking and are responsible for the poor economic performance of much of Sub-Saharan Africa since independence.

Reducing poverty, increasing GDP growth rates, and increasing per capita incomes are a primary focus of public policy in most countries in Sub-Saharan Africa. Many countries in the region have formulated Poverty Reduction Strategy Papers (PRSP)[4] and are committed to achieving the Millennium Development Goal (MDG) of halving poverty and reducing hunger by 2015. High poverty incidence and low per capita incomes coupled with increasing vulnerability to various shocks has motivated poverty and vulnerability research in Sub-Saharan Africa. Sub-Saharan African governments are increasingly making investments in poverty monitoring through welfare monitoring surveys (with technical support from the World Bank) to inform policy decisions and poverty reduction interventions. Welfare monitoring surveys focus on inter-temporal changes in aggregate poverty within a population, and are mainly concerned with poverty incidence, poverty gap and poverty severity at a particular point in time. The welfare monitoring surveys have been complimented by participatory poverty assessments. The World Bank's Poverty Assessments, for example, have as a component a participatory poverty assessment (PPA).

The research presented in this thesis examines poverty dynamics, income inequality and exposure to shocks within the sustainable livelihoods conceptual framework (SLF) (Ellis, 2000). A core feature of the SLF is an analysis of the different types of assets or capital upon which individuals draw to build their livelihoods. These are natural, social, human, physical, and financial capital (Ashley and Carney, 1999; Bebbington, 1999; Carney, 1998). Other

[4] Poverty Reduction Strategy Papers (PRSP) describe a country's macroeconomic, structural, and social policies and programs to promote broad-based growth and reduce poverty, as well as associated external financing needs and associated sources of financing. These are prepared through a participatory process involving domestic stakeholders and external development partners that include the IMF and World Bank

types of capital include geographical and political capital (e.g. Adato and Meinzen-Dick, 2002; Jansen *et al.*, 2006). Assets within a given context of policies, institutions, and processes — that vary between the local, regional, and national levels, shape the choice of livelihood strategies pursued by households. The livelihood strategies in turn shape the livelihood outcomes (e.g. improved well-being, increased income). Furthermore, households operate in a vulnerability context, exposed to various shocks (covariant or idiosyncratic). There is a rapidly growing body of theoretical and empirical work that draws on the SLF (Ellis and Freeman, 2004; Jansen *et al.*, 2006; Kristjanson *et al.*, 2005). The SLF, however, does not provide explicit guidance as to which indicators of each asset type to use under what circumstances.

We used data from rural households in Kenya. The situation in Kenya resembles that of many low income countries, characterized by low per capita GDP and high population growth. Official statistics indicate that incidence of rural poverty remains high, estimated to be 49% in 2005/06 (KNBS, 2007). Kenya's Human Development Index[5] increased marginally from 0.437 to 1990 to 0.464 in 2009 (UNDP, 2010). Life expectancy declined from 60 years in 1990 to 54 years in 2008 (World Bank, 2010), partly due to the HIV/AIDS pandemic. The Kenya Aids Indicator Survey in 2007 showed that an estimated 1.4 million adults in Kenya were infected with HIV (NASCOP, 2009). Whereas urban areas have a higher HIV prevalence rate than rural areas, the burden of HIV (total number of people living with HIV) in rural areas remains high because more than two-thirds of Kenyans (68%) live in rural areas.

This study contributes to a broader understanding of the nature of rural poverty, poverty dynamics, economic growth and exposure to shocks. We examine temporal and spatial dimensions of poverty for the same set of households. The temporal dimension examines an individual household's welfare level over multiple periods using different approaches — participatory and income panel survey data. The spatial dimension examines the relative contributions of geography and local-level institutions in explaining variations in income across households in different communities. First, we examine income and participatory approaches to analyzing poverty and poverty dynamics. Second, we distinguish structural and stochastic poverty transitions using asset-based approaches, and explore the processes underlying the transitions using event-histories. Third, we characterize shocks

[5] The Human Development Index (HDI) is an aggregate measure of progress in three dimensions — health (life expectancy at birth), education (mean years of schooling and expected years of schooling), and income (gross national income per capita).

facing rural households and examine whether poor households are vulnerable to certain shocks. Fourth, we revisit the geography versus institutions debate using local data to explain within-country income differences.

To summarize, the research presented in this thesis contributes to the literature in four main ways. First, we contribute micro-level empirical evidence to the debate on methods for analyzing poverty and poverty dynamics. Second, the combined quantitative and qualitative approach that we adopt to analyze poverty dynamics contributes to a better understanding of poverty and the processes underlying poverty transitions, and to the increasing need to combine quantitative and qualitative research methods in poverty analysis — referred to as 'Q-Squared' (Carvalho and White, 1997; Kanbur, 2003). Third, we contribute micro-level evidence to the literature on vulnerability to shocks in developing countries. Fourth, we contribute new micro-level evidence to the geography versus institutions debate linking with the macro growth literature.

The remainder of this chapter is organized as follows. We briefly review previous studies of poverty dynamics in Sub-Saharan Africa, and discuss various approaches to analysing poverty and poverty dynamics in section 1.2. Section 1.3 introduces the setting. We present the research objectives in section 1.4. Section 1.5 introduces the data used. Section 1.6 presents the thesis outline.

1.2 Poverty and vulnerability

Poverty is a complex economic and social concept with multiple dimensions and manifests itself in various forms. Poverty is an *ex-post* measure of well-being (or lack thereof). Poverty reflects resource insufficiency — low incomes and expenditures, low achievements in education and health, vulnerability to adverse shocks such as illness, violence or insecurity and loss of livelihood, and powerlessness in the political, social and economic life of one's community (World Bank, 2001).

Most of the earlier empirical micro-level poverty research in Sub-Saharan Africa was static based on cross-section studies. Literature on static poverty is widely available for many countries in Sub-Saharan Africa. However, static poverty studies cannot distinguish between transitory and chronic poverty. These studies conceal a dynamic reality, one where there is a substantial flow of households into and out of poverty even when the net numbers remain static, decrease or grow at the national or regional levels.

To understand the effects of economic growth, to design effective poverty reduction policies and interventions, and to identify the key micro-level constraints to poverty

reduction, there is need to focus on poverty dynamics — inter-temporal changes in poverty of specific households. There are important advantages of poverty dynamics studies for policy. First, poverty dynamics capture heterogeneity in poverty, identifying the persistently poor and most vulnerable persons. Governments often target the poor using static welfare indicators. However, appropriate policies may differ fundamentally according to the nature of poverty of the target subpopulation. Second, poverty dynamics provide useful insights into the micro-level factors associated with movements into and out of poverty and why some households remain poor for long periods of time. Designing the right policies for a given poor population depends on an accurate understanding of poverty dynamics. Barrett (2005b), for example, describes how policies for helping people climb out of poverty ('cargo net' policies) differ from those that help them avoid falling into chronic poverty ('safety net' policies). Third, understanding why over longer time periods some households increase their well-being relative to others will assist in the design of policies that promote more equitable growth.

In recent years, the number of studies of poverty dynamics using panel survey data in developing countries including Sub-Saharan Africa has been increasing (Sub-Saharan Africa studies include Adato *et al.*, 2006; Deininger and Okidi, 2003; Gunning *et al.*, 2000; Muyanga *et al.*, 2007; Suri *et al.*, 2009). A common finding across the panel studies of poverty dynamics in Sub-Saharan Africa is that transitory poverty comprises a rather large share of overall poverty. The large share of transitory poverty based on income or expenditure underscores the inherent stochasticity of flow-based measures of welfare. However, nation-wide panel survey datasets are still limited in many of the countries in the region, and where panel data is available they are often hard to access.

Poverty dynamics studies based on household living standards using consumption expenditures or income are incapable of distinguishing between two different types of poverty transitions, namely *structural* and *stochastic* transitions. Transitorily poor households exiting poverty in a panel survey of household living standards may represent different experiences (Carter and Barrett, 2006). Some may have been initially poor due to bad luck, with their exit from poverty reflecting a return to an expected non-poor standard of living (*stochastic poverty transition*). For others the transition may be due to asset accumulation (*structural poverty transition*). Similarly, transitorily poor households descending into poverty can represent different experiences. For some it could represent a return to an expected standard of living after a brief spell of good luck. For others it could represent a structural shift caused by asset losses. To address the distinction between these two types of

poverty transitions, it is important to study the structural processes underlying poverty and poverty dynamics.

An asset-based approach to poverty analysis — referred to as third generation poverty measures, makes it possible to distinguish such structural and stochastic transitions and to understand the root causes of persistent poverty (Carter and May, 2001; Carter and Barrett, 2006). The studies that have used asset-based approaches to analyzing poverty dynamics in Sub-Saharan Africa include Adato *et al*. (2006) and Barrett *et al.* (2006).

The methods discussed above measure only certain aspects of poverty. Because poverty is complex and multidimensional, no single approach can exhaustively capture all aspects of poverty. Multiple methods that combine survey data and qualitative approaches are necessary to provide a deeper understanding of many of the processes underlying poverty and poverty transitions. In recent years, other dimensions of well-being such as health, nutrition, security have increasingly been incorporated into poverty analysis. The use of mixed quantitative and qualitative methods is a new and growing practice in poverty analysis and dynamics in Sub-Saharan Africa (e.g. Adato *et al.,* 2006; Barrett *et al.,* 2006; Lawson *et al.*, 2006).

The use of participatory approaches in poverty appraisal has been increasing. Participatory approaches are diverse, and generally refer to contextual methods of analysis including data collection methods that aim to understand poverty dimensions within social, cultural, economic and political environment of a locality or of group of people. In particular, new participatory methods have been developed over the past few years that generate comparable poverty outcomes in terms of poverty incidence as flow-based measures of consumption expenditures or incomes (e.g. Alkire and Foster, 2009; De Weerdt, 2010; Krishna, 2010b). The Stages-of-Progress (SOP) method, for example, has been used since 2003 to study poverty dynamics in parts of India, Kenya, Peru, Uganda and Colombia (see Johnson *et al.*, 2009; Krishna *et al.*, 2004; Krishna *et al.*, 2005; Krishna *et al.*, 2006; Krishna and Lecy, 2008; Kristjanson *et al.*, 2007; Kristjanson *et al.*, 2010). The Stages-of-Progress relies on community focus group discussions to delineate locally applicable 'Stages of Progress' that poor households typically follow as they make their way out of poverty (see Krishna (2010b) for a detailed discussion of the approach). These stages are used to create a 'ladder' by which households' well-being is measured at different points in time. Because some of the new participatory approaches give similar poverty indicators (i.e. poverty rate or incidence) as consumption expenditures or income based methods, there is need for a comparative analysis of these methods to existing methods. Such comparisons are necessary

to inform decisions about which methods are best for what purposes and under what conditions. This is particularly essential for developing countries where financial resources are a major constraint, yet these new participatory approaches offer relatively quick and cheap options for monitoring poverty and impacts of poverty reduction interventions.

There is also an increasing interest among researchers and policy makers in the spatial patterns of poverty and the spatial factors influencing persistent poverty. Empirical evidence from developing country studies shows that poverty and income distribution vary widely across space (Minot and Baulch, 2005; Okwi *et al.*, 2007). These studies show that there are significant differences in poverty and welfare levels across geographical areas, and different spatial factors may be important in explaining welfare levels in different geographical areas. In Kenya, for example, income and poverty distribution are characterized by wide spatial variability, with significant differences between communities living in different geographical areas (CBS, 2003; 2005; Okwi *et al.*, 2007; Suri *et al.*, 2009). These findings suggest that poverty reduction strategies can be targeted to specific geographic areas. The Kenya poverty maps currently form the basis of resource allocation at the parliamentary constituency-level — Constituency Development Fund (CDF) (CBS, 2005). The CDF was established in 2003 and aims to control imbalances in regional development and redistribute national resources at the local-level (constituencies) with a view to stimulating economic development and reducing poverty. Funding for each constituency takes into account poverty levels, such that areas with high poverty receive slightly more resources.

Risk has been identified as an important aspect of poverty, and is one of the factors that influence the dynamics of wealth and poverty. Persistent poverty, for example, may be caused by the *ex-ante* response of households to risk (Elbers and Gunning, 2003). Like households in developing countries elsewhere, rural households in Sub-Saharan Africa face various risks, such as drought, disease, death of human beings and livestock losses. The manifestation of risk as a shock can lead to undesirable welfare outcomes that can sometimes persist over long periods of time. Health shocks (diseases) and death, for example, affect human capital and productivity of rural households. Traditional vulnerability assessments are particularly concerned with downside risks that cause welfare to fall. However, welfare levels can also influence the likelihood of exposure to certain risks or shocks. The literature suggests that the poor likely more vulnerable since they are typically more exposed to shocks, coupled with limited coping options (Hoogeveen *et al.*, 2004). For example, poor households normally face higher mortality risks. Risk and vulnerability analysis complement traditional

poverty analysis, and is important for policy in developing countries where the exposure to risks is relatively high.

The literature on risk and vulnerability in Sub-Saharan Africa is growing (e.g. Dercon and Krishnan, 2000a; b; Dercon, 2004; Dercon *et al.*, 2005; Gunning *et al.*, 2000; Hoddinott, 2006). Majority of the studies examine the impact of shocks on household welfare. However, most empirical studies are still constrained by limited information on the full range of shocks and focus on the impact of the selected shocks on household welfare. Moreover, few explore how initial welfare conditions influence exposure to various shocks.

1.3 Poverty and economic growth in Kenya

Poverty has been a major concern in Kenya since independence in 1963. After experiencing moderately high economic growth rates in the 1960s and 1970s, Kenya's economic performance was characterized by stagnant and erratic growth in the 1980s and 1990s. Average GDP growth rates declined from about 7% in the 1970s to slightly over 2% during the 1990s, falling below the average population growth rate of 2.6% (World Bank, 2006). The deterioration in economic performance coupled with declining social, political and governance indicators worsened the poverty situation. The poverty incidence increased considerably from 45% in 1992 to 57% in 2000 (Mwabu *et al.*, 2003; Republic of Kenya, 2000b).

The increase in poverty incidence occurred despite several government anti-poverty policies and strategies. In the late 1990s and early 2000s the government developed the National Poverty Eradication Plan (NPEP) and drafted a Poverty Reduction Strategy Paper (PRSP) in line with the United Nations MDGs (Republic of Kenya, 2001). The PRSP resulted in a better understanding of poverty in Kenya as it was a product of a broad-based and nation-wide inclusive consultation among key stakeholders. The PRSP outlined the priorities and measures necessary for poverty reduction and economic growth. The PRSP was central to the development of a pro-poor and pro-growth Medium Term Expenditure Framework (MTEF) budget that aimed at improving the quality of expenditure and shifting or targeting of resources towards pro-poor activities and programs. However, there were contentious issues regarding the implementation of the PSRS. In particular, the PRSP priorities were not explicitly linked to the national budget (Kabubo-Mariara and Ndeng'e, 2004). Moreover, key political and economic governance measures that were highlighted in the PRSP such as fighting corruption were also not implemented.

In 2003, a new government — the National Rainbow Coalition, came into power and embarked on an economic recovery process through a broad nationwide development framework — the Economic Recovery Strategy for Wealth and Employment Creation (ERS) 2003-2007 (Republic of Kenya, 2003). Through the ERS the government sought to maintain macroeconomic stability, improve the investment climate, restructure public expenditure to support growth, ensure equity and poverty reduction measures, improve public service delivery, carry out financial sector reforms, and develop infrastructure and the productive sectors of the economy. Among the key successes of the ERS were free primary education (FPE) and the constituency development fund (CDF). Economic performance improved remarkably over the period 2003–2007 with growth in real GDP estimated at about 7.1 % in 2007 — the highest in the last two decades (see Figure 1.1). However, in 2008 the economic growth momentum that started in 2003 was restrained by internal and external factors that included the 2008 post-election disruptions, the global financial crisis, and the high fuel and food prices. Combined, these factors slowed the economic growth from 7.1% in 2007 to 1.7% in 2008.

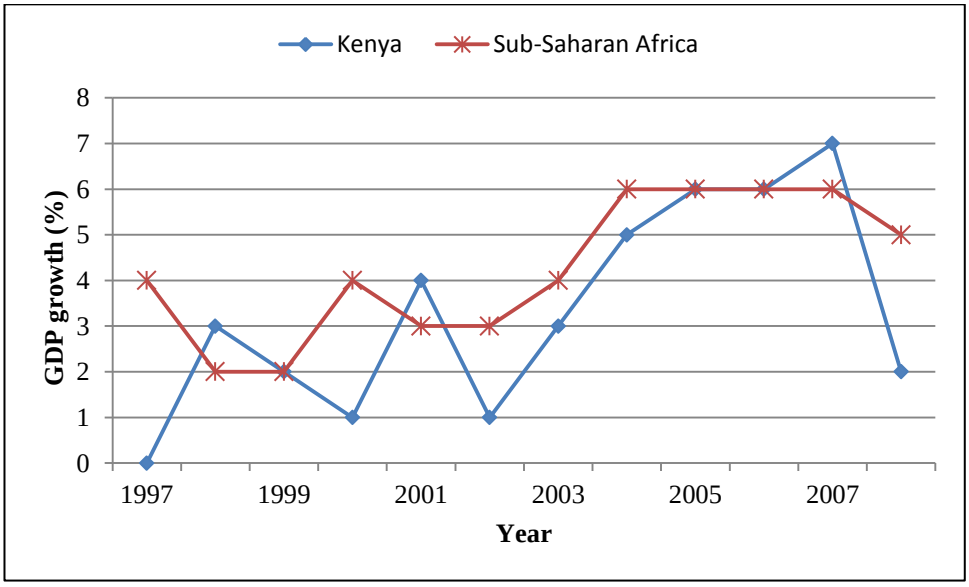

Figure 1.1: Trends in annual GDP growth rates in Kenya and SSA
(Source: Africa Development Indicators Database (World Bank, 2010))

Towards the end of 2007, the government unveiled a new long-term development framework that aims to transform Kenya into an industrialized middle-income country by 2030 — Kenya Vision 2030. Vision 2030 is anchored on three key pillars: economic, social, and political governance. The economic pillar aims to achieve an annual economic growth rate of 10% and sustaining the same till 2030 in order to generate adequate resources to

achieve the MDGs. The trends in GDP growth rates (Figure 1.1) underscore the magnitude of the economic growth challenge facing the country's growth target as envisioned in Kenya Vision 2030.

While GDP per capita has been increasing since 2003, the levels are lower than the average GDP per capita for the Sub-Saharan Africa region (Figure 1.2). The low GDP per capita is reflected in high poverty incidence. Official statistics indicate that the incidence of rural poverty remains high, estimated to be 49% in 2005/06 (KNBS, 2007). Poverty is more concentrated in rural than urban areas. It is estimated that approximately 80% of the poor live in the rural areas (CBS, 2003; KNBS, 2007). Consequently, poverty in Kenya is still a rural phenomenon. Poverty incidence varies widely across regions. Some regions have relatively high poverty rates. Yet, even within the regions large variations in poverty exist. Moreover, due to high population growth, the number of those living below the poverty line is estimated to have increased from 13.4 million in 1997 to about 16.6 million in 2006. Figure1.3 shows trends in poverty incidence over the period 1992–2005/06.

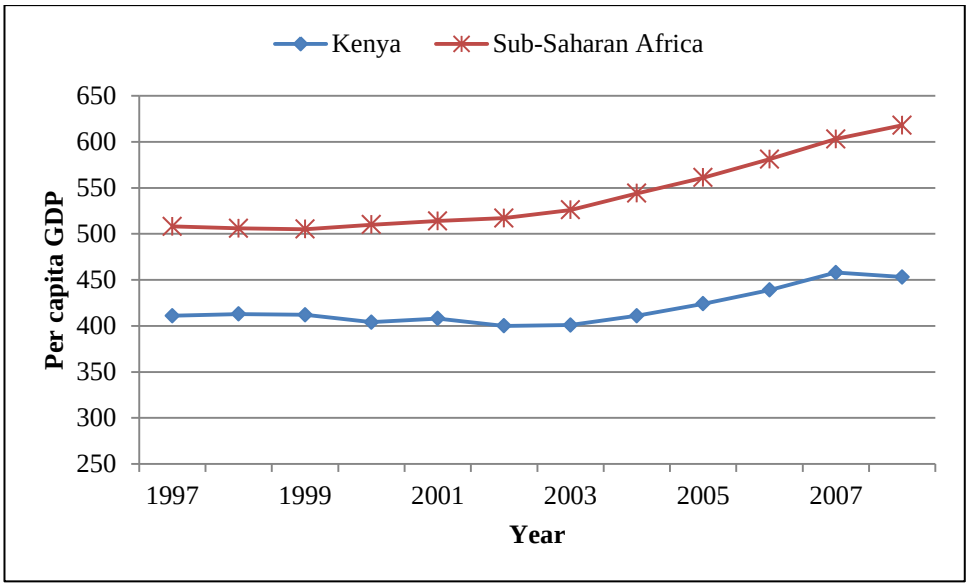

Figure 1.2: Trends in GDP per capita in Kenya and SSA (in constant 2000 USD) (Source: Africa Development Indicators Database (World Bank, 2010))

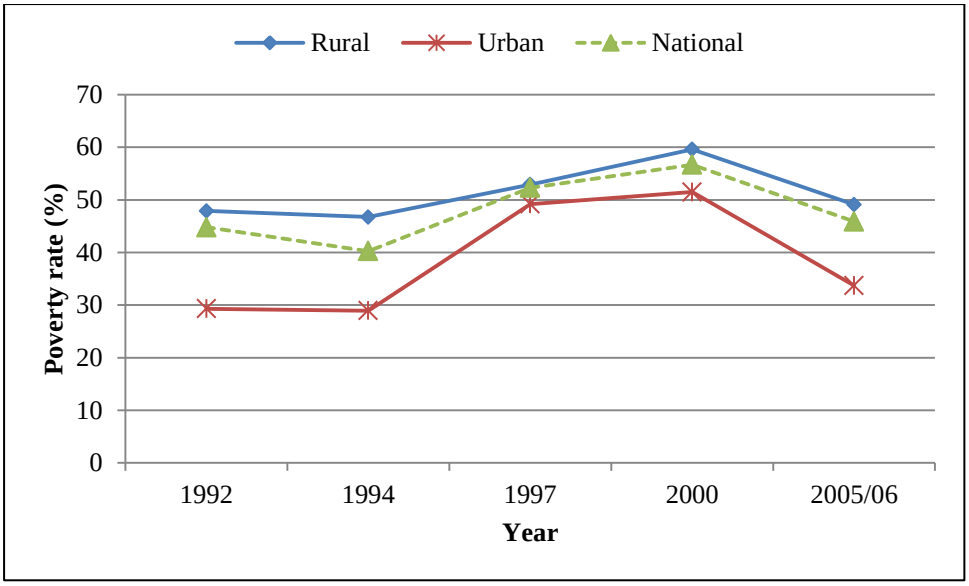

Figure 1.3: Trends in poverty rates in Kenya (1992–2005/06)
(Source: KNBS (2007) and Mwabu et al. (2003), based on consumption expenditure poverty lines)

The persistently high poverty incidence and low per capita incomes in Kenya have created a desire for empirical studies to inform poverty reduction policies and strategies (e.g. CBS, 2003; KNBS, 2007; Mwabu *et al.*, 2003; Okwi *et al.*, 2007; Republic of Kenya, 1998; 2000b). Using various methods such as inequality and welfare at the household level, construction of poverty profiles, and spatial distribution of poverty, these studies have largely characterized poverty based on analysis of cross-sectional household surveys. In addition, participatory poverty assessment studies have also been carried out by the government to compliment the quantitative studies (e.g. AMREF, 1998; Narayan and Nyamwaya, 1996; Republic of Kenya, 1997; 2007).

Few studies have examined poverty in a dynamic context using panel survey data in Kenya (e.g. Burke *et al.*, 2007; Muyanga *et al.*, 2007; Suri *et al.*, 2009). Other studies have used a participatory poverty appraisal method — the Stages-of-Progress, to examine poverty dynamics and reasons associated with poverty transitions (Krishna *et al.*, 2004; Kristjanson *et al.*, 2010). However, few address a key challenge facing the empirical analysis of poverty dynamics — that of distinguishing between *structural* and *stochastic* mobility. Moreover, individual poverty studies in Kenya largely remain confined to single disciplines and methodologies.

In recent years, there is a growing literature exploring the link between geography and poverty in Kenya (e.g. Burke and Jayne, 2008; Kristjanson *et al.*, 2005; Okwi *et al.*, 2007). Whereas geography is an important factor explaining variation in poverty and incomes, other

factors may matter as well. Institutions such as political organization, governance and social capital (shared norms and values, trust) may be among such factors. Yet the role of institutions has largely been ignored. While certain national institutions in Kenya may affect villages alike, there are variations in the quality of institutions at the local-level. Social capital (trust), for example, varies widely across different ethnic communities in Kenya (Bratton and Kimenyi, 2008).

1.4 Research aim

The overall objective of the study is to explore rural welfare and welfare dynamics in Kenya within the sustainable livelihoods conceptual framework (SLF) to identify and understand the linkages between welfare, livelihood assets, livelihood strategies, local-level institutions, and exposure to shocks. We examine temporal and spatial dimensions of welfare using different approaches and data sources for the same set of households. The specific objectives are as follows:

1) Compare participatory and income approaches to studying poverty and poverty dynamics and to identify the extent to which these measures give similar versus different results and lead to similar or different policy implications.
2) Explore the nature of rural poverty dynamics using asset-based approaches, distinguishing stochastic from structural poverty transitions, and examine the livelihood strategies, shocks and other factors (positive and negative) associated with structural poverty transitions.
3) Characterize shocks facing rural households and examine whether poor households are more vulnerable to specific shocks.
4) Revisit the geography versus institutions debate at the micro-level using local data to explain within-country income differences, and to "unbundle" local-level institutions.

1.5 Data

We use household-level panel and cross-section survey data, secondary data, and information from community-level focus group discussions. The study sites spread across four diverse agro-regional zones in Kenya. The zones selected were part of a 10–year panel dataset collected by Tegemeo Institute of Agricultural Policy and Development in 1997, 2000, 2004 and 2007.

The original sampling frame in 1997 was designed in consultation with the Kenya National Bureau of Statistics (KNBS). A stratified sampling technique was used to generate a sample of 1500 households, taking into account the ecological diversity inherent in the country, excluding pastoral areas. The national census data for rural divisions[6] in Kenya formed the basis for selection of sample households. Populations in all divisions were assigned to one or more agro-ecological zones based on secondary data. Using standard proportional random sampling, two or three divisions were selected within each agro-ecological zone. The selected divisions were spread across 24 districts. Within each division, the choice of location, sub-location, and villages were done consecutively and randomly, with the help of the relevant government officers.[7] For each village, households were randomly selected from a list of all households in the village. The 24 districts were clustered into eight agro-regional zones. Agro-regional zones represent a cluster of areas with similar broad climatic conditions, agricultural activities and rural livelihood strategies, and may also reflect diversity in market access and population densities.

The four zones selected for this study were randomly drawn from seven of the eight agro-regional zones[8], and represent high and low potential agro-ecological zones. The high potential sites included Central highland (CH) and Western transitional (WT) zones. The Central highland is characterized by high value cash crops (tea and coffee), relatively low poverty incidence compared with other sites (estimated to be 33% in 2005/06), and relatively good market access due to proximity to the capital city of Nairobi. Average annual rainfall in this zone ranges from 1400 to 2200 mm. The Western transitional zone is characterized by high population pressure, relatively high poverty incidence, and medium market access. Over

[6] Local administration in Kenya is divided among eight *provinces* each headed by a *Provincial Commissioner*. Provinces are divided into *districts.* Districts are divided into *divisions.* Divisions are divided into *locations,* and finally locations are divided into *sub-locations.*

[7] District Officers, District Agricultural Extension Officers, Chiefs, and Assistant chiefs.

[8] Areas that were falling within the Rift Valley province were excluded from the sampling process as a result of security concerns, difficulties in following up households and mistrust among communities in these areas. The Rift Valley province was severely affected by the 2007/2008 post-election violence.

50% of the population in this zone lived below the rural poverty line in 2005/06. Average annual rainfall ranges from 1600 to 1800 mm. Sugarcane is the main cash crop.

The low potential sites included Eastern lowland (EL) and Western lowland (WL) zones. The Western lowland zone is characterized by a relatively high poverty incidence and medium market access. About half of the population (47-50%) in this zone lived below the rural poverty line in 2005/06. The dominant agro-ecological zone is lower midland, with sugarcane as the main cash crop in the relatively better potential areas. The Western lowland zone has the highest HIV prevalence rates in Kenya. The provincial prevalence rate of 15.3% in 2007 was more than double the national prevalence rate of 7.4% (NASCOP, 2009). The Eastern lowland is drier with a lower population density compared with the other zones. Average annual rainfall for the sites within the EL ranged from 800 mm to slightly more than 900 mm in the slightly wetter areas. Poverty rate is high. Over 60% of the population lived below the rural poverty line in 2005/06 (KNBS, 2007). Market access is low in this zone. Figure 1.4 shows the selected study sites.

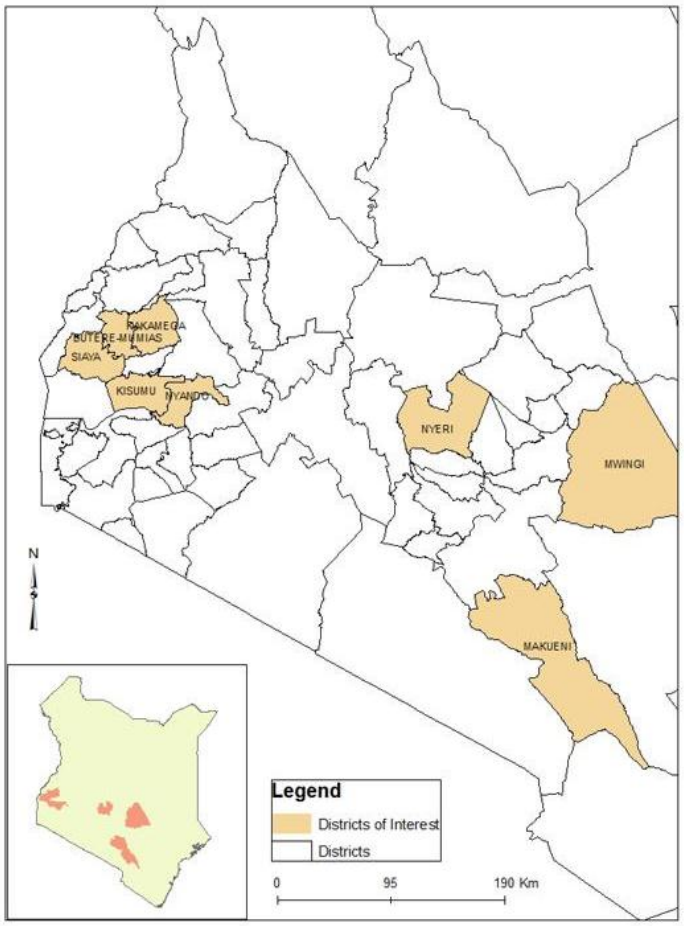

Figure 1.4: Map of study sites

The household-level survey data covers a number of aspects of household livelihoods. Detailed information on income from different sources (crops, livestock, and off-farm), demographic and education data for each household member were collected. We collected additional information that was not covered in the previous panel surveys in 2009. The additional information included data on various dimensions of local-level institutions (e.g. social capital and quality of local governance).

In 2009, we also conducted participatory poverty appraisals in the same communities using the Stages-of-Progress approach. The Stages-of-Progress is a community and household-level approach that relies on community-based poverty definitions to assess household welfare. The Stages-of-Progress captures many of the advantages of quantitative approaches that includes the ability to aggregate numerical information (see Krishna, 2010a for detailed discussion).

The household survey data and participatory poverty assessments were complimented with secondary data from various sources. The secondary data provided information on geography variables such as rainfall, temperature, altitude, indicators of soil quality, normalized differential vegetation index (NDVI), malaria risk (endemicity), distance to markets, distance to major towns, distance to health facilities and distance to good roads.

1.6 Content and outline of thesis

The rest of the chapters are structured as follows. We compare participatory and income approaches to studying poverty and poverty dynamics, and identify the extent to which these measures give similar versus different results in Chapter 2. We use the household panel survey data over the period 1997–2009 and the Stages-of-Progress method — a participatory community-based approach. We find a significant positive correlation between the results obtained using the two approaches. Nevertheless, we find discrepancies in poverty levels and poverty dynamics as well. Poverty rates (or incidence) were much lower and with fewer transitions using the participatory approach compared to the income approach. Moreover, the participatory poverty measure showed a steady increase in poverty incidence, whereas the income approach showed an initial decline between 1997 and 2000, followed by a variable but rising trend in subsequent years.

We explore the nature of rural poverty dynamics in Kenya using the panel survey data and qualitative methods in Chapter 3. We examine the extent to which economic mobility is stochastic or structural (due to successful asset accumulation or de-accumulation) using asset-based approaches for analyzing poverty and poverty dynamics (Carter and May, 2001; Carter

and Barrett, 2006). We use event-histories to understand the processes underlying poverty transitions. The mixed methods approach that we adopt contributes to the debate on the need to combine quantitative and qualitative research methods in poverty analysis — referred to as 'Q-Squared' (Carvalho and White, 1997; Kanbur, 2003). We find substantial mobility across welfare categories using economic transition matrices, except for the most well-off and the poorest households. The majority of the households that were poor in two consecutive survey years were structurally poor. Of the households rising from poverty, a large proportion (between 65% and 82%) was characterized by stochastic transitions. Few households successfully escaped poverty through asset accumulation. In contrast, a large proportion of the households declining into poverty experienced structural movements. The findings suggest limited asset accumulation among rural households in Kenya. In most cases, a combination of livelihood strategies, shocks and other factors (negative and positive) interact to influence household structural mobility. We find that health shocks are more common than other shocks, thus pointing to the need to invest in preventive health care and health insurance.

We characterize the various shocks rural households in Kenya face and explore whether welfare level and geographical location affect exposure to *specific* shocks and the *number* of shocks reported across diverse regions in Chapter 4. We thus contribute to the relatively limited micro-level empirical evidence on vulnerability to shocks among rural households in developing countries. Exposure to shocks (e.g. drought, death of the main income earner) has been identified as one of the main causes of vulnerability to poverty. Several studies have explored the impact of shocks on household welfare in Sub-Saharan Africa (e.g. Carter *et al.*, 2007; Dercon and Krishnan, 2000b; Dercon, 2004; Dercon *et al.*, 2005; Hoddinott, 2006). However, whereas traditional vulnerability assessments are particularly concerned with shocks that cause welfare to fall, a household's wellbeing can have an impact on exposure to certain shocks. Health expenses, ill-health, funeral expenses, livestock losses, land sub-division, and death of major income earner were the most important shocks reported. We find limited evidence that welfare level affects exposure to specific shocks. Instead, we find a significant geographical effect for ill-health, funeral expenses, livestock losses and death of income earner.

We revisit the geography versus institutions debate at the local-level in Chapter 5. We adopt a micro-focus to explain within-country income differences, and unbundle the institutional framework at the local-level distinguishing between a number of institutional proxies. Recent evidence by Bhattacharya (2009b) suggests that the nature of the geography-

versus-institutions debate varies with the aggregation level of the analysis. Whereas empirical evidence from global cross-country studies typically points to institutions as the main determinant of income (e.g. Acemoglu *et al.*, 2001; Easterly and Levine, 2003; Hall and Jones, 1999; Rodrik *et al.*, 2004), geographical factors (notably malaria prevalence) best explain income differences in a sample of African countries (Bhattacharyya, 2009b). Our main findings provide support for the geography-based perspective on underdevelopment within Kenya. We conclude that both geography and institutions may matter for promoting growth and reducing income inequality, depending on whether the focus is on domestic or international income differences.

The discussion and conclusions are presented in Chapter 6. We review the objectives and findings to flesh out the contribution of the research to the broader macro-literature on poverty, economic growth, and vulnerability to shocks. We discuss the policy implications of the findings, limitations of the research and future research areas.

Chapter 2

Comparing Participatory and Income Measures: Analysis of Poverty Levels and Dynamics in Rural Kenya[9]

[9] This paper was co-authored with Marrit van den Berg and Rob Schipper, Development Economics Group, Wageningen University, 6706 KN Wageningen, The Netherlands. Submitted to *Review of Income and Wealth.*

Abstract

We compare participatory and income approaches to studying poverty and poverty dynamics, using a combination of panel data and a participatory community-based method called Stages-of-Progress. Using data from rural households in Kenya, we find a significant positive correlation between the results using the two approaches. Nevertheless, we find discrepancies in poverty levels and dynamics as well. Poverty levels were lower, and with fewer transitions using the participatory approach compared with the income approach. Moreover, the participatory poverty measure showed a steady increase in poverty incidence, from 19% in 1997 to 33% in 2009, whereas the income approach showed an initial decline between 1997 and 2000, followed by a variable but rising trend in poverty levels from 27% in 2000 to 54% in 2009.

Key words: poverty measures, poverty dynamics, rural households, Kenya

2.1 Introduction

Poverty remains a huge challenge across Sub-Saharan Africa. Despite decades of evolving approaches to alleviate rural poverty, it is persistent and widespread. In recent years, many African governments and development partners have renewed their interests in and intensified their commitment to poverty reduction. In response to the Millennium Development Goal of reducing by half the proportion of people living on less than a dollar a day by 2015, several African countries have formulated poverty reduction strategy papers.[10] Success in reducing poverty in these countries will, however, depend on accurate information as to the nature and causes of poverty and on local and national policies based upon this evidence.

While significant advances have been made in methods for measuring poverty, poverty is complex, multi-dimensional and manifests itself in various forms (World Bank, 2001). Consequently, no single approach can capture all the essential aspects of poverty. Multiple methods combining quantitative and qualitative approaches are key to providing a deeper understanding of many of the processes underlying poverty and poverty transitions (Adato *et al.*, 2006; Kanbur, 2003; Lawson *et al.*, 2006). However, there is need for a comparative analysis of existing methods, some of which measure similar poverty outcomes using different approaches. Such comparisons are necessary to inform decisions about which methods are best for what purposes and under what conditions. This is essential particularly for developing countries where financial resources are a major constraint.

Static poverty measures based on material wellbeing have traditionally dominated poverty studies. Apart from material wellbeing, other dimensions of wellbeing exist that are based on a number of indicators: physical wellbeing (nutrition, health), security, freedom of choice and action, and social wellbeing. The standard measures of static poverty are inherently quantitative, based on monetary indicators of poverty, usually income or expenditure. Static poverty studies are necessary to identify the scale of poverty, who are the poor, where they live, how poor they are, including insights into evolution of poverty within a society. This information is very useful to policy makers and donors. Static poverty measures, however, are unable identify the heterogeneity among the poor and cannot distinguish between transitory and chronic poverty.

[10] Poverty reduction strategy papers (PRSPs) describe a country's macroeconomic, structural, and social policies and programs to promote growth and reduce poverty, as well as associated external financing needs.

To distinguish between transitory and chronic poverty, poverty needs to be studied in a dynamic context. Dynamic income or expenditure poverty measures are motivated by the interest in understanding these two different types of poverty based on longitudinal data and permit decomposition of households into three different categories: chronic poor, transient poor and the never poor. In recent years, issues of severity and poverty dynamics are increasingly receiving attention in poverty analysis in Africa (e.g Carter and May, 2001; Kedir and McKay, 2005; Muyanga *et al.*, 2007; Okidi and McKay, 2003). There is also a growing demand to better understand the causes of transitory and persistent poverty as a step in designing more effective policy interventions, as different policy responses are likely to be appropriate for each type of poverty. Krishna (2004; 2006) and Barrett (2005b), for example, describe how strategies and policies for helping people climb out of poverty ('cargo net' policies) differ from those that help them from falling into chronic poverty ('safety net' policies). Poverty dynamics is thus the more fundamental policy concern. In addition, dynamic income or expenditure poverty analysis is a more forward looking approach. Empirical findings from a number panel data studies suggest that transitory poverty comprises a large share of overall poverty (Baulch and Hoddinott, 2000). This has been attributed to the inherent stochasticity of flow-based measures of welfare.

Dynamic income and expenditure poverty measures, however, are limited in their ability to distinguish between very distinctive sorts of poverty transitions: structural and stochastic transitions. As Carter and Barrett (2006) explain, transitorily poor households in a longitudinal survey exiting poverty may represent two distinctly different experiences. Some may have been initially poor due to bad luck, and their exit from poverty reflects a return to an expected non-poor standard of living (a stochastic poverty transition). For others, the transition may be because of asset accumulation, or enhanced returns to their existing assets (structural poverty transition). Likewise, transitorily poor households descending into poverty can represent different experiences. For some, it could represent a return to an expected standard of living, after a brief spell of good luck, a temporary transition caused by bad luck in a later survey period, or a structural move caused by asset losses or by a deterioration in returns to their assets brought on changes in the broader economy. Carter and Barrett (2006) develop an asset-based approach based on previous studies by Carter and May (1999; 2001) that address these limitations in what they refer to as third generation poverty measures. These asset-based measures use asset poverty lines that provide information on structural poverty and poverty transitions.

The standard measures of static poverty and poverty dynamics are often based on monetary indicators of poverty. Most studies of welfare dynamics in Africa have largely used panel data based on expenditure or income (see Kedir and McKay, 2005; Muyanga *et al.*, 2007; Okidi and McKay, 2003; Suri *et al.*, 2009). Although poverty measures based on monetary indicators still dominate the policy circles, the use of participatory approaches to poverty appraisal has been increasing. Other studies have combined monetary measures and participatory methods for analysis of poverty dynamics in Africa (examples include Adato *et al.*, 2006; De Weerdt, 2010; Kedir, 2005; Lawson *et al.*, 2006). In addition, new participatory methods of measuring poverty and poverty dynamics have been developed over the past few years that are improvements over the traditional wealth ranking. These methods use community-based focus group discussions. Examples include the Stages-of-Progress method (Krishna *et al.*, 2004; Krishna *et al.*, 2006) and 'peer-assessment' based on a 'ladder of life' (De Weerdt, 2010).

Quantitative monetary and community-based measures of poverty and poverty dynamics have considerable potential to contribute to a deeper understanding of poverty processes, and in helping to formulate targeted poverty reduction strategies. The relationship between these two different approaches and findings, however, has not been explored. The Stages-of-Progress (SOP) method has been used since 2003 in parts of India, Peru, Kenya, Uganda and Colombia to study poverty dynamics (Johnson *et al.*, 2009; Krishna *et al.*, 2004; Krishna, 2006; Krishna *et al.*, 2006; Kristjanson *et al.*, 2007). The Stages-of-Progress is an adapted participatory poverty assessment method. This method is a community and household-level approach that relies on community definition of poverty to assess household welfare at a given point in time, and thus providing a rapid and effective way to collect data on household poverty dynamics in one survey. In the context of developing countries, available panel income or expenditure data is hard to access, and in some cases not available. Even where survey data are available at more than one point in time, the determination of changes in poverty has proven problematic due to changes in survey designs, including changes in recall period and changes in survey instrument. Panel data takes a considerable amount of time to collect. Approaches such as Stages-of-Progress, therefore, are useful and cost-effective alternatives for tracking changes in poverty over time, but without empirical evidence as to the results when the two approaches are taken in the same locations, it is difficult to further inform the debate and conclusions as to relative strengths and weaknesses.

This paper examines the relationship between monetary and community-based poverty measures. The aim is to identify the extent to which these measures give similar

versus different results and lead to similar or different policy implications. From this we deduct what research questions can be can be best addressed by each method and their relative strengths and weaknesses. In particular, this paper represents a unique attempt to systematically compare poverty trends and transitions from income measures of welfare to the Stages-of-Progress measure on the same population of rural households in Kenya. Until now, no empirical research has compared the Stages-of-Progress to monetary poverty measures. This paper thus contributes new micro-level empirical evidence to the debate on methods for analysing poverty and poverty dynamics and in particular the need for innovation in refining and integrating approaches. Clearly, no single method is best suited for studying every aspect of poverty, thus it is crucial to understand how poverty estimation is sensitive to the choice of approach and when to apply one method and not the other. It is useful to look at the extent to which conventional income-based poverty indicators resemble people's (communities) perception of poverty as there will be lessons from each. The guiding research questions are:

- To what extent are the results from applying a Stages-of-Progress approach similar to the findings from an income approach? Are income poor or non-poor households similarly identified as poor or non-poor using the SOP approach?
- What are the results of using these two different approaches for analysis of poverty trends and dynamics across diverse agro-regional zones in rural Kenya?
- Do the approaches identify different populations as poor, therefore leading to different policy implications?
- What are the relative strengths and weaknesses of each approach and which dimensions of poverty does each approach reveal or mask?

The remainder of this paper is organized as follows. Section 2.2 reviews the quantitative and qualitative methods for poverty analysis. Section 2.3 provides a brief overview of poverty trends in Kenya and background to the study areas. Section 2.4 presents the methods and then describes the data we use. Section 2.5 presents the findings and discussions. The conclusions are presented in section 2.6.

2.2 Quantitative and qualitative methods for poverty analysis

The major differences between quantitative and qualitative poverty analysis methods are outlined in detail in Kanbur (2003). Key fundamental differences include data collection methods, type of data collected and methods of analysis. Quantitative analysts tend to rely on

deductive methods and general random sampling to capture the big picture. In contrast, qualitative researchers rely on inductive methods (Kanbur and Shaffer, 2007) and are more concerned with returning the research findings to the population under study and to using the research experience to directly empower the poor.

The standard static poverty and poverty dynamic measures are inherently quantitative based on monetary indicators of poverty — usually income or expenditure, such that a person with a higher income or expenditure is deemed to enjoy a higher standard of living. A cut-off level of income or expenditure is typically chosen as the poverty line, below which one is considered to be poor. The strengths of quantitative methods include ease of aggregation, they provide results whose reliability are measurable, and allow simulation of different policy options. These measures rely on rigorous statistical methods for inference that can be used to examine a variety of poverty issues: time series comparison to identify trends, cross-section comparisons at different levels, correlations which identify associations and raise questions of causality and covariant changes, estimation of prevalence and distribution of poverty within population areas, triangulation and linkages with qualitative data. Other advantages of these measures include the credibility of numbers in influencing policy-makers and the utility to policy-makers of being able to put numbers on trends and other comparisons.

Despite widespread use, flow-based quantitative approaches for poverty analysis suffer from two fundamental conceptual problems. The first is the identification problem of what weights to attach to aspects of individual welfare that are not revealed by market behaviour. The second is the referencing problem of determining the appropriate level of welfare below which one is considered to be poor (i.e. the poverty line). It can be argued that while the poverty line used in this approach is a numerical parameter calculated using statistical methods, it is subjectively chosen, and the same value judgements can be used to choose other poverty lines. In practice, these problems are dealt with by making assumptions based upon the caloric energy requirements of 2250 per adult equivalent per day. Also, these measures can only provide partial information on poverty and often miss out many of the other wider aspects of well-being. While it is not possible to capture all of the different dimensions of poverty in conventional household surveys, there have been efforts to include information on some of the key non-monetary indicators of poverty (such as education, anthropometric status, morbidity and mortality) (Baulch and Masset, 2003).

In recent years, the use of qualitative approaches in poverty appraisal including poverty trends and dynamics has been increasing. These are mainly in the form of

participatory poverty assessments (PPAs). In general, PPAs can be classified as contextual methods of analysis including data collection methods that aim to understand poverty dimensions within social, cultural, economic and political environment of a locality or of group of people. Participatory poverty assessment methods are diverse and often act as complimentary to conventional quantitative approaches. These approaches are generally subjective and often context specific. The commonly used PPA methodologies include focus group discussions (FGDs), timelines, trend analysis, gender analysis, social mapping, seasonal calendar, wealth ranking, or a combination of these methods. These tools are often adopted in a sequence, and as such can be tailored to fit a particular context and the specific aspect of interest. The main strengths of participatory approaches include a richer definition of poverty, more insights into causal processes, and more accuracy and depth of information on certain aspects of poverty. The major limitations that have been cited include lack of generalizability, difficulties in verifying information, subjectiveness and context specificity.

New participatory methods of poverty and poverty dynamics analyses that rely on community-based focus group discussions to make interpersonal comparisons of welfare have been developed over the past few years. In principle, it is possible to triangulate welfare assessments using focal groups formed from random samples within the geographic primary sampling units of quantitative surveys (Kanbur, 2003). The Stages-of-Progress (SOP) method, for example, relies on community FGDs to delineate locally applicable 'Stages of Progress' that poor households typically follow as they make their way out of poverty (Krishna, 2006). These stages are used to create a 'ladder' by which households' well-being is measured at different points in time. De Weerdt (2010) uses a combination of qualitative and quantitative data to explore the growth trajectories of households in Kagera region of Tanzania between 1993 and 2004. The qualitative component comprised of an FGD based on a six-step 'ladder of life' — from poorest (bottom) to richest (top) — to assess the position of individuals on the 'ladder of life' in 1993 and 2004, in what they refer to as 'peer-assessment'.

Other qualitative approaches use self-rated welfare. Pradhan and Ravallion (2000), for example, show how qualitative perceptions of the adequacy of consumption and services can be used to derive social subjective poverty lines using data from Jamaica and Nepal. Ravallion and Lokshin (2002) use a 9-step ladder (from poor to rich) to study the determinants of peoples' perception of their economic welfare among Russian adults in a panel study. Though the association between subjective assessments of economic welfare and standard income-based measures was highly significant, large discrepancies were found.

About 60% of the poorest eighth of adults in terms of current household income relative to the poverty line in their sample did not place themselves on either the poorest or second poorest rungs of the subjective ladder. Their ladder question, however, seemed to be better at distinguishing the rich from middle-income groups than it was at identifying the poor. While income was a significant predictor of subjective economic welfare, subjective economic welfare was influenced by other factors including health, education, employment, assets, relative income in the area of residence and expectations about future welfare.

Self-rated welfare has been criticized for biases that arise as a result of mood variability[11], and thus responses can vary according to the time of the interview (Ravallion and Lokshin 2001). Secondly, since these measures are subjective, different people can have different personal notions of what a high or low level of subjective welfare means.

Other studies have found participatory approaches such as wealth rankings to result in similar rankings as monetary ones. Scoones (1995) found wealth rankings to be highly correlated with livestock ownership, farm asset holdings, crop harvests and crop sales among farming households in southern Zimbabwe. The study concludes that wealth ranking provides an adequate indicator of relative wealth and can be a useful complementary method to be employed alongside survey assessments. Likewise, Kozel and Parker (1999) found similarities in the characteristics of better-off and worse-off households using participatory approaches and those obtained through survey exercises in rural India. Wealthier households had more agriculture land, more education, higher paid jobs, and better access to basic services.

The potential benefits of using mixed quantitative and qualitative methods for poverty analysis have been a subject of debate in recent years. Carvalho and White (1997) outline three major ways of combining these methods for poverty measurement and analysis. The first is through integration where quantitative information is used to focus on particular groups of interest for qualitative study and use of qualitative work to design quantitative survey instruments. The second involves using one approach to examine, explain, confirm, refute and or enrich information from the other. Third, the findings from the two approaches can be merged into one set of policy recommendations. Altogether, these options involve sequential and simultaneous mixing. In sequential mixing, the qualitative methods are largely used before or after the quantitative methods or surveys. Simultaneous mixing involves integrating certain qualitative methods into standard quantitative surveys. There are many

[11] For example, two happy people may have very different variances in their happiness over time.

opportunities for mixing, but to realize the potential benefits of mixed methods, it is desirable to have qualitative and quantitative data for the same households or communities.

2.3 The Setting and study sites

2.3.1 Poverty trends in Kenya

Since independence, Kenya's development efforts have emphasized poverty reduction through economic growth, employment creation and provision of basic social services (Kimalu *et al.*, 2002). Several initiatives that have aimed at improving poverty measurement include the welfare monitoring surveys (WMS) in 1992, 1994, 1997 and 2000, and the Kenya integrated household budget survey (KIHBS) in 2005/06. Data from these surveys have been used for cross-sectional national poverty studies (CBS, 2003; KNBS, 2007; Republic of Kenya, 2000b). These quantitative studies have been complimented by PPAs (Narayan and Nyamwaya, 1996; Republic of Kenya, 1997; 2007). In contrast to previous PPAs that focused mainly on poverty diagnostics with no explicit link to policy, the fourth PPA analysed the impact of various policies on the poor and used the Stages-of-Progress method to understand the factors associated with ascent from and descent into poverty (Republic of Kenya, 2007).

Despite various poverty-focused efforts and initiatives across Kenya, the national head count of poverty remains high. The recent nation-wide welfare survey (KIHBS) of 2005/06 estimated the national headcount poverty level to be 46%, with a rural poverty incidence of 49% over the same period (KNBS, 2007). The number of those living below the poverty line was estimated to be about 16.6 million in 2006. The overall poverty trends, however, mask significant differences across and within regions. On average, approximately 80% of the poor live in the rural areas (CBS, 2003; KNBS, 2007). Consequently, poverty in Kenya is largely (but certainly not exclusively) a rural phenomenon. The persistently high poverty incidence in Kenya has created a desire for empirical studies to inform poverty reduction strategies, including analysis of poverty dynamics. Among the few studies that have examined poverty in a dynamic context in Kenya using income panel data are those by Muyanga *et al*. (2007) and Suri *et al*. (2009). Others used participatory methods (Krishna *et al.*, 2004; Kristjanson *et al.*, 2010). Barrett *et al*. (2006) used quantitative and qualitative methods.

2.3.2 Study area

The sites selected for this study were drawn from a four wave panel data collection effort of Tegemeo Institute, between 1997 and 2007. In 1997, the sampling frame was designed in consultation with Kenya Central Bureau of Statistics (CBS), and households were randomly selected to represent eight diverse agro-regional zones, reflecting population distribution, but excluding the pastoral areas. Agro-regional zones represent a cluster of areas with similar broad climatic conditions, agricultural activities and rural livelihood strategies. We selected five districts spread across four diverse agro-regional zones. The four zones were randomly selected from seven of the eight original zones[12] and include Eastern lowland, Western lowland, Western transitional and Central highland zones. These zones reflect diversity in agro-ecological conditions, market access and population densities. In each district, all communities and households covered in the panel data were revisited in 2009. The community FGDs and household surveys were conducted from February through August 2009, across 28 communities in these zones.

The eastern lowland zone is diverse, with many agro-ecological zones and subzones, and comprised of Makueni and Mwingi districts. Population densities are low compared to other zones. In 1999, the population density was estimated to be 30 and 97 persons/km^2 in Makueni and Mwingi, respectively. Annual average rainfall ranges from 800 mm in Mwingi to 900 mm in Makueni. Poverty rates are quite high in these districts, with over 60% of the population living below the rural poverty line in 2005/06 (KNBS, 2007). HIV prevalence rate for the zone is lower than the national average, with a provincial rate of 4.7% in 2007 (NASCOP, 2009)

The western transitional zone is predominantly high potential, with reasonably fertile soils and comprised of the larger Kakamega district. Average annual rainfall ranges from 1600 to 1800 mm spread over two main growing seasons. High population pressure is a significant characteristic of this zone. Population density ranged from 433 to 508 persons per km^2 as of 1999. Poverty rates are equally high: 51-54% of the population lived below the rural poverty line in 2005/06 (KNBS, 2007). HIV prevalence rate in this zone is lower than the national average, provincial prevalence rate is 5.1% (NASCOP, 2009).

The western lowland is predominantly low potential and included the larger Kisumu district. The dominant agro-ecological zone is lower midland, with sugarcane as the main

[12] Areas that were falling within the Rift Valley province were excluded from the sampling process as a result of security concerns, difficulties in following up households and mistrust among communities in these areas. The Rift Valley province was severely affected by the 2007/2008 post-election violence.

cash crop in the relatively better potential areas. Poverty incidence is relatively high. In 2005/06, the poverty incidence ranged from 47-50% (KNBS, 2007). Population density ranged from 257 to 549 persons km^2 in 1999. This zone has the highest HIV prevalence rates in the country, the provincial prevalence rate of 15.3% in 2007, was more than double the national prevalence rate of 7.4%.

The central highland, located in the heartland of Kenya highlands, contains unique agro-ecological zones and subzones and comprised the larger Nyeri district. It is predominantly high potential, with average annual rainfall ranging from 1400 to 2200 mm in the highland areas. Average population density in 1999 was estimated to be 197 persons per km^2. Poverty incidence is relatively low, estimated to be 33% in 2005/06. HIV prevalence rates are equally low; the provincial prevalence rate in 2007 was 3.8%, the lowest across all the zones.

2.4 Methodology

We used a combination of panel data and a participatory community-based method — the Stages-of-Progress (SOP) mentioned earlier. The Stages-of-Progress method provided information on poverty trends and dynamics based on focus group discussions, while the panel data provided information on income poverty trends and dynamics. Overall the selected study sites accounted for 50% of all the panel households interviewed in 2007 in the four selected agro-regional zones.

2.4.1 The Stages-of-Progress method

The Stages-of-Progress involves facilitated focus group discussions followed by household-level interviews. It is an adapted participatory poverty assessment method that relies on community-based poverty definitions to assess household welfare. This method is a relatively rapid, effective and participatory way to learn about poverty processes at both community and household levels. In addition, this method captures many of the advantages of quantitative approaches, including the ability to aggregate numerical information and can be applied in a modular manner, linking with other methods including household surveys. The Stage-of-Progress methodology is described in detail in previous studies (Krishna, 2006; Krishna *et al.*, 2006). We briefly describe the main steps.

Assemble a diverse and representative community group:

In each community, the focus group discussions involved 20-25 individuals from different households, who were knowledgeable about the community and households within their

village. Different groups of households within the communities were represented including poorer households.

Clearly present the objectives of the exercise

Clearly explaining the objectives of the study to the community groups is crucial in managing any expectations. Particularly, the fact that there would be no benefits or losses from speaking out freely and frankly and no development project to be implemented. This helps to remove any incentive anyone would have to misrepresent themselves or anyone else as being poor.

Define and describe poverty collectively

This step involved eliciting a common understanding of concepts of poverty based on a shared conception of 'poorest family in the community'. Once this was done, each community group defined locally applicable stages of progress that poor households typically follow on their pathways out of poverty. The group successively answers the question 'What would this family do with additional resources'? Which expenditures are the very first ones to be made? Until they reach the point at which the household would be considered prosperous. We are interested in the actual experiences of typical households — not the community's opinion of what a household should or should not do. Community groups were asked to identify the poverty cut-off and prosperity cut-off points on the progression of stages. The poverty cut-off denotes the stage after which a household is no longer considered poor. It is equivalent to the concept of the poverty line commonly used in conventional poverty studies.

Refer to a well-known signifying event or events to demarcate an earlier period

Well-known significant events were chosen to demarcate time periods being used in the study. The aim is to ensure that people across all community groups in the study zones discuss same reference time periods. For example, we used the El Niño rains in 1997 and pre-election period in 2007 as reference points for 1997 and 2007, respectively.

Ask about households' poverty status today and in the earlier periods

Using the stages of progress developed as a yardstick, the position of each household in the community for each time period was determined by the community groups through consensus.[13] The exercise involved going through each household in the community, one at

[13] A complete list of all households in the village was prepared by the village representative (village elder in advance) and verified by the community group for accuracy and completeness. Verification of the list is usually done during the first day of the community meeting.

a time, and having the community group come to a consensus as to what stage the household is at the present time, what stage they (or their parents' household) were at some point in the past using the significant events. Three reference points — 1997, 2007 and 2009 — were selected for this study. The reference years were chosen to coincide with the periods for which panel data existed. There were relatively few disagreements regarding a household's position on the ladder and those that arose were resolved through discussion and debate among the participants.

Assign households to particular welfare categories

Based on their welfare status in each year, households were assigned to one of the four categories below, in relation to the poverty cut-off:

A. Poor then and poor now (Remained Poor)

B. Poor then and non-poor now (Escaped Poverty)

C. Non-poor then but poor now (Became Poor)

D. Non-poor then and non-poor now (Remained Non-Poor)

In this study with five data waves, there are many possible combinations. However, we look at the long (1997–2007) and short (2007–2009) period changes.

Ascertain reasons for change or stability for a random sample of households

The sampling procedures for follow-up are usually determined by the objective of the research. We selected a random sample representing 35% of households from each village, spread across the four poverty categories (remained poor; escaped poverty; became poor; remained non-poor) for in-depth enquiries into the reasons associated with households' welfare trajectories at the community focus group discussions. In addition, for these households selected, their respective stages of progress for 2000 and 2004 were ascertained.

Follow up with household-level interviews to verify and go deeper into reasons for change

The reasons indicated by the community group above were cross-checked separately through individual household interviews. This was done for a subset of the 35% to verify and go deeper into the reasons for change or stability, to triangulate and verify the group responses, but also it is possible that there are factors that were unknown outside the particular household. Approximately 45% of the households selected for ascertaining reasons for change at community level were followed up for in-depth household interviews. We linked with the panel households at this stage, where the subset included all the panel

households in every selected community, and additional households were randomly selected in order to take care of households that may have dropped out from the panel.[14]

The household survey collected information on the chronology of events between 1996 and 2009 regarding livelihood strategies, positive events and negative shocks that had an impact on household well-being, particularly in terms of making them poorer or wealthier. In addition, the household level interviews constituted the final wave of the panel data and provided the link between income and SOP welfare measures. Subsequent discussions and analysis in this paper, comparing SOP and income-based welfare measures are based on the same set of individual households.

2.4.2 Panel data

The panel data is drawn from 354 rural households interviewed in 1997, 2000, 2004, 2007 and 2009. Of the original sample of 415 households across the selected districts in 1997, 394 households (95%) were re-interviewed in 2000, 383 (92%) in 2004, 364 (88%) in 2007, and 354 (85%) were re-interviewed in 2009. The overall attrition rate is 14.7%, whereas the annual attrition rate is very low, estimated to be 3.1%. Across the zones, annual attrition rate ranged from 2.2% in Eastern lowland to 4.1% in Western lowland. The high annual attrition rate in Western lowland is mainly due to HIV/AIDS. This attrition rate is reasonably low compared to similar surveys in Kenya and other developing countries (Alderman *et al.*, 2001). We estimated a probit model for probability of attrition using selected households characteristics, and found attrition to be largely random. Only gender of the household head was significant. Male headed households were more likely to be re-interviewed.

The panel surveys collected information covering various aspects of household livelihoods in each year. Detailed information on crops grown and harvested, inputs used (seed, fertilizer, labour and land preparation costs), outputs and prices were collected at plot level for each household. Information on livestock holdings and other assets were also covered. Demographic and education data were collected for each household member in all rounds. Detailed income data was collected, and all sources of income of all members of the household were captured. The major income categories were crop income (from revenues and net of input costs), livestock income (income from sale of livestock and livestock products less production costs), salaried income, remittances, business income, and income from

[14] The original sampling frame for 1997 for each village was followed closely for follow-up households. For example, in a village where 20 households were sampled in 1997 and only 18 have been interviewed consistently, additional two households were selected.

casual labour and dividends. The panel, however, does not contain comprehensive expenditure data, except for expenditures on purchased food items consumed, and thus misses out other main components of consumption expenditures as outlined in Deaton and Zaidi (1999). We use, therefore, household income as welfare indicator despite the theoretical and practical reasons for preference of consumption welfare indicators over income indicators as outlined in Deaton and Grosh (2000).

In order to compare households of varied size and demographic composition, we converted the incomes from a household to individual level. Whereas more rigorous adult equivalent (AE) scales exist (for instance the World Bank and World Health Organization scales), we used AE scales of the Kenya National Bureau of Statistics (KNBS, 2007; Republic of Kenya, 2000b), adjusted for full time adult equivalent scales[15] for consistency because the income poverty lines used in the paper are anchored on the official poverty lines for rural Kenya.

We defined several income poverty cut-off points or poverty lines initially, specifically for the years in which there were no official poverty lines (2000, 2004, 2007 and 2009). Surprisingly, whereas the official nominal overall poverty line in Kenya rose by 26% between 1997 (KSh 1,239) and 2005/06 (KSh 1,562), the general price level as measured by the consumer price index (CPI) increased by over 100%, with food CPI alone rising by 118% over the same period. Thus, the poverty lines seem to be rising more slowly than the general price.[16] We explored six different approaches to extrapolating rural income poverty lines.

First, we used food CPI to estimate food poverty lines for each year, using official rural food poverty line of 1997 as benchmark. The 1997 rural food poverty line was inflated using food CPI, to derive nominal food poverty lines for subsequent years. The food poverty line in Kenya has consistently been defined as the cost of consuming 2,250 calories per day per adult equivalent. The overall poverty line derivation takes into account basic non-food requirements: health, education, fuel, clothing and transport for rural households. In 1997, this component was calculated using the non-food household spending for households within the range of the food poverty lines defined by a band of -20% and +10% on the lower and upper sides of the food poverty line, respectively. This gives more weight to non-food spending of the poor on the lower side of the food poverty line. A non-food expenditure

[15] The scales are: 0-4 yrs are weighted as 0.24, 5-14 yrs are weighted as 0.65, and all others aged 15 yrs and above are assigned a value of 1. These scales have been used for all the previous studies of poverty by the Kenyan government and were developed by Anzagi and Bernard (1977).

[16] As Sahn and Stifel (2000) point out, the consumer price indices are often suspect in Africa, due to weaknesses in data collection and related analytical procedures.

allowance of KSh 312 per month per AE was derived in 1997, which translates to 34% of the food poverty line. This approach gives an upper bound on the poverty lines for successive years. The second approach is similar to the first one, however, we used overall poverty line in 1997 as the benchmark, adjusted by the overall CPIs to extrapolate overall poverty lines for other years.

Third, we used the change in overall CPI and official overall poverty lines between 1997 and 2005/06 to extrapolate overall poverty lines for other years. Fourth, we assumed that official poverty lines were correctly estimated and that the cost of a poverty basket does not have to follow change in CPI. We then used official overall poverty lines in 1997 and 2005/06 as principal anchors and used the rate of change between the two periods to project overall poverty line for other years. The third and fourth approaches provide lower bound poverty lines compared to the first and second approaches given the overall CPI trend, and therefore results in a more conservative estimate of income poverty lines.

The fifth and sixth approaches, are similar to the first two, however, official food and overall poverty lines of 2005/06 were used benchmarks. The non-food expenditure allowance of KSh 574 in 2005/06 translates to 58% of the food poverty line. Estimated overall poverty lines for each survey year from the various approaches and their corresponding purchasing power parity equivalents are shown in Table A1 and A2 (Appendix A).

We use overall income poverty lines based on the fourth approach (the conservative poverty lines) for subsequent analysis and comparison of Stages-of-Progress and income welfare measures. We use per adult equivalent income transitions matrices to depict economic mobility, as they offer a simple way of summarizing inter temporal movement relative to an income poverty line — what Carter and Barrett (2006) refer to as the second generation poverty analysis. Other studies of welfare dynamics in Kenya have also based their poverty lines on official poverty lines (Muyanga *et al.*, 2007; Suri *et al.*, 2009). Barrett *et al*. (2006) used an ultra-poverty line of USD 0.50 per person per day for rural Kenya to look at income mobility and poverty dynamics between 2000 and 2002. This ultra-poverty line was reasonably close to the relevant official poverty line in rural Kenya of KSh 1239 per month per capita (about US$ 0.53/day).

2.4.3 Comparison of Stages-of-Progress and income poverty measures

We examined the extent to which Stage-of-Progress and income poverty measures tell the same or different story for the same individual households in several ways. First, we looked at the poverty trends and transitions between 1997 and 2009 using the two approaches. Second, we calculated chi-squared test for independence of the two categorical distributions (poor versus non-poor), using the observed frequencies of SOP measure as the expected frequencies against which to compare the frequencies of the income measure. Third, to compare the persistence of poverty using the different measures, we used the 'spells' approach (Baulch and McCulloch, 1998). In this approach, the chronic poor are households with their welfare measure consistently below the poverty cut-off in all periods. The transient poor have their welfare measure below the poverty line at least in one period out of the periods the welfare indicator is measured, whereas the non-poor have their welfare measure above the poverty line in all periods. The "spells" approach allowed us to examine the extent to which the various groups of chronically poor households from income and SOP measures overlap.

The Stages-of-Progress measure captures a combination of expenditures of meeting household basic needs, assets such as livestock, and livelihood strategies (Krishna, 2006; Kristjanson *et al.*, 2007). As such this measure captures a household's underlying circumstances in addition to the basic needs. These indicators are broad and are likely more stable than income measures. The Stages-of-Progress, therefore, appears consistent with the recent trend of observing the value of a household's assets as perhaps a more appropriate measure, arguing that asset levels will be less susceptible to random shocks while still providing accurate description of a household's true level of poverty (e.g. Burke *et al.*, 2007). In contrast, income levels are likely to be affected by transitory shocks, such as weather fluctuations, and consequently a household may be found to be better off in one period versus another without any significant changes having occurred in their underlying circumstances, particularly the stock of productive assets under their control. This can occur with random price and yield fluctuations and irregular, stochastic earnings from remittances, gifts, lotteries, and so forth (Carter and Barrett, 2006). Consequently, we expect poverty levels to be relatively stable, with a clearer trend using Stages-of-Progress. The income measure is likely to show highly variable poverty levels, with less clear trend. Similarly, we hypothesize more poverty transitions from the income measure compared to Stages-of-Progress.

2.5 Results and discussion

2.5.1 Community definition of the stages of progress

The first few stages of progress were relatively similar across communities within a zone, while the exact order of the stages varied somewhat across these communities. The stages that define the poverty cut-off, however, were similar across zones, with a few variations that reflect different lifestyles and cultures. Table 2.1 presents the typical stages that are found below the poverty 'cut-off' (the poor), and those above it in each zone (the non-poor), including the number of times each stage was mentioned in a particular zone. The median poverty cut-off came after Stage five, except for the Central highland zone. The first few stages of progress are related to basic needs for food, clothing and shelter. Next comes primary education, livestock assets and in some cases, a bicycle. Once households get beyond these stages, they are considered to be out of poverty by most community members. The stages beyond the poverty cut-off point included purchasing larger animals (particularly cattle), buying some land, investing in cash crop farming, starting a small retail business, higher education (high school and college), constructing a new house, and acquiring other assets. Because these are more discretionary expenses, there tended to be more variations in the ordering of these later stages across different communities and zones. For this paper, we focus on households that have moved either above the poverty line or fallen below the poverty cut-off for comparison with household poverty movements as calculated using the income poverty measure.

Table 2.1: Stages of progress and poverty cut-off points across four zones in Kenya[1]

Stage	Eastern Lowland (4 villages)	Western Transitional (8 villages)	Western Lowland (8 villages)	Central Highland (8 villages)
1	Food (4)	Food (8)	Food (8)	Food (8)
2	Chicken (4)	Chicken (1)	Primary education (8)	Clothing (8)
3	Clothing (4)	Primary education (8)	Chicken (1)	Chicken (1)
4	Primary education (4)	Clothing (8)	Clothing (8)	Primary education (8)
5	Purchase small livestock (3)	Improve shelter (6)	Improve shelter (4)	Purchase small livestock (4)
6		Purchase small livestock/bicycle (6)	Purchase small livestock (8)	Purchase a young bull (7)
7		Invest in cash crop farming[2] (4)	Purchase bicycle (2)	Improve shelter (1)
			Purchase local cow (1)	
		Poverty line		
8	Purchase furniture (1)	Invest in cash crop farming (1)	Invest in cash crop farming (6)	Purchase a heifer (2)
9	Construct a semi-permanent house (4)	Purchase local cow (7)	Expand cash crop farming >4 acres (4)	Extension of house to 2-3 rooms (1)
10	Purchase local cow (4)	Rent 1 acre of land for farming (7)	Secondary education (6)	Purchase cross breed cow (5)
11	Purchase donkey (2)	Secondary education (8)	Tertiary education (1)	Purchase local cow (1)
12	Secondary education (4)	Construct a semi-permanent house (7)	Construct a semi-permanent house (7)	Improve coffee management (1)
13	Irrigation farming (1)	Purchase cross breed cow (2)	Construct a permanent house (4)	Secondary education (8)
14	Tertiary education (1)	Purchase oxen and plough (2)	Invest in posho mill or rental plots (5)	Rent tea bushes >500 bushes (2)
15	Purchase land (3)	Purchase 2 grade cows (1)	Purchase land (3)	Tertiary education (8)
16	Construct a permanent house (4)	Construct a permanent house (7)	Purchase local cow (7)	Purchase 2 grade cows (1)
17	Purchase plot and build (4)	Expand cash crop farming >4 acres (5)	Purchase oxen and plough (4)	Rent 1 acre of land for farming (1)
		Tertiary education (4)	Purchase a vehicle (5)	Purchase 0.5 acres of land (3)
		Purchase land >1 acre (8)		Construct a permanent house (6)
		Purchase plot and build (7)		Purchase land >1 acres (3)
		Purchase a vehicle (6)		Construct a semi-permanent house (8)
				Purchase plot - 0.25 acres (1)
				Purchase plot and build (7)

1 – The figures in brackets refer to the number of villages where each stage was mentioned within a zone. For example, food was mentioned across all the 4 villages in Eastern lowlands and all the 8 villages in Western transitional, Western lowland and Central highland zones.

2 - Sugarcane of 0.5 acres

2.5.2 Poverty trends

Overall poverty levels from the SOP approach and analysis increased from 29% in 1997 to 37% in 2009. For the panel households, poverty levels were lower and increased steadily from 19% in 1997 to 33% in 2009 using the Stages-of-Progress method (Figure 2.1). In contrast, the income poverty trends for these households showed an initial decline between 1997 and 2000, followed by a variable but increasing trend in the subsequent years. However, poverty levels in subsequent years were lower than the 1997 levels, except in 2009. In general, poverty increased sharply between 2007 and 2009.

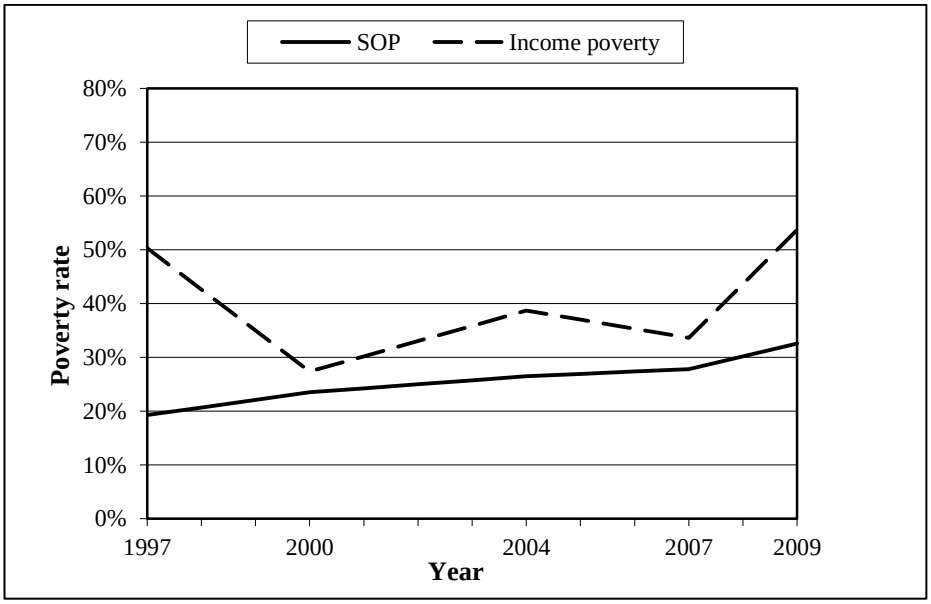

Figure 2.1: Overall poverty trends (panel households)

Regional differences in poverty levels and trends are clearly evident from both approaches (Figure 2.2). Poverty levels decrease as one moves from poorer (lowlands) to better agro-ecological conditions (transitional and highland zones) using Stages-of-Progress. Income poverty levels are high and variable in the western zones (Western lowland and Western transitional), and consistently increasing in Eastern lowland from 2000, while the Central highland experienced marginal increments in poverty. The results reflect the prevalence of poverty in these zones, and not the absolute number of poor households. Thus while the low potential areas may have a higher proportion of poor households, the high potential areas with high population pressure may have greater numbers of poor people.

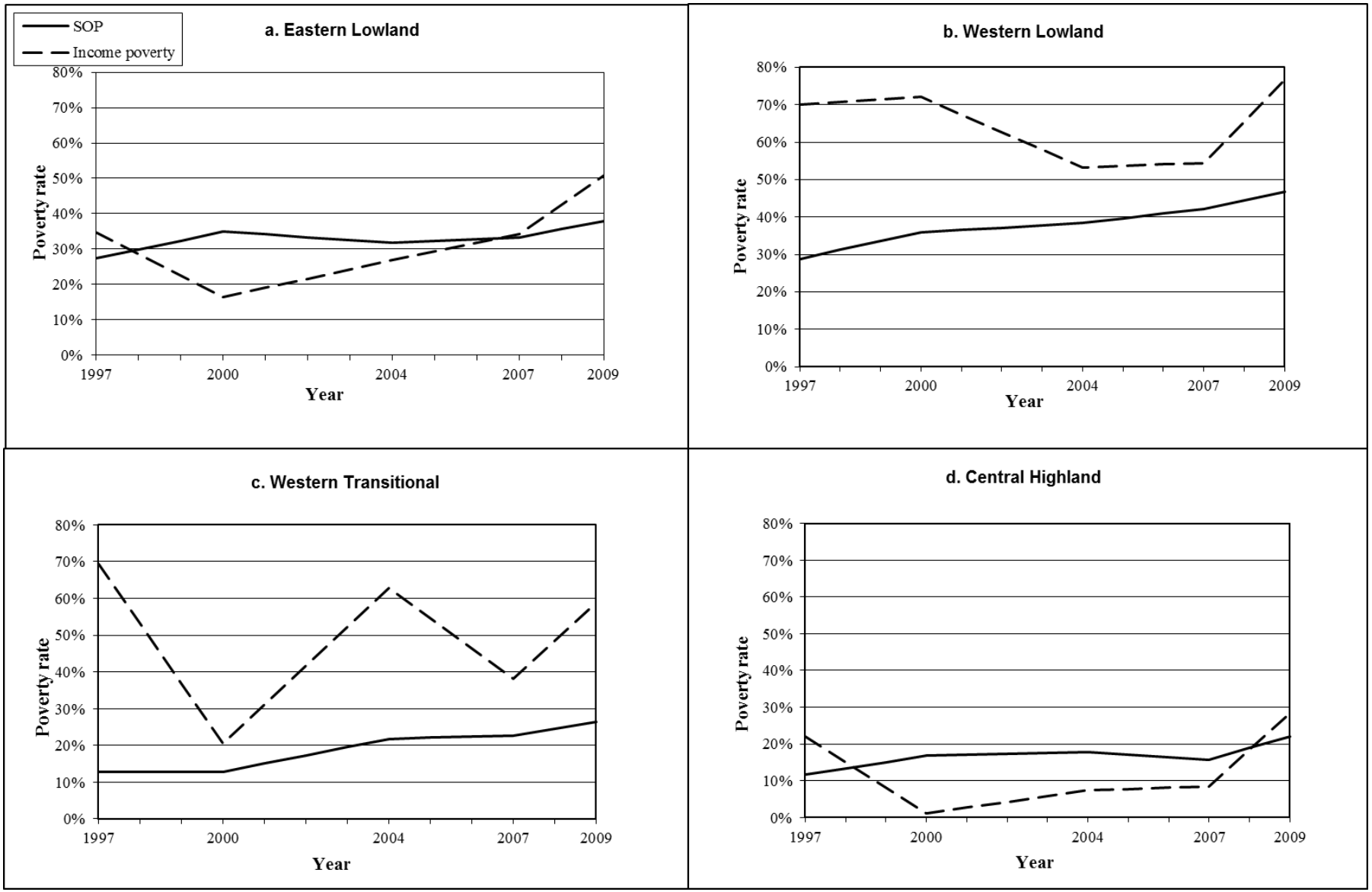

Figure 2.2: Regional poverty trends

The large reduction in poverty between 1997 and 2000 could be attributed to a general increase in crop income across all zones in 2000, except Western lowland. Crop income accounted for 72% of total household income in 2000, the highest in all the five survey years. Low levels of income poverty in Eastern lowland, despite poor ecological conditions could be attributed to a large share of household income from off-farm sources of up to 70% in all years, except in 2000. High poverty levels in Western lowland are due to low agricultural potential, coupled with weather shocks resulting from drought and flood in some of the communities within the 12 years (over the period 1997–2009). The findings show significant differences in poverty levels from the two measures. Poverty levels are consistently lower with Stages-of-Progress method compared to income measure. When other alternative income poverty lines are used (as discussed in section 2.4.2), income poverty levels are still higher than the SOP poverty levels (Figure A1 in Appendix A).

The two measures, however, show similarities in overall increasing poverty levels for the sample over the last nine years (i.e. from 2000). Our findings are consistent with the decreasing average household real income trends observed over the 12 years. These findings are also consistent with trends in real gross domestic product (GDP) per capita in Kenya over the same period. Real GDP per capita decreased between 1997 and 2003, and then increased between 2003 and 2007, but it is only during 2006 and 2007 that real GDP per capita exceeded the levels registered in 1997 (KIPPRA, 2009).

Kenya's overall GDP growth rate increased from 3% in 2003 to 7% in 2007. Overall positive growth rates in GDP, therefore, can mask significant poverty in certain geographic regions. Aggregate economic growth can sometimes result in little or no change at the micro-level. The large increments in poverty levels in 2009 are due to a combination of shocks arising from the effects of global downturn, adverse agro-climatic conditions in Kenya in 2008, rising cost of living and probably the effects of the post-election violence.

2.5.3 Poverty transitions

For poverty transitions, we divided the 12 years into two sub-periods to account for effects of the early 2008 post-election violence (PEV) shock that had serious effects on various sectors of the Kenyan economy: 1997–2007 (first period) and 2007–2009 (second period). Turning to household movements into and out of poverty from the SOP analysis (Figure 2.3), majority of households remained at the same relative welfare level in 2007 as they were in 1997, 11% became poor, with very few (3%) escaping poverty within the first period. More households continuously remained poor in the lowland zones (24%) than in other zones. No significant

changes in welfare status occurred within the second period (Figure 2.4). Most households that were poor in 2007 (28%), however, remained poor in 2009. In looking across zones, again we see that the proportion of households remaining poor decreases as one moves from poor to better agro-ecological conditions, while the proportion of households remaining non-poor increases as agro-ecological and market access conditions improve.

As expected, income measure demonstrates more poverty transitions compared to the SOP method (Figure 2.3 and 2.4). Overall, within the first period, 23% of the households remained poor, nearly 27% escaped from poverty, 11% became poor and about 40% remained non-poor. More households became poor in the second period (27%), with very few escaping poverty (7%). Variations in poverty movements across zones can clearly be seen. In contrast to poverty movements seen in the SOP analysis, here we see a higher proportion of households escaping poverty compared to the proportion of households that became poor in the first period, except in Eastern lowland. In the second period, however, a large proportion of households (up to 30% in Western lowland) became poor, compared to those who escaped poverty. Also, the proportion of households remaining consistently non-poor was lower in the western zones. No clear pattern in relation to agro-ecological conditions was found with income poverty transitions.

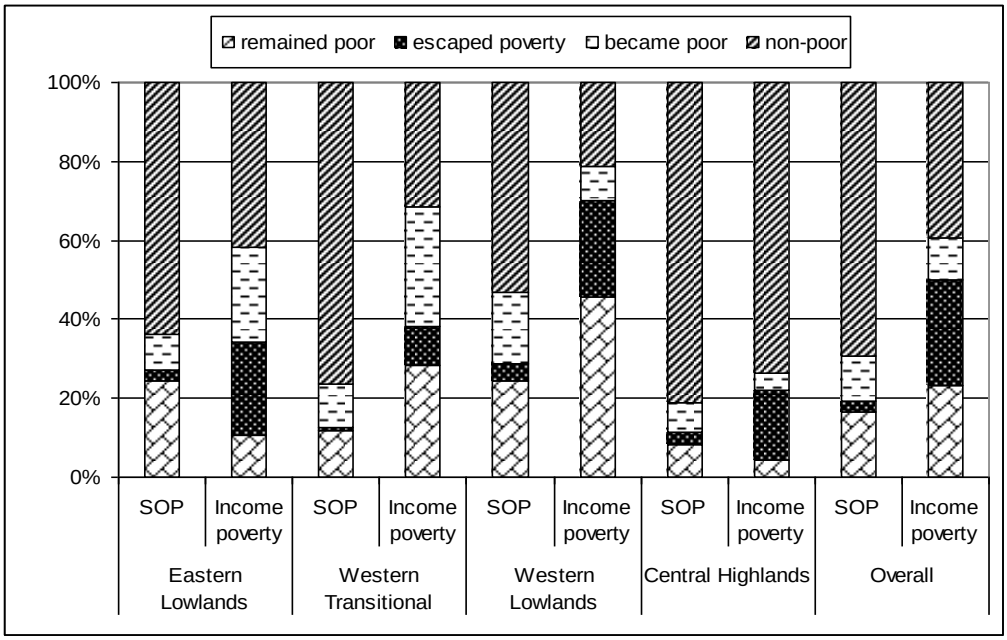

Figure 2.3: Poverty transitions 1997-2007

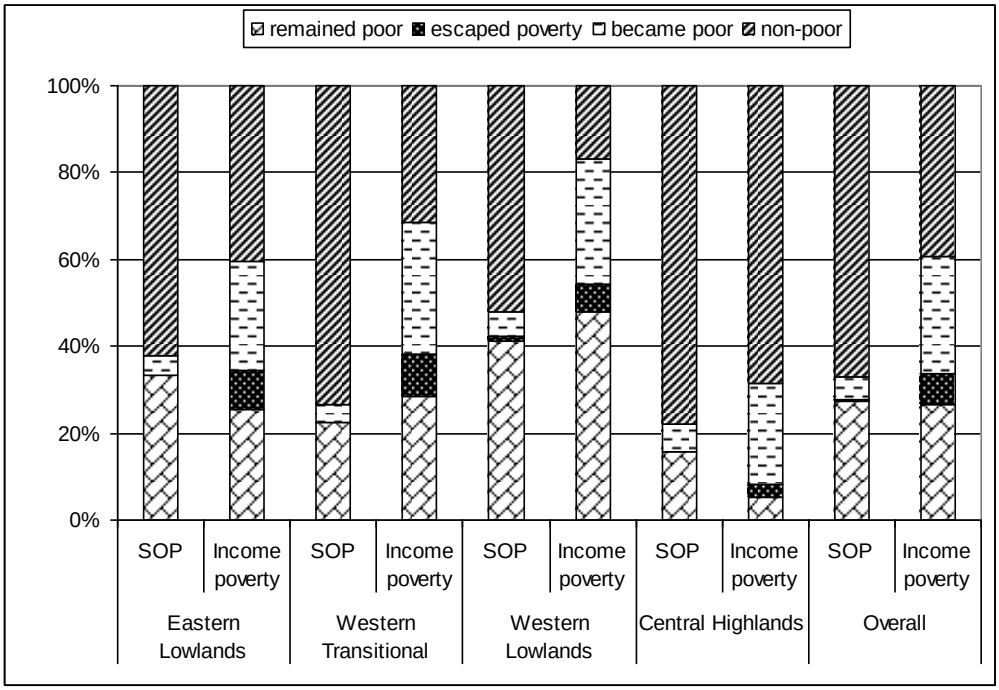

Figure 2.4: Poverty transitions 2007-2009

Similar to findings from poverty trends, large regional differences in poverty transitions were clearly evident from both approaches. The SOP method shows a higher proportion of chronically poor households (24%) in poor agro-ecological (lowland) zones. Findings from the income measure transitions are mixed, but the western zones consistently had higher than average proportion of chronically poor compared to other zones. The detailed transitions are also presented in Table A5 (Appendix A).

2.5.4 Duration in poverty

We also compared the two measures based on duration or spells in poverty. We aggregated the spells in poverty for each welfare measure into three broad categories: chronic poor, transient poor and non-poor (Table 2.2). We defined the chronic poor as households with four or five spells in poverty, the transient poor as households with less than four spells in poverty and the non-poor as households that were always above the poverty lines. We found striking similarities in the overall proportion of chronically poor households in both welfare measures (21.5% with the SOP and 22.3% with the income measure), yet the proportions of transient and non-poor households were highly different.

A large share of income poverty is transitory (55%), while SOP results show high a proportion of non-poor households (64%). Large regional differences in chronic poverty were evident. Nearly one-third of households in poor agro-ecological zones were chronic poor, with more than three spells in poverty over the 12 year period using SOP. On the contrary,

over 70% of households in better agro-ecological areas were consistently non-poor using SOP. Findings from both approaches show the Western lowland as the poorest of the regions. Half of the households in this zone were chronically poor from the income measure and one-third from the SOP.

Table 2.2: Spells in poverty from Stages-of-Progress and income welfare measures by zone (1997 – 2009) – per cent of households

Agro-regional zones	Stages-of-Progress			Income welfare measure		
	Chronic poor	Transient poor	Non-poor	Chronic poor	Transient poor	Non-poor
Eastern lowland	31.8	9.1	59.1	9.0	71.6	19.4
Western transitional	12.8	14.7	72.6	25.5	64.7	9.8
Western lowland	33.3	17.8	48.9	50.0	45.6	4.4
Central highland	12.6	13.7	73.7	2.1	43.2	54.7
Total	21.5	14.2	64.3	22.3	55.4	22.3

The large share of income transitory poverty can be explained by the inherent stochasticity of flow-based measures of welfare and confirms the hypothesis that income measures are relatively unstable and are likely to respond to random shocks. Our findings are consistent with findings by Burke *et al*. (2007). The majority of households in their sample (57%) had remained at the same relative poverty levels in 2004 as they were in 1997 using an asset-based poverty measure, compared to 27% using an income poverty measure. Likewise, Kristjanson *et al*. (2010) and Krishna *et al*. (2006) using the Stages-of-Progress approach, found that the majority of households in their samples remained static (i.e. in the same poverty category), across five livelihood zones (68%) over 15 years in Kenya and across 36 villages in Central and Western Uganda (60%) over 25 years, respectively.

The results from poverty trends, transitions and spells in poverty all point to evidence of geographical clusters of poverty. The results for the Central highland zone are consistent with its conducive environment for agriculture and cropping activities of high value food and cash crops (coffee and tea), improved marketing infrastructure and organization (dairy and cash crop cooperatives) that have the potential of reducing poverty. Findings from previous studies in Kenya, however, show that even within zones variations in poverty exist (CBS, 2003; Okwi *et al.*, 2007). Barrett *et al*. (2006) also found evidence of distinct geographical patterns among a sample of rural households in Kenya and Madagascar, where sites with poorer agro-ecological conditions and market access had greater and more persistent poverty than sites that had more favourable conditions.

2.5.5 Differences in poverty levels, transitions and spells

We used non-parametric tests (Pearson chi-square statistic) to determine whether observed differences in poverty levels, transitions and spells in poverty from the two measures were significant. Cross-tabulations of SOP and income welfare status for each year reveal a positive relationship between the two measures in the aggregate. The chi-squared statistic reported for all years except 1997 firmly rejects the hypothesis that SOP and income poverty categories are independent (Table 2.3). The Cramer's V statistic values, however, are all less than 0.3, indicating that the association between SOP and income measures is not strong.[17] Of the households classified as poor by SOP method in 1997, for example, 60% were also classified as income poor, while for the non-poor households, 53% were also classified as income non-poor (Table 2.3). Overall, there are similarities in classification of non-poor households by the two measures, thus the level of convergence for the two approaches seem to be high for non-poor compared to poor households. Disaggregating by zone, we find significant relationships only in few zones in particular years. Significant relationships were found in the two western zones in 2007. In 2009 the relationship was highly significant in all zones except Western lowland.

Table 2.3: Comparison of income poverty and Stages-of-Progress 1997 – 2009 (per cent of households)

	Stages-of-Progress measure									
Income	1997		2000		2004		2007		2009	
welfare measure	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor
Poor	60	47	41	22	53	34	53	26	72	45
Non-poor	40	53	59	78	47	67	47	74	28	55
N	68	286	76	260	90	251	98	256	115	238
Pearson chi2	3.8		10.3		11		23		23.1	
Cramer's V	0.10		0.18		0.18		0.25		0.26	

Results of cross-tabulation of SOP and income poverty transitions (1997–2007) are presented in Table 2.4. Although, the chi-square statistic shows a significant relationship, the large discrepancies in poverty transitions for households who remained poor, became poor or escaped poverty imply a weak association. Less than half (47%) of households remaining non-poor with SOP measure remained non-poor from the income measure.

[17] Cramer's V statistic lies between zero and one and is a measure of association between any two categorical variables.

Table 2.4: Cross tabulation of income and Stages-of-Progress poverty transitions 1997 – 2007 (per cent of households)

	Stages-of-Progress measure					
Income welfare measure	Remained poor	Escaped poverty	Became poor	Remained non-poor	Total (per cent)	N
Remained poor	**34**	20	45	17	23	82
Escaped poverty	26	**40**	23	27	27	94
Became poor	17	0	**10**	9	10	37
Remained non-poor	22	40	23	**47**	40	141
Total (per cent)	16	3	11	69	100	
N	58	10	40	246		354

Pearson chi2(9) = 30.6564 Pr = 0.000, Cramér's V = 0.1699

Table 2.5 shows the results of cross-tabulations using the spells approach. Similar discrepancies as with poverty levels and transitions are evident. Apart from transient poor households, less than 40% of SOP chronic poor and non-poor households fell into similar income spells categories. Overall, 8% (29 households) were chronically poor by both measures, 6% (23 households) were moderately poor and 20% (70 households) were non-poor in both cases. The chi-squared statistic reported rejects the hypothesis that SOP welfare measure is independent of the income measure. However, the Cramer's V statistic indicates a moderate association. Almost all households classified as chronically poor by both measures were from the western zones, while over 60% of those classified as non-poor by both measures were from the Central highland.

Table 2.5: Cross tabulation of income and Stages-of-Progress spells in poverty (per cent of households)

Income welfare measure	Stages-of-Progress measure				
	Chronic poor	Transient poor	Non-poor	Total	N
Chronic poor	**38**	40	13	22	79
Transient poor	58	**46**	56	55	195
Non-poor	4	14	**31**	23	80
Total (per cent)	21	14	64	100	
N	76	50	228	100	354

Pearson chi2(4) = 44.9857 Pr = 0.000; Cramér's V = 0.2521

Given the discrepancies above, we delve more into analysing the characteristics of individual households classified differently by the two approaches, specifically households that were classified differently in two consecutive years. First, we look at the characteristics of individual households that were classified as poor using SOP method but were classified as income non-poor. A large proportion of these households (average of 68% for the five years) had their SOP welfare measure at the SOP poverty cut-off, implying that they are right at the border line of poor and non-poor. In addition, these households were involved in similar

livelihood strategies: food crop production for subsistence, farm labour and informal casual jobs, petty trading (selling vegetable, fruits, cereals and fish), and others were involved in small scale cash crop production (Table A6). These livelihood strategies are typically characterised by variable and relatively low incomes and are indicators of poverty as described by community groups in these zones. Other notable characteristics were drunkenness and domestic conflicts. As such, using the SOP method, households engaging in these activities are considered to be relatively poor by the communities.

Across all the years, households classified as poor using SOP but income non-poor had significantly smaller household sizes than the sample averages. In addition, the overall total household income for these households was significantly lower than the sample total averages in some years. Off-farm income accounted for a large share (over 30%) of their total income and a substantial share of the off-farm income was from business and informal activities (up to 56%). Despite high variability of income from these sources combined with poor lifestyles (drunkenness) making these households vulnerable to poverty in the eyes of the communities, their small household sizes could translate into higher per capita incomes. Some of the households experienced shocks related to ill-health, health expenses, funeral expenses and death of major income earner between 2000 and 2007. However, the effects of health shocks on income has been shown to differ between earned and unearned income (Wagstaff, 2007). Health shocks may be associated with increases in unearned income and consequently may not result in significant reduction of incomes among households in some cases. Surprisingly, majority of these households were from Eastern lowland and Central highland zones, where off-farm and crop incomes constitute a relatively large share of household incomes, respectively.

Similarly, we examined the characteristics of households that were classified as non-poor using SOP method but were categorized as income poor. These households had significantly larger household sizes than the sample averages for the respective years. It is likely that SOP does not explicitly take into account household size in welfare ranking, thus a household with more income and many members could be income poor but SOP non-poor. Their livelihood strategies included cash crop production (mainly sugarcane), food crop production for subsistence, livestock keeping (largely indigenous breeds of cattle, goats and sheep), informal jobs (skilled casual labour), medium level trading (oxen and plough for hire, livestock trade, brewing) and some received remittances (Table A7). In terms of assets and livelihood strategies, therefore, these households are relatively well-off as per the assessments by the community groups, but not all their wealth (such as livestock) translates

directly into cash income. In addition, their income has to be shared among many household members. While these households also experienced shocks related to ill-health, health expenses and funeral expenses, the shocks probably did not translate into asset depletion. Adverse health shocks, however, can have negative effects on earned income as it affects returns to particular livelihood strategies such as those related to trading. Over 70% were from the western zones.

Overall, our data indicates a significant positive correlation between the Stages-of-Progress and income measures relative to a poverty line based on the chi-square statistics (Table 2.3, 2.4 and 2.5). Households with higher per capita incomes were more likely to be classified as non-poor by the SOP approach. Nevertheless, we find large discrepancies between the welfare measures. For example, an average 44% of poor households relative to the SOP poverty line were classified as income non-poor across all the five years. In contrast, a lower proportion (35%) of the non-poor households relative to the SOP poverty line, were classified as income poor. Consequently, the level of convergence between the two measures is high for non-poor households, but large divergences exist for poor households. Our results are consistent with findings from previous studies (Baulch and Masset, 2003; Caizhen, 2010; Ravallion and Lokshin, 2002), where similar discrepancies between different types of welfare measures have been reported.

Ravallion and Lokshin (2002) found large discrepancies between subjective assessments of economic welfare and standard income-based measures in Russia. Amongst the income non-poor, there was a sharp increase in the proportion of respondents who saw themselves as being on the upper rungs of the ladder as real income deflated by the poverty line increased. Baulch and Masset (2003) also found low levels of correlation and overlap between monetary and non-monetary indicators and differences in their distribution among households in Vietnam in the 1990s. They used malnutrition and stunting among young children and education enrolment as non-monetary poverty measures. Similar to our findings from the poverty transitions and spells in poverty, monetary poverty was found to be less persistent compared to non-monetary poverty. In contrast, Scoones (1995) and Kozel and Parker (1999) found similarities between household survey approaches, wealth ranking and participatory approaches in their studies, respectively.

The differences in poverty levels, transitions and spells between SOP and income measures could be attributed to several reasons. First, SOP captures broader and stable welfare indicators that include expenditures on basic needs, assets and livelihood strategies. Income levels are likely to be affected by transitory shocks, such as weather fluctuations. The

findings are consistent with the fact that PRAs often adopt a broader view of poverty than monetary measures. Several other factors influence community perceptions of well-being, and using a single monetary indicator from survey data might not proxy local people's rankings correctly, even though communities attach importance to that indicator. Past incomes, for example, may matter as well as current incomes. Health, education, livelihood strategy, marital status and other culturally acceptable or unacceptable behavioural norms (domestic conflicts, drunkenness) may matter independently of income. Thus community evaluations of well-being take into account several indicators, with an implicit evaluation of the trade-offs between achievements in one or the other. At the same time, discrepancies might be found between what is assumed by local people and what is really happening at the household level, as community knowledge of certain issues might be imperfect.[18]

Second, unlike income measure, SOP does not explicitly take into account household size in welfare ranking. Consequently, smaller households engaging in livelihood activities characterized by low and highly variable returns are more likely to be SOP poor and income non-poor. Likewise, households engaging in high return livelihood strategies and with more assets, but large household size could be income poor but SOP non-poor. Third, the differences could arise from the way the income poverty lines were constructed. The change in official absolute poverty line between 1997 and 2005/06 is not consistent with the rise in general inflation as measured by the CPI. In particular, the nominal poverty lines in Kenya rose much less than inflation over the same period. This could also partly explain the decreasing national poverty levels reported. The differences could possibly reflect deeper limitations on how economic welfare is routinely measured in deciding who is poor and who is not. These limitations trace back to the well-known theoretical problems in the way in which poverty lines are set in practice — identifying an exact metric of welfare cut-off. Similar challenges of identifying the correct quantitative poverty lines have been reported in other studies using longitudinal data (Roberts and May, 2000).

Fourth, slight differences in the time period over which income is measured versus the time period over which the SOP welfare measure were based could explain the discrepancies. Also community welfare assessments to some extent could be driven by relative welfare within the community. The identification of poor households depends on which approach is used. The two approaches focus on different dimensions of poverty, highlighting certain

[18] Although in the SOP approach, findings from the community discussions are triangulated through follow-up at the household level.

aspects. The discrepancies imply poverty targeting using only one approach ignores other dimensions and aspects of poverty.

2.6 Conclusions

In developing countries in Africa, few studies have compared participatory and monetary measures of welfare systematically. Many studies of poverty trends and dynamics have focused on consumption and income welfare measures on their own. This paper offers a unique attempt to compare participatory and income welfare measures using household panel survey data collected in five different periods, compared to information from a retrospective, community and household-based participatory poverty assessment method (Stages-of-Progress) applied in a sample of the same villages. We examined the extent to which evidence as to poverty trends, household poverty movements and duration of poverty differ coming from these two very different approaches.

Poverty levels were found to be consistently lower with Stages-of-Progress approach compared to income-based measure. Findings based on income measure showed more variation in poverty levels and household-level transitions into and out of poverty than the SOP approach found. Our data show a significant positive correlation in the poverty category any given household fell into (i.e. poor versus non-poor) between the Stages-of-Progress and income welfare measures. Households with higher per capita incomes were also likely to be classified as non-poor by the Stages-of-Progress method, similar to findings from other studies using wealth rankings. There was, however, much less agreement for poorer households. Similar discrepancies between monetary and non-monetary welfare measures have been reported in other studies (Baulch and Masset, 2003; Ravallion and Lokshin, 2002).

While both approaches measure economic welfare, we attribute the differences in poverty levels and transitions to several reasons. First, the Stages-of-Progress captures broad and more stable welfare indicators than income measure. Second, SOP does not explicitly take into account household size in welfare ranking. Third, participatory poverty measures might be expected to be influenced by people's values and attitudes and relative welfare within the community. Lastly, slight differences in the time period over which income was measured versus the SOP period could explain the discrepancies. The SOP method is retrospective, recovering information on past events while the income measure is based on a series of surveys.

Both approaches show regional differences in poverty levels and transitions. The SOP method showed higher poverty levels and higher proportion of chronic poor in poor agro-

ecological zones (lowlands). Findings from the income measure are mixed, but the western zones had higher than average poverty levels. Both approaches, however, show that Western lowland is the poorest of the four regions.

Because poverty is complex and multidimensional, no single approach can capture all dimensions of poverty. The welfare measure used in practice will depend on the research objective. Each approach should be used according to its strengths for different purposes. Participatory poverty studies are useful for analysing issues for which monetary assessments would require a great amount of data. The Stage-of-Progress in particular allows a researcher to gather a great deal of information about poverty processes in a relatively short time. In the absence of panel data, the Stages-of-Progress is a good option, particularly for addressing the issue of 'why is it that some households have moved into poverty while others have moved out of poverty?' Pursuing the reasons for these movements leads to much more targeted policy interventions. In addition, SOP can be used to look at the impact of particular interventions on asset accumulation, livelihood strategies and household welfare, including resilience to unpredictable shocks. SOP provides a richer definition of poverty and empowers local people to look systematically at the circumstances and experiences of their entire community. In doing so, these individuals develop an awareness of local economic constraints and opportunities.

The monetary measures of poverty based on income and expenditure allow for ease of aggregation of information. These measures rely on rigorous statistical methods for sampling and inference and can be used to examine a variety of poverty issues. These methods are useful for macro-level analysis to assess the magnitude of poverty within a population, poverty trends and simulations of the effects public policy on poverty for example. The large discrepancies between SOP and income measures imply that these measures highlight different dimensions of poverty, thus one method cannot substitute the other. To understand the different facets of poverty, it is important to combine different methods. A combination of methods can overcome the biases that are encountered when only one approach is used, leading to formulation of more effective poverty reduction strategies.

Appendix A

Table A1: Estimated poverty lines using different approaches (KSh. per month per adult equivalent unit)

Year	Approach 1 1997 food poverty line benchmark – Food CPI	Approach 2 1997 overall poverty line benchmark - Overall CPI	Approach 3 Extrapolate the poverty lines using the overall CPI	Approach 4 Using the annual rate of change in poverty line between 1997 and 2005/06	Approach 5 2005/06 benchmark – Food CPI	Approach 6 2005/06 benchmark – General CPI
1997	1149	1170	1219	1217	669	773
2000	1454	1440	1297	1294	846	952
2004	2035	1876	1422	1462	1184	1240
2007	3197	2658	1647	1606	1860	1757
2009	4755	3608	1920	1694	2767	2385

Table A2: Estimated poverty lines in Purchasing Power Parity (PPP) equivalents - KSh. per current international dollar

		In $ PPP					
Year	KSh./$PPP	Approach 1	Approach 2	Approach 3	Approach 4	Approach 5	Approach 6
1997	21.9	52.4	53.4	55.6	55.5	30.5	35.3
2000	25.4	57.3	56.7	51.1	51.0	33.3	37.5
2004	27.5	74.1	68.3	51.8	53.2	43.1	45.2
2007	32.2	99.3	82.6	51.2	49.9	57.8	54.6
2009	35.8	133.0	100.9	53.7	47.4	77.4	66.7

Source: IMF – World Economic Outlook Database, April 2008

Table A3: Stages-of-Progress and income poverty trends – 1997 - 2009

Agro-regional zone	Qualitative approach (% of poor households)					Quantitative approach (% of poor households – lower bound poverty line)				
	1997	2000	2004	2007	2009	1997	2000	2004	2007	2009
Eastern lowland	27	35	32	33	38	35	16	27	34	51
Western transitional	13	13	22	23	27	69	21	63	38	59
Western lowland	29	36	39	42	47	70	72	53	54	77
Central highland	12	17	18	16	22	22	1	7	8	28
Total	19	24	27	28	33	50	27	39	34	54

Table A4: Trends in mean annual household real income 1997 – 2009[19]

Agro-regional zones	1997	2000	2004	2007	2009	N
Eastern lowland	92,038	195,342	110,619	76,338	41,546	67
Western transitional	78,973	249,995	62,828	65,517	41,444	102
Western lowland	48,870	52,271	64,199	45,430	21,307	90
Central highland	128,063	246,745	111,305	95,509	55,232	95
Total	86,966	189,577	85,231	70,507	40,044	354

[19] We used overall Kenya CPI from 1996/97 to 2008/09 to deflate the nominal incomes for each year, thus the real income presented above are CPI-deflated.

Table A5: Poverty transitions – qualitative and quantitative approaches

Period	Agro-regional zone	Stages-of Progress transitions				Income measure transitions			
		Remained poor	Escaped poverty	Became poor	Remained non-poor	Remained poor	Escaped poverty	Became poor	Remained non-poor
1997-2007									
	Eastern lowland	24.2	3.0	9.1	63.6	10.5	23.9	23.9	41.8
	Western transitional	11.8	1.0	10.8	76.5	29.4	39.2	8.8	22.6
	Western lowland	24.4	4.4	17.8	53.3	45.6	24.4	8.9	21.1
	Central highland	8.4	3.2	7.4	81.1	4.2	17.9	4.2	73.7
	Total	**16.4**	**2.8**	**11.3**	**69.4**	**23.2**	**26.8**	**10.5**	**39.6**
2007-2009									
	Eastern lowland	33.3	0.0	4.6	62.1	25.4	9.0	25.4	40.3
	Western transitional	22.6	0.0	3.9	73.5	28.4	9.8	30.4	31.4
	Western lowland	41.1	1.1	5.6	52.2	47.8	6.7	28.9	16.7
	Central Highland	15.8	0.0	6.3	77.9	5.3	3.2	23.2	68.4
	Total	**27.5**	**0.3**	**5.1**	**67.1**	**26.6**	**7.1**	**27.1**	**39.3**

Table A6: Characteristics of households classified as SOP poor and income non-poor

	1997/2000	2000/2004	2004/2007	2007/2009
Households with stage equal to the SOP poverty line (%)	74	76	69	53
Small scale cash crop production	47	41	31	25
Domestic conflicts	16	11	4	0
Many dependants	32	22	23	13
Drunkards	37	33	31	19
Farm labour	53	44	42	31
Informal jobs	42	19	12	6
Experienced shocks - (health, funeral, death)	32	70	88	25
Small land size & other land related	26	7	8	0
Petty trade & trade	47	56	46	38
Livestock keeping	47	44	23	25
Receiving remittances	21	26	23	50
Experienced livestock losses	0	7	15	6
Food crop farming for subsistence	68	70	69	63
Observations	19	27	26	16

Table A7: Characteristics of households classified as SOP non-poor and income poor

	1997/2000	2000/2004	2004/2007	2007/2009
Cash crop production (sugarcane)	65	46	70	41
Experienced crop losses	5	0	3	0
Many dependants	5	11	6	9
Experienced shocks - health, funeral, death)	72	64	91	30
Informal jobs	28	4	3	7
Regular jobs (public or private)	14	7	9	0
Job loss	7	11	12	0
Experienced livestock losses	16	11	9	2
Livestock keeping	79	68	64	57
Petty trade	26	39	27	24
Receiving remittances	33	36	45	28
Food crop farming for subsistence	77	68	64	61
Trade (medium level)	60	46	45	24
Paying school fees	12	7	6	9
Observations	43	28	33	46

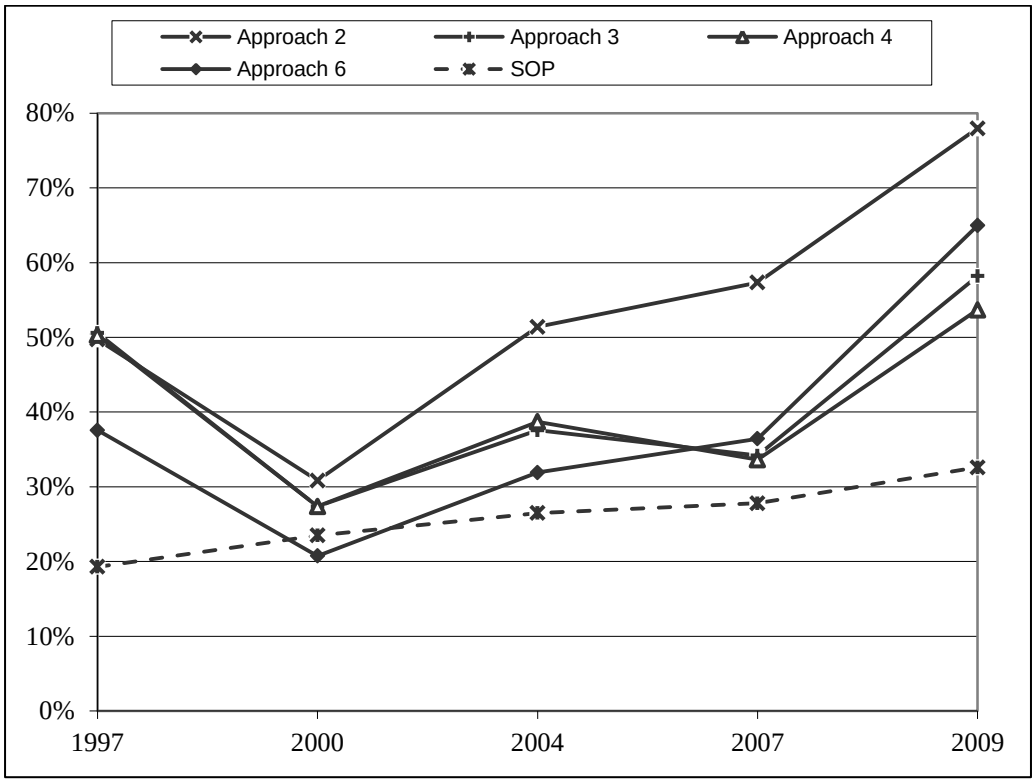

Figure A1. SOP and income poverty trends using alternative poverty lines

Chapter 3

Rural Poverty Dynamics in Kenya: Structural Declines and Stochastic Escapes[20]

[20] This paper was co-authored with Marrit van den Berg and Rob Schipper, Development Economics Group, Wageningen University, 6706 KN Wageningen, The Netherlands. Submitted to *World Development*.

Abstract

We use panel survey data and household event-histories to explore patterns of rural poverty dynamics in Kenya over the period 2000–2009. We find substantial mobility across poverty categories using economic transition matrices. Drawing on asset-based approaches, we distinguish stochastic from structural poverty transitions. The majority of households (up to 90%) that were poor in two consecutive survey years were structurally poor, whereas few households (up to 35%) successfully escaped poverty through asset accumulation. Moreover, a large proportion of households (up to 66%) declining into poverty experienced structural transitions. Our results suggest a limited asset accumulation among rural households in Kenya. We use household event-histories to explain changes in household poverty status over time, and find significant differences across structural poverty transition classes in livelihood strategies, household-level shocks, and other negative or positive factors. A combination of livelihood strategies, shocks, and other factors interact to influence household structural transition. Health shocks were experienced across all welfare categories, pointing to the need to invest in preventive health care and health insurance.

Key words: poverty, livelihood assets, mixed methods, Sub-Saharan Africa, Kenya

3.1 Introduction

Persistent poverty continues to be a challenge in Sub-Saharan Africa. Rural poverty rates remain high and persistent (51%), and the absolute number of the poor has been increasing since 1993 (World Bank, 2008). Consequently, poverty reduction is a priority in many countries in Sub-Saharan Africa. In Kenya development efforts have emphasized poverty reduction through economic growth, employment creation and provision of basic social services (Kimalu *et al.*, 2002). In the 1980s and 1990s, the Kenyan economy was characterized by stagnant and erratic growth, however, economic growth accelerated considerably over the period 2003–2007 following the implementation of the Economic Recovery Strategy (ERS). The annual gross domestic product (GDP) growth rate increased from 3% in 2003 to 7% in 2007. As annual population growth stagnated at 3%, annual GDP per capita growth rate increased from zero to 4% over the same period (World Bank, 2010). The macroeconomic growth policies failed to stimulate broad based sustainable economic growth, and poverty levels remain high.

The official statistics indicate that the incidence of poverty remains high in Kenya, and is estimated to be 46% in 2005/06 (KNBS, 2007). The national trends mask large regional differences in poverty levels, with some regions having relatively high poverty rates. As in many countries, the poor in Kenya are disproportionately found in rural areas. The poverty incidence was estimated to be 49% for rural areas compared with 34% for urban areas in 2005/06. Moreover, due to population growth, the number of those living below the poverty line is estimated to have increased from 13.4 million in 1997 to about 16.6 million in 2006. The co-existence of strong economic growth and deepening poverty underscore the fact that causes of poverty are complex and that appropriate policy responses are inadequately understood.

Several poverty studies in Kenya have looked at poverty in a static dimension using data from the welfare monitoring surveys of 1992, 1994, 1997 and 2005/06 (CBS, 2003; KNBS, 2007; Mwabu *et al.*, 2003; Okwi *et al.*, 2007; Republic of Kenya, 1998; 2000a). Static poverty studies, however, cannot distinguish between transitory and chronic poverty. These studies conceal a dynamic reality, one where there is a substantial flow of households into and out of poverty, even when the net numbers remain static, decrease or grow at the national or regional levels. Besides, they do not provide insights into how or why households move into and out of poverty and therefore are unable to identify the kinds of decisions made by households whose welfare subsequently improves or declines over time.

In order to understand the effects of economic growth and policy interventions on poverty, there is a need to focus on the dynamics of poverty. Analysis of poverty dynamics can be beneficial in identifying some of the key micro-level constraints to poverty reduction. Using a dynamic perspective to identify the persistently poor and most vulnerable persons, and the characteristics associated with such poverty refines the understanding of the causes of poverty that are important for designing more effective policy interventions. Appropriate policies may differ fundamentally according to the nature of poverty of the target subpopulation. Krishna (2006) and Barrett (2005b), for example, describe how strategies and policies for helping people climb out of poverty ('cargo net' policies) differ from those that help them avoid falling into chronic poverty ('safety net' policies). In Kenya and other countries where formal social safety net systems are lacking, it is important to identify the different types of poverty in order to maximize the opportunities to achieve poverty reduction goals. Poverty dynamics is therefore fundamental to effective formulation of poverty reduction policies.

Longitudinal datasets on household living standards — income or consumption expenditures — have been used to investigate the characteristics and determinants of different types of poverty. Nevertheless, poverty dynamic studies based on household living standards are incapable of distinguishing between two different types of poverty transitions, namely *structural* and *stochastic transition*. Transitorily poor households exiting poverty in a longitudinal survey of household living standards may represent distinctly different experiences (Carter and Barrett, 2006). Some may have been initially poor due to bad luck, with their exit from poverty reflecting a return to an expected non-poor standard of living (*stochastic poverty transition*). For others the transition may be due to asset accumulation, or enhanced returns on existing assets (*structural poverty transition*). Similarly, transitorily poor households descending into poverty can represent different experiences. For some it could represent a return to an expected standard of living after a brief spell of good luck. For others, it could represent a structural shift caused by asset losses or a deterioration in returns on their assets brought on by changes in the broader economy. To address the distinction between these two types of poverty transitions, it is important to study the structural processes underlying poverty and poverty transitions.

The current understanding of poverty emphasizes ownership or access to productive assets as the building blocks for constructing one's own route out of poverty (Carter and May, 1999; Hulme and Shepherd, 2003). Productive assets have both direct and indirect (through their impact on the livelihood strategy choice) influence on income and thus

welfare. Carter and Barrett (2006) develop an asset-based approach to poverty analysis, building on previous studies by Carter and May (1999; 2001), that makes it possible to distinguish structural and stochastic transitions. However, poverty is multidimensional and manifests itself in various forms. No single approach can capture all the essential aspects of poverty. An asset framework on its own, therefore, may be inadequate to explain the complexity of poverty. In recent years, the use of mixed methods is a new and growing practice in poverty analysis and dynamics (e.g. Adato *et al.*, 2006; Lawson *et al.*, 2006).

This paper employs a mix of panel survey data and household event-histories to explore the nature of rural poverty dynamics in Kenya. The aim is to explore the extent to which economic mobility is stochastic or structural (due to successful asset accumulation or de-accumulation), and to examine the factors associated with the mobility patterns. First, we explore welfare mobility using economic transition matrices. Second, we analyze the determinants or correlates of household income and subsequently use the outcome from this analysis to decompose welfare transitions into stochastic and structural components. Third, we use household event-histories to explore characteristics of households in each of the identified structural transition categories.

Most of the earlier empirical studies of poverty dynamics using panel survey data in Kenya have typically measured the conventional chronic and transitory poverty (Muyanga *et al.*, 2007; Suri *et al.*, 2009). Other studies have used a participatory poverty appraisal method — the Stages-of-Progress (Krishna *et al.*, 2004; Kristjanson *et al.*, 2010), to look at poverty dynamics and reasons associated with poverty transitions. However, few have attempted to distinguish between structural and stochastic transitions. Consequently, it is likely that previous studies mask very different kinds of poverty with very different policy implications. In addition, individual poverty studies in Kenya largely remain confined to single disciplines and methodologies. The dual approach that we adopt contributes to a better understanding of poverty and the processes underlying poverty transitions than using either approach in isolation, and can thus lead to design of more effective interventions. This study, therefore, also contributes to the debate on the need to combine quantitative and qualitative research methods in poverty analysis — referred to as 'Q-Squared' (Kanbur, 2003).

The remainder of this paper is organized as follows. Section 3.2 gives a background to the study areas and describes the panel survey data. Section 3.3 discusses the poverty measures we use and section 3.4 then presents and discusses poverty transition patterns. Section 3.5 draws on the household event-histories to explore transition patterns. Section 3.6 concludes the paper.

3.2 Study sites and panel data description

We used panel data drawn from 354 rural households interviewed in 1997, 2000, 2004, 2007 and 2009, in combination with a participatory community-based poverty assessment method — the Stages-of-Progress (SOP). The first four waves of the panel data were collected by the Tegemeo Institute of Agricultural Policy and Development. Our study sites spread across four diverse agro-regional zones in Kenya, reflecting diversity in agro-ecological conditions, market access and population densities. These zones were part of larger panel covering eight regions in Kenya. The original sampling frame in 1997 was designed in consultation with the Kenya Central Bureau of Statistics. Households were randomly selected to represent eight diverse agro-regional zones, reflecting population distribution, excluding the pastoral areas. Agro-regional zones represent a cluster of areas with similar broad climatic conditions, agricultural activities and rural livelihood strategies. The four zones in which our study sites are located were randomly drawn from seven of the eight regions[21], and represent high potential and low potential agro-ecological zones.

The high potential sites were Central highland (CH) and Western transitional (WT) zones. Average annual rainfall in the CH ranges from 1400 to 2200 mm in the highland areas, with relatively good market access closer to the capital city of Nairobi. Tea and coffee are the main cash crops in this zone. The average population density in 1999 was estimated to be 197 persons per km^2. Poverty incidence is relatively low, estimated to be 33% in 2005/06. In WT, average annual rainfall ranges from 1600 to 1800 mm, with medium market access. High population pressure is a significant characteristic of this zone. Population density ranged from 433 to 508 persons per km^2 in 1999. Unlike CH, poverty incidence is high, over 50% of the population lived below the rural poverty line in 2005/06. Sugarcane is the main cash crop in this zone.

The low potential sites were Eastern lowland (EL) and Western lowland (WL) zones. The dominant agro-ecological zone in WL is lower midland, with sugarcane as the main cash crop in the relatively better potential areas. Population density in this area ranged from 257 to 549 persons km^2 in 1999. Poverty incidence is relatively high. Between 47-50% of the population in this area lived below the rural poverty line in 2005/06. The WL zone has the highest HIV prevalence rates in the country, the provincial prevalence rate of 15.3% in 2007 was more than double the national prevalence rate of 7.4% (NASCOP, 2009). The EL is drier

[21] Areas that were falling within the Rift Valley province were excluded from the sampling process as a result of security concerns, difficulties in following up households and mistrust among communities in these areas. The Rift Valley province was severely affected by the 2007/2008 post-election violence.

with a lower population density than other zones. The annual average rainfall for the sites within the EL zone ranged from 800 mm to more than 900 mm in the slightly wetter areas. Poverty rates are quite high. Over 60% of the population lived below the rural poverty line in 2005/06 (KNBS, 2007). The WL and EL zones are characterized by medium and low market access, respectively.

Of the original sample of 415 households across the selected zones in 1997, 394 households (95%) were re-interviewed in 2000, 383 (92%) in 2004, 364 (88%) in 2007, and 354 (85%) were re-interviewed in 2009.[22] The overall attrition rate is 14.7 %, and the annual attrition rate is very low, estimated to be 3.1%. Across the zones, the annual attrition rate ranged from 2.2% in the Eastern lowland to 4.1% in the Western lowland. The high annual attrition rate in the Western lowland is mainly due to HIV/AIDS. This attrition rate is reasonably low compared to similar surveys in developing countries (Alderman *et al.*, 2001). We estimated a probit model for probability of attrition using household characteristics. The results showed attrition to be largely random; only gender of the household head was significant. Male headed households were more likely to be re-interviewed. We focus on the 2000–2009 period because the data collected in 1997 was not as comprehensive as that in later years.

The longitudinal data collected information covering various aspects of household livelihoods in each survey year. Detailed information on crops grown and harvested, inputs used (seed, fertilizer, labour and land preparation costs), outputs and prices were collected at plot level for each household. Information on livestock holdings and other assets were also covered. Demographic and education data were collected for each household member in all rounds. Detailed household income data was collected, and all sources of income of all members of the household were captured. The major income categories were crop income (from revenues and net of input costs), livestock income (income from sale of livestock and livestock products less production costs), salaried income, remittances, business income, and income from casual labour and dividends. However, the panel does not contain detailed and comprehensive expenditure data, except for expenditures on purchased food items consumed. We use income as poverty indicator in this paper.

In addition, we used secondary data sources to generate information on spatial variables: distance of the households to the nearest markets, health facilities, good

[22] The distribution of the households across the study sites in the original sample in 1997 were 75 households in EL, 122 in WT, 111 in WL and 107 households in CH.

(motorable) road, proximity to major town and city. The spatial variables for each household were derived using the household's global positioning system (GPS) coordinates and overlaying these with existing secondary data for towns, markets, health facilities, cities and good (motorable) roads.

Table 3.1 summarizes the pooled sample characteristics of the panel variables. Household annual income per adult equivalent was KSh 30,140. Most households in the sample were male headed (74%). On average, the household head was found to be 58 years old. Less than a quarter of the household heads had achieved secondary education and above. One-third of adult household members had more than primary education. The average household size was five adult equivalent units. The average number of non-dependant household members was four, 30% of whom were males.

Table 3.1: Summary of panel variables (N=1402)

Variable	Mean	Std. Dev.
Annual household income (000' KSh)	131.15	154.28
Annual income per adult equivalent (000' KSh)	30.14	37.04
Mean age of household head	58.47	13.07
Male headed	0.74	0.44
Head has more than primary education	0.23	0.42
Household size (adult equivalents)	4.90	2.28
Labour size (non-dependants)	3.96	2.24
Proportion of male non-dependants	0.30	0.20
Proportion of adults with more than primary education	0.32	0.31
Land owned (acres)	4.34	4.62
Local dairy cattle	1.29	2.26
Improved dairy cattle	0.63	1.16
Non-dairy cattle	0.82	1.84
Sheep, goat and poultry value (000' KSh)	4.85	9.66
Plough (yes=1)	0.18	0.39
Spray pump (yes=1)	0.25	0.43
Irrigation equipment (yes=1)	0.07	0.26
Bicycle (yes=1)	0.48	0.50
Radio (yes=1)	0.86	0.35
Distance to nearest town (km)	20.94	9.45
Distance to nearest trading centre (km)	2.49	1.24
Distance to national trunk roads - highways (km)	64.10	33.08
Distance to nearest good road (all yr motorable) (km)	8.69	4.44
Distance to nearest public health facility (km)	2.88	2.49

Turning to assets holdings, land acreage averaged 4.3 acres per household. Forty four per cent of the households had local dairy cattle, 32% improved dairy cattle and 29% non-dairy cattle. More than half of the households had sheep and goats, and poultry. Average distance to the nearest town and city were 21 and 64 km, respectively. Most households are

less than 3 km away from trading centres and health facilities, while average distance to a good road was 9 km.

3.3 Measuring poverty

3.3.1 Consumption expenditure and income poverty measures

The estimation of the overall consumption expenditure poverty line takes into account food and basic non-food requirements. In Kenya, the food component has consistently been defined as the cost of consuming 2,250 calories per day per adult equivalent. The basic non-food components include health, education, fuel, clothing and transport for rural households. Surprisingly, while the official nominal overall poverty line in Kenya rose by only 26% between 1997 (KSh 1,239) and 2005/06 (KSh 1,562), the general price level as measured by the consumer price index (CPI) increased by over 100%. Thus, the official poverty lines seem to be rising slower than the general price level. The rural poverty lines for 2000, 2004, 2007 and 2009 were computed using the rate of change in official overall rural poverty lines between 1997 and 2005/06, and deflated using the Kenya GDP deflator (to convert the extrapolated poverty lines into real terms in KSh 2000). Deflating the poverty lines does not affect the assignment of households to poverty categories, as incomes are also deflated using the same deflator. The resulting real rural poverty lines (KSh per month/adult unit) used in subsequent analysis in this paper were KSh 1294 in 2000, KSh 1253 in 2004, KSh 1089 in 2007 and KSh 1003 in 2009.

In estimating welfare mobility, a distinction is made between relative and absolute mobility. Relative mobility examines changes in the rank of individual households between two time periods and is thus concerned with the ability of households to move up (or down) in welfare ranking. Absolute mobility examines absolute changes in welfare between two time periods and is concerned with changes in absolute well-being (and poverty). In this paper, we look at absolute mobility in four distinct periods: 2000-2004, 2004-2007, 2007-2009, and 2000-2009. We use transitions in adult-equivalent incomes to depict economic mobility. The transitions offer a simple way of summarizing inter-temporal movement relative to an income poverty line. Household-level poverty transition matrices were constructed based on scaled household income per adult equivalent (per adult-equivalent income divided by the rural poverty line) ranks. Transition matrices typically measure what is conventionally referred to as chronic and transitory poverty, which Carter and Barrett (2006) refer to as the second generation poverty analysis. However, it fails to distinguish structural

from stochastic transitions. For example, does an observed amount of upward transition reflect asset accumulation and/or increased returns on the assets held by the poor (*structural transition*)? Or does it reflect a large amount of structural stagnation that is masked by transitions of households that already possess assets and enjoy expected returns that predict a non-poor standard of living on average?

3.3.2 Developing asset-based poverty measures

We used the asset-based approaches to poverty measurement (Carter and May, 1999; Carter and May, 2001; Carter and Barrett, 2006), to decompose poverty into structural and stochastic components. To do this, we first construct an asset-based poverty threshold ($\underline{c}$), an equivalent of the standard monetary poverty lines discussed above. A person, *i,* is said to be poor in period *t* if:

$$c_{it} \leq \underline{c} \qquad (1)$$

where c_{it} is the realised level of wellbeing. The identification of the threshold requires estimation of a regression function that relates income or consumption of household *i* at time *t* (c_{it}) to the bundle of assets held by the household at that time (A_{it}). We estimate $\hat{c}(\boldsymbol{A})$, which is the expected income level, $\hat{c}$, for a household given its assets, $\boldsymbol{A}$. This estimation is subsequently used to explore the structural or asset basis of poverty by developing 'asset poverty lines', ($\underline{A}$), defined as:

$$\underline{A} = \{A \mid \hat{c}(\boldsymbol{A}) = \underline{c}\} \qquad (2)$$

Thus $\underline{A}$ is the combination of assets that yield an expected level of well-being exactly equal to the single period poverty line. In our case, $\underline{A}$ is the combination of assets that yield an expected level of income exactly equal to the rural poverty line for each period (Figure 3.1). In any time period, a household is *stochastically poor* if it has assets worth at least $\underline{A}$, yet its realized income falls below the income poverty line ($c_{it} \leq \underline{c}$), for example, a household at point *D* (Figure 3.1). Equally, a household is *structurally poor* if its asset holdings is less than $\underline{A}$, and its realized income falls below the income poverty line ($c_{it} \leq \underline{c}$), for example, a household at point *C* (Figure 3.1). The non-poor can be similarly disaggregated into *structurally non-poor* (point *E*) and *stochastically non-poor* (point *B*) (Figure 3.1).

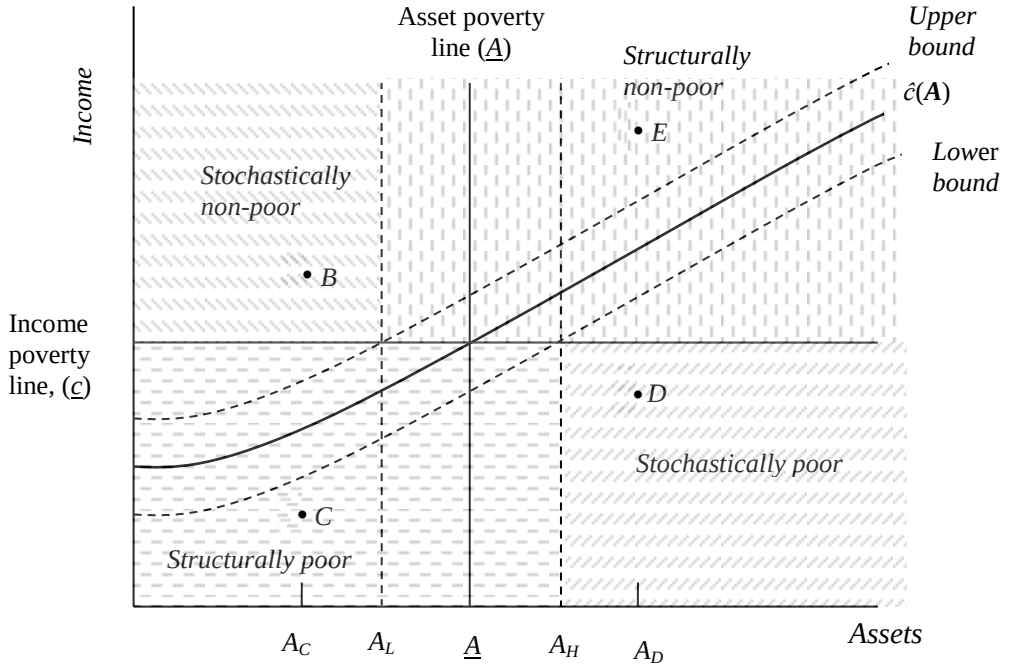

Figure 3.1: Income and asset poverty lines

To account for imprecision in estimation of $\hat{c}_{it}(\boldsymbol{A}_{it})$**,** we constructed a 95% confidence interval band (upper and lower bounds) of $\hat{c}_{it}(\boldsymbol{A}_{it})$, and used the interval band to identify stochastically poor and stochastically non-poor households. We defined a household as stochastically poor if c_{it} falls below the poverty line (PL_t), and the confidence interval band around the estimate ($\hat{c}_{it}$), falls completely above PL_t:

$$c_{it} < PL_t \quad \text{and} \quad \textit{lower bound of } \hat{c}_{it} > PL_t \qquad (3)$$

Stochastically poor households, therefore, have assets $\geq A_H$ yet their realised income $c_{it} < \underline{c}$ (Figure 3.1). By using the confidence bands, we are confident that these households are indeed above each period's asset poverty line ($\underline{A}$ in Figure 3.1), given that $\hat{c}_{it}$ may not be estimated precisely. This criterion for identifying stochastically poor households implies that households with predicted welfare level ($\hat{c}_{it}$) above the PL_t, but with a confidence band of their predicted level of well-being below PL_t will not be classified as stochastically poor.

Similarly, households were identified as stochastically non-poor if c_{it} falls above PL_t, and the confidence interval band estimate of $\hat{c}_{it}$ falls completely below PL_t:

$$c_{it} > PL_t \quad \text{and} \quad \textit{upper bound of } \hat{c}_{it} < PL_t \qquad (4)$$

Stochastically non-poor households, therefore, have assets $\leq A_L$ yet their realised income $c > \underline{c}$ (Figure 3.1).

We used definitions (3) and (4) to decompose welfare transitions into stochastic and structural components. We identified three stochastic transition classes from the definitions: *stochastically poor, stochastically upward mobile,* and *stochastically downward mobile*. The *stochastically poor* are households that are observed to be below the poverty line based on their realized income in both periods, but whose asset levels are such that they are expected to be above the poverty line in both periods (e.g. point D in Figure 3.1).[23] The *stochastically upward mobile* are households that have moved from below to above the poverty line, but still lack the assets to generate sufficient income to be non-poor. This transition is illustrated as movement from point C to point B (Figure 3.1). The *stochastically downward mobile* are households that have moved from above to below the poverty line, but have the assets to generate sufficient income to be non-poor in both periods, movement from point E to D (Figure 3.1). Households for whose transitions are not accounted for by stochastic factors, but by changes in assets are classified as structurally mobile, resulting in four structural transition classes: *structurally poor, structurally upward mobile, structurally downward mobile and twice non-poor*. A household that moves from point E to point C, for example, would have made a structural transition below the poverty line due to asset losses from A_D to A_C (Figure 3.1) — *structurally downward mobile*.

The sustainable livelihood framework (SLF) provides a way of exploring the relationship between assets and income. A core feature of the SLF is an analysis of the different types of assets upon which individuals draw to build their livelihoods. These are natural, social, human, physical, financial and geographical capital (Ashley and Carney, 1999; Bebbington, 1999). The livelihoods framework, however, does not provide explicit guidance as to which assets and asset indicators are critical correlates of income in different settings or systems.

Various methods have been used to map assets into incomes or livelihoods (see Adato *et al.*, 2006; Barrett *et al.*, 2006; Carter and May, 1999). Given the complexity of rural livelihoods and imperfect markets, the asset-livelihood mapping is not a linear relationship (Carter and May, 1999). The various methods permit the creation of asset indices in which the weights depend on the presence or absence of complementary assets in the household's asset portfolio. We used a flexible functional form specification that permits marginal returns to assets to both diminish (or increase) with the level of the assets, as well as to be influenced

[23] Structural processes that are not easily captured or measured in panel surveys such as multiple shocks, may prevent these households from effectively utilizing their assets to generate income. Also households that rent out land to others may fall into this category.

by holdings of other assets (for example, marginal returns to capital assets may be boosted by the presence of educated labour or exogenous income). Each period's expected income (Y_{it}) is a function of a vector of productive assets (X_{it}) used to generate income.

The choice of explanatory variables was guided by the SLF and previous similar studies, taking into account data availability. Four key livelihood assets were used as determinants of household income:

- Human capital: labour (non-dependent household members, proportion of non-dependent males), education (proportion of adults with more than primary education, education level of the head), age and gender of the household head. We defined non-dependents as individuals aged 15 to 64 years.
- Natural capital: land owned (acres), livestock (improved dairy cattle, unimproved dairy cattle, non-dairy cattle, and value of small ruminants and poultry).
- Physical capital: Farm equipment dummies (bicycles, plough, radio and irrigation equipment).
- Geographical capital: distance to the nearest city, distance to a motorable road, distance to the nearest health facility, distance to the nearest town, distance to the nearest market centre, and zonal dummies.

We lacked exogenous variables to capture financial and social capital. Financial capital, however, is closely linked to some of the geographical assets such as distance to the nearest market centre and nearest major town, where most financial institutions are located. Our social capital indicators — membership and participation in different types of groups (producer cooperatives, savings and credit cooperatives, community based organizations, and informal self-help groups) are likely to be endogenous.

We made efforts to reduce problems of endogeneity and multicollinearity in our choice of explanatory variables. However, we appreciate the inherent difficulties in entirely eliminating these econometric problems. Virtually all the geographical assets are predetermined (exogenous). Human capital assets and land are relatively stable over time and are likely to be predetermined as well. Moreover, many of the explanatory variables such as livestock holdings, level of education were measured at the beginning of the period under investigation. Other physical capital assets are fixed, with minimal variation within a given year.

We used panel data econometric estimation techniques. The advantages of using panel data over cross-sectional data are outlined in Verbeek (2004) and Baltagi (2005). We use panel data estimation techniques to deal with unobserved heterogeneity across households.

The "fixed-effects" (FE) model allows one to control for the potentially large number of unmeasured explanatory variables and appropriate if the explanatory variables are correlated with individual (unit-specific) effects (α_i). The FE model, however, has a major drawback in estimating time-invariant variables with unit effects. The FE model uses only the within variance for estimation and disregards the between variance, and therefore does not allow the estimation of time-invariant variables (Baltagi, 2005; Verbeek, 2004). A second drawback of the FE model results from its inefficiency in estimating the effect of variables that have very little within variance (Plümper and Troeger, 2007). In practice, most applied researchers interested in time-invariant variables have estimated empirical models using "random effects" (RE) models or by pooled OLS. Pooled OLS and RE, however, are inconsistent and biased when explanatory variables are correlated with the unit effects. The geographical assets such as distance to major town, distance to nearest trading centre and zone dummies have no variation. Other assets such as physical capital have little variation. Yet these assets are important determinants of incomes.

We used an alternative estimator, the ''fixed effects vector decomposition'' (fevd) model as suggested by Plümper and Troeger (2007). The fevd model allows estimation of time-invariant variables and is more efficient than the FE model in estimating variables that have very little longitudinal variance. The fevd estimator decomposes the unit FE into an unexplained part and a part explained by the time-invariant or the rarely changing variables. A detailed discussion of the fevd procedure is presented in Plümper and Troeger (2007), and we briefly describe the three steps involved. First, the procedure estimates a standard FE model to obtain estimates of unit effects ($\hat{u}_i$). The estimated unit effects ($\hat{u}_i$) include all time-invariant variables, the overall constant term, and the mean effects of the time-varying variables. Second, the procedure splits the unit effects into an explained and an unexplained part by regressing the estimated unit effects ($\hat{u}_i$) from the first stage on the observed time-invariant and or rarely changing explanatory variables. Third, the procedure performs a pooled-OLS estimation of the baseline model by including all explanatory variables (time-variant, time-invariant variables and the rarely changing variables) without the unit effects, but includes the unexplained part of the FE vector from the second stage. The third stage allows for computation of correct standards errors (SEs), and can be used to adjust for serial correlation of errors. To correct for heteroscedasticity and serial correlation, the models should be estimated using robust standard errors (in stages 1 and 3).

We went through a considerable process of testing the relationships between the explanatory variables to determine the model functional form (linear or quadratic). The

Akaike information criterion (AIC), the Bayesian information criterion (BIC), and the joint F-test were used to identify the appropriate functional form and final set of predictor variables. We estimated returns to individual assets using a polynomial expansion of the basic assets, including interaction terms in some cases in the final model. As discussed previously, this specification permits marginal returns to assets to both decrease (or increase) with the level of the assets, and to be influenced by holdings of other assets. Returns were allowed to vary by year, thus we included the period-dummies and a time trend. To control for heteroskedasticity and or autocorrelation, and other types of misspecification, we estimated the model using robust or sandwich estimator of variance (in stages 1 and 3).

The explicit model is specified as:

$$Y_{it} = \alpha_i + \sum_j \beta_j X_{it}^j + \sum_k \sum_l \gamma_{kl} X_{it}^k X_{it}^l + \sum_m \delta_m \left(X_{it}^m\right)^2 + \sum_t \lambda_t t_t + \upsilon t + \varepsilon_{it} \qquad (5)$$

where Y_{it} is measured annual total household income[24], X is a vector of assets used to generate income, and j, k, l and m denote the individual assets ($k \in j$, $l \in j$, $l \neq k$, *and* $m \in j$), t_t represents period-specific dummies, t is a time trend, and ε_{it} is an idiosyncratic error term. The coefficients on the period-specific dummies summarize the exogenous fluctuations in expected rates of return holding assets stocks constant (Barrett *et al.*, 2006). The interest with these regressions is less in identifying the precise marginal returns to any individual assets, and more with deriving a set of weights that reliably predicts the impact of an asset bundle on expected income (Adato *et al.*, 2006).

3.4 Income sources, trends and poverty transitions

We first present an overview of income sources and trends, poverty trends, and poverty transitions. We conclude with results from the estimation of determinants of income, and decomposition of poverty transitions into stochastic and structural components.

3.4.1 Income sources and trends

Total household income comprised net crop income, net livestock income, non-farm business income, and salary and remittances as shown in Figure 3.2. Across all the years, crop income accounted for a large proportion of household income (50%). Livestock income accounted for 11%, business for 17%, and salaries and remittances for 22%. Thus, 62% of income was farm-based while the rest was from non-farm sources, including remittances. However, year

[24] Total household income used instead, as assets are measured at the household and not individual or per capita level.

2000 was a good year, characterized by a general increase in crop income. Crop income accounted for 72% of total household income in 2000.

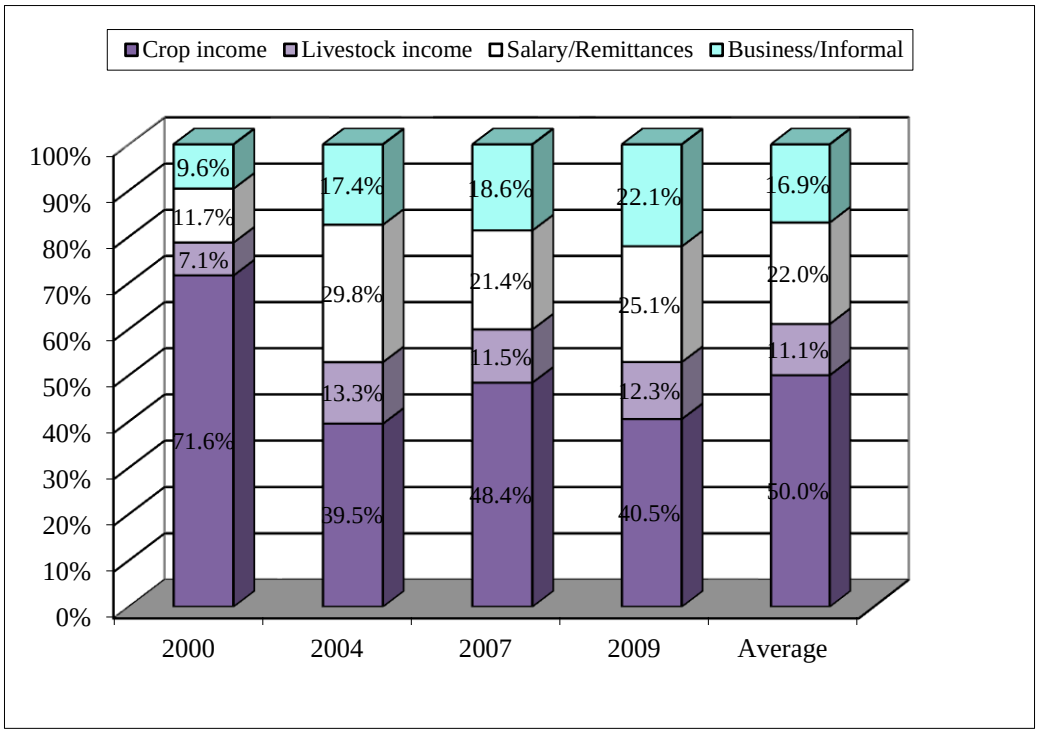

Figure 3.2: Trends in average sources of income (2000–2009)

Figure 3.3 shows trends in real per capita incomes between 2000 and 2009.[25] Overall, real incomes have been declining. Real annual per capita income in 2000 was more than double that of 2009. The income decline over the period 2007–2009 is a reflection of the rapidly rising cost of living in Kenya, coupled with the effects of the post-election violence shock.[26] Similar trends were observed across the zones with minor deviations observed in the Western lowland and Western transitional zones. Our findings are consistent with declining real GDP per capita growth rates in Kenya over the period 2000–2002, but inconsistent with GDP growth rates over the period 2003–2007. While our results show that real rural incomes stagnated over the period 2004–2007, Kenya's economy grew over the period 2003–2007, with real GDP annual growth rate increasing from 3% in 2003 to 7% in 2007. The results suggest that overall macroeconomic growth over the period 2003–2007 did not trickle down to the rural population. This could be partly explained by the high levels of inequality —

[25] We used the Kenya GDP deflator to convert the nominal incomes to real incomes in 2000 KSh.
[26] Refers to the political crisis in early 2008 following the disputed presidential elections of December 2007. Over 1,200 people were killed and over 300,000 displaced from their homes. The crisis adversely affected economic activity in many sectors of the economy, but mostly tourism and agriculture.

specifically the significant rural-urban divide. Individuals in urban areas earn higher incomes than those in rural areas. In addition, the rural areas are dominated by the informal sector and smallholder agricultural production for subsistence, which are often less connected to markets. The growth in GDP has also been confined mainly to particular sectors of the economy. The services sector, for example, contributed about 45% of growth in GDP, whereas the agricultural sector contributed about 18% (KIPPRA, 2009).

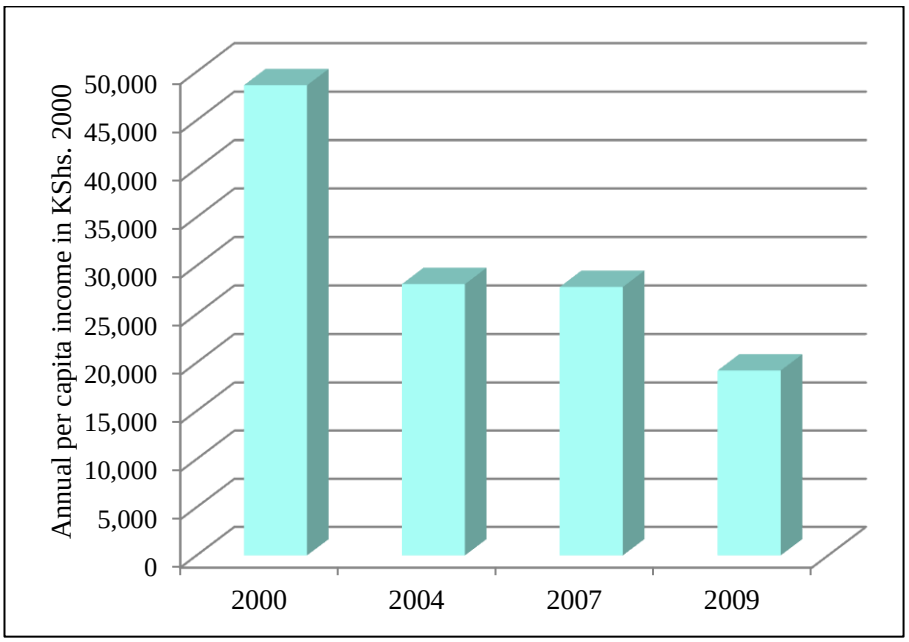

Figure 3.3: Trends in average annual per capita real income (2000–2009)

3.4.2 Poverty trends and poverty transitions

We start by exploring the extent to which households experienced poverty during the four observations (Table 3.2). The number of years is not necessarily consecutive. For instance, a household experiencing two years of poverty during the four year period might experience them in the second and fourth years. Almost 70% of the households experienced poverty. One-fifth, however, experienced poverty only for one year, whereas less than half experienced poverty for two years or more. Only 11% of the households consistently had incomes below the poverty line in all the four years of the panel. These findings suggest that income poverty is predominantly transitory.

Table 3.2: Distribution of households experiencing different periods of poverty

Number of years in poverty	Number of households	Percent of households
0 (i.e. never poor)	109	32
1	75	22
2	69	20
3	54	16
4 (i.e. always poor)	36	11

To explore poverty trends, we used the Foster-Greer-Thorbecke (FGT) poverty measures: poverty headcount, poverty gap, and poverty severity (Table 3.3). The results show a variable but increasing trend in overall poverty with regard to the headcount, gap and severity. Overall, the poverty headcount (proportion of households with welfare levels below the poverty line) increased from 28% in 2000 to 52% in 2009. The poverty gap (average shortfall below the poverty line) and poverty severity almost doubled over the same period. The sharp increments in poverty headcount, poverty gap and poverty severity in 2009 are due to a combination of shocks arising from effects of the global downturn, adverse agro-climatic conditions in Kenya in 2008, rising cost of living and probably the effects of the post-election violence.

Table 3.3: Poverty trends in Kenya: 2000 to 2009

Poverty indicator	2000	2004	2007	2009
Poverty Headcount (α =0)	0.28	0.39	0.32	0.52
Poverty Gap (α =1)	0.14	0.19	0.12	0.28
Poverty Severity (α =2)	0.10	0.12	0.06	0.18

The FGT measure, P(α), is defined as: $P(\alpha) = \frac{1}{\mathrm{N}} \sum_{i=1}^{\mathrm{N}} \left(\frac{z - y_i}{z} \right)^{\alpha} I(y_i < z)$ where N is the population size, y_i is the level of welfare (income or consumption expenditures) of the *i*th household, z is the poverty line, I(.) is an indicator function with a value of 1 when the constraint is satisfied and 0 otherwise, and α is the poverty sensitivity indicator.

Turning to poverty transitions, we constructed household-level poverty transition matrices using the rural poverty lines (PL) discussed in section 3.3.1. We defined five absolute levels of welfare — *y* (ratio of monthly income per adult equivalent to the poverty line): $y \leq 0.5$ PL, 0.5 PL < $y \leq$1 PL, 1 PL <$y \leq$1.5 PL, 1.5 PL < $y \leq$ 2.5 PL, $y >$ 2.5 PL. We used these welfare classes to establish which households were poor in each survey period, which had exited poverty from one round to the next, which had fallen into poverty between survey rounds, and which had consistently stayed non-poor.

Table 3.4 presents the findings of the poverty transition matrices, reflecting the per cent of households in each welfare class (given by the rows of Table 3.4) that were observed in the following year's welfare classes (the columns of Table 3.4). The results cover four

distinct periods: 2000–2004, 2004–2007, 2007–2009, and 2000–2009. The main diagonal elements of the matrices show the percentage of households in each row that did not change their welfare position. The initial distribution of the sample across each of the welfare categories are shown in the last column of Table 3.4. Apart from the well-off ($y > 2.5$ PL) and the poorest ($y \leq 0.5$ PL) classes, none of the main diagonal elements exceed 40%. Therefore, there is substantial mobility among the welfare classes. Very few households, however, transitioned from the bottom welfare classes to the top welfare classes or vice versa in subsequent years.

Over the period 2000–2004, about 60% of the poor households (with income below the poverty line) in 2000 remained below the poverty line in 2004 (Table 3.4). Less than one-third of households in the next welfare class (1 PL $< y \leq 1.5$ PL) moved to higher welfare groups in 2004. About 60% of households in the next higher levels of welfare classes ($y > 1.5$ PL) moved to lower welfare classes in 2004. Similar trends were observed over the period 2004–2007 for poor households (with income below the poverty line) in 2004, more than half of these households remained below the poverty line in 2007.

For poverty transitions over the period 2007–2009, we find limited mobility for poor households and those in the top welfare class. About 82% of the poor households in 2007 with income below the poverty line remained below the poverty line in 2009. More than half of the very poor households in 2007 ($y \leq 0.5$ PL) remained at the same level in 2009. Overall, our results show more downward than upward movements across welfare classes in all periods.

Welfare transitions over the entire nine years (2000–2009) shows that a large number of households remained at relatively the same welfare level in 2009 as they were in 2000. Yet, this long period trend masks significant movements across welfare levels in intermediate periods.

Table 3.4: Measured income poverty transition matrix (per cent of row), using deflated poverty lines for each year (in 2000 KSh)

2000 Scaled per capita income classes	2004 Scaled per capita expenditure classes					
	$y \leq 0.5$ PL	$y \leq 1$ PL	$y \leq 1.5$ PL	$y \leq 2.5$ PL	$y > 2.5$ PL	Total
$y \leq 0.5$ PL	41.7	27.1	25.0	4.2	2.1	14.0
$y \leq 1$ PL	22.9	27.1	20.8	22.9	6.3	14.0
$y \leq 1.5$ PL	29.6	18.2	20.5	22.7	9.1	12.8
$y \leq 2.5$ PL	16.9	21.5	21.5	27.7	12.3	19.0
$y > 2.5$ PL	8.0	13.8	15.9	21.0	41.3	40.2
Total	19.2	19.5	19.5	20.4	21.3	100
2004 Scaled per capita income classes	2007 Scaled per capita expenditure classes					
	$y \leq 0.5$ PL	$y \leq 1$ PL	$y \leq 1.5$ PL	$y \leq 2.5$ PL	$y > 2.5$ PL	Total
$y \leq 0.5$ PL	25.0	35.3	17.7	19.1	2.9	19.3
$y \leq 1$ PL	21.7	24.6	24.6	21.7	7.3	19.6
$y \leq 1.5$ PL	5.9	26.5	20.6	27.9	19.1	19.3
$y \leq 2.5$ PL	2.7	17.8	20.6	28.8	30.1	20.7
$y > 2.5$ PL	1.3	4.0	10.7	14.7	69.3	21.3
Total	11.1	21.3	18.7	22.4	26.6	100
2007 Scaled per capita income classes	2009 Scaled per capita income classes					
	$y \leq 0.5$ PL	$y \leq 1$ PL	$y \leq 1.5$ PL	$y \leq 2.5$ PL	$y > 2.5$ PL	Total
$y \leq 0.5$ PL	56.4	30.8	7.7	2.6	2.6	11.1
$y \leq 1$ PL	42.7	37.3	10.7	9.3	0.0	21.3
$y \leq 1.5$ PL	28.8	31.8	21.2	16.7	1.5	18.7
$y \leq 2.5$ PL	20.3	20.3	19.0	21.5	19.0	22.4
$y > 2.5$ PL	6.4	10.6	9.6	23.4	50.0	26.6
Total	26.9	24.7	13.9	16.4	18.1	100
2000 Scaled per capita income classes	2009 Scaled per capita income classes					
	$y \leq 0.5$ PL	$y \leq 1$ PL	$y \leq 1.5$ PL	$y \leq 2.5$ PL	$y > 2.5$ PL	Total
$y \leq 0.5$ PL	56.3	29.2	2.1	10.4	2.1	14.0
$y \leq 1$ PL	35.4	31.3	14.6	14.6	4.2	14.0
$y \leq 1.5$ PL	34.1	25.0	22.7	11.4	6.8	12.8
$y \leq 2.5$ PL	26.2	27.7	15.4	18.5	12.3	19.0
$y > 2.5$ PL	11.6	19.6	13.8	19.6	35.5	40.2
Total	26.8	24.8	13.7	16.3	18.4	100

3.4.3 Econometric estimates of household income

Constructing an asset-based poverty threshold requires the estimation of a regression function that relates household income to the bundle of assets held by the household as discussed earlier (section 3.3.2). Table 3.5 presents results of the regression model of household income on indicators of human, natural, physical and geographical capital, and a set of control variables. At least one variable from each of the four asset categories explained variation in income levels across households. The last column of Table 3.5 shows the per cent change, computed at mean incomes, for increasing the independent variable by one standard deviation for continuous variables, and proportions or a unitary change for dummy variables.

Within the human capital assets, education and gender of the household head had significant impacts on income. Households headed by educated heads (with more than primary education) and with a high proportion of educated adults (with more than primary education) had significantly higher incomes. Evaluated at the mean incomes, households headed by educated heads *ceteris paribus* exhibited a coefficient of real income that was 17% higher. Similarly, real income was 4% higher for households with an additional proportion of educated adults equal to its standard deviation. Higher level of education leads to the ability to find formal wage or salaried non-farm employment. Moreover, the steady cash flow provided by salaried employment can facilitate on-farm investment in agricultural intensification (for example increased use of mineral fertilizers and organic soil inputs such as manure and improved seeds). As a consequence, the educated households acquire an absolute advantage in both farm and non-farm productivity.

Surprisingly, after controlling for other factors, male-headed households had significantly lower incomes than female-headed households. Real income was 11% lower for male-headed households (Table 3.5). Other human capital asset indicators such as labour size — number of non-dependants and fraction of non-dependant males, had no significant effect on incomes.

As expected, natural capital assets had significant effects on household incomes. Livestock assets (improved dairy cattle, local dairy cattle, non-dairy cattle and small ruminants), and non-dairy cattle in combination with ploughs, significantly and positively influences income. Evaluated at the mean incomes, real income was 11% higher for households with additional local dairy cattle equal to its standard deviation. Similarly, real incomes were 14% higher for households with additional improved dairy cattle equal to its standard deviation; 13% higher with additional non-dairy cattle equal to its standard

deviation; and 22% higher for households with additional value of shoats equal to its standard deviation. Households owning non-dairy cattle and ploughs often rent these at a fee to other households for land preparation during the cropping seasons. These assets, therefore, can be used both within the households for production purpose and as business assets for earning extra income. These findings underscore the importance on-farm diversification through livestock farming and intensification of livestock systems as a pathway out of poverty.

The effect of land owned on incomes differs with the amount of land. Land owned has a negative marginal impact on incomes. Evaluated at mean incomes, real income was 4% lower with additional land acreage equal to its standard deviation. The marginal effect of land on incomes, however, is positive for households owning at least six acres of land. This finding suggests that land is not a constraint limiting the potential for higher incomes in the study sites. More land does not necessarily lead to higher incomes, and households with less land may be able to compensate by obtaining higher productivity or by pursuing off-farm activities. Land quality and other land attributes might be important as well. Therefore, it implies that the use and productivity of land is more important to incomes than the amount of land owned. For example, imperfect credit markets where access to capital is 'wealth biased' imply that assets such as land can only be effectively utilized to generate incomes when they are matched by holdings of other assets such as own-financial capital (Carter and May, 1999). Thus households who cannot self-finance investments in their farms through such means as salaried non-farm employment cannot put their agricultural land and labor resources to their full productive use.

The ownership of irrigation equipment, an indicator of physical capital, had a positive effect on income. Irrigation equipment increases land productivity. The effect of owning irrigation equipment was unexpectedly high, leading to 60% increase in real income. In contrast, ownership of a bicycle had no influence on incomes, likely due to the fact that ownership is mainly concentrated in the western zones where bicycles are used as taxis (*boda boda*), which are characterized by very low returns. Equally, ownership of other physical assets such as spray pumps and radio had marginal effects on incomes.

Table 3.5: Fixed effect vector decomposition estimates for household income ('000 KSh)

Variables	Coefficient	Std. error	% change[a]
Human capital			
Age of head	0.477	1.20	
Age of head squared	-0.013	0.01	
Male household head	-14.623**	5.72	-11
Household head education (more than primary education)	21.938**	9.64	17
Labour size (non-dependants)	6.095	5.30	
Labour size squared	0.658	0.52	
Fraction of non-dependant males	7.165	24.10	
Fraction of non-dependant males squared	3.043	19.25	
Fraction of adults with more than primary education	59.801**	26.02	4
Fraction of adults with more than primary education squared	-45.924	29.77	
Natural capital			
Land owned (acres)	-3.816*	1.95	-4
Land owned squared	0.314****	0.09	
Local dairy cattle (number)	7.826****	2.53	11
Local dairy cattle squared	-0.337**	0.15	
Improved dairy cattle (number)	20.200****	5.62	14
Improved dairy cattle squared	-1.830****	0.70	
Non-dairy cattle (number)	9.042****	3.24	13
Non-dairy cattle squared	-0.629****	0.19	
Sheep, goats and poultry value	0.002****	0.00	22
Sheep, goats and poultry value squared	-0.000****	0.00	
Non-dairy*land interaction	-1.748****	0.33	
Non-dairy*plough interaction	12.202****	4.40	
Physical capital			
Plough dummy	-3.984	12.22	
Spray pump dummy	13.160*	7.05	
Irrigation equipment dummy	78.220****	19.67	60
Bicycle dummy	-1.805	6.83	
Radio dummy	13.796*	8.08	
Geographical capital			
Distance to nearest major town (km)	1.079**	0.44	8
Distance to nearest trading centre (km)	-6.084****	2.33	-6
Distance to nearest health facility (km)	-2.833**	1.20	-5
Distance to nearest good road (all yr motorable) (km)	-1.911**	0.91	-6
Distance to nearest city (km)	-1.484****	0.30	-37
Western transitional (WT)	-9.84	18.75	
Western lowland (WL)	-155.649****	30.06	
Central highland (CH)	33.859**	14.25	
Period effects			
Time effect	-15.613****	1.05	
Year 2004	-33.954****	6.04	
Year 2007	7.727	5.26	
Residual from second stage regression (vhat)	1.001****	0.09	
Constant	291.021****	52.52	

[a]% changes are computed at mean incomes for increasing the independent variable by one standard deviation for continuous variables and proportions or a unitary change for dummy variables.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Turning to the influence of location on incomes, we found that incomes were significantly higher in the high agriculture potential zone of the Central highland (CH), and significantly lower in the Western lowland (WL) compared to Eastern lowland (EL). Better agro-climatic conditions, including higher rainfall and altitude (where there are fewer pest and diseases due to lower temperatures) have an indirect positive effect on income because they stimulate more remunerative livelihood strategies. These findings support the hypothesis that households in areas with high agricultural potential are likely to have more livelihood options (on-farm and off-farm) open to them resulting in higher incomes. Distance to a major city and trading centre (indicators of market access), health facility, and good road had a negative significant influence on income, so households further from markets, hospitals and those not linked up by good road all suffer in terms of welfare. Evaluated at the mean incomes, real incomes were 37% lower for households with an additional distance to the city equal to its standard deviation. Similarly, real income was 6% lower for households with additional distance to market centre equal to its standard deviation (Table 3.5). Better roads and market access are also expected to favour production of high-value products and opportunities for rural non-farm activities (largely small business activities) that will contribute to higher incomes. Surprisingly, we found that distance to a major town had a positive and significant effect on household income. Real income was 8% higher for households with additional distance to a major town equal to its standard deviation.

The time trend variable indicates that real incomes were significantly higher in 2000 than in subsequent years, similar to our findings from the observed declining trends in real incomes (Figure 3.3). Overall, our model explained 62% of the variation in household incomes. The detailed percentage changes of selected significant variables calculated at the sample means by zone are presented in Table 3.6. The results show differential impacts on income of different assets across the different zones. For example, average real income in male-headed households was almost twice as low (22%) in the Western lowland compared to the other regions. Geographical assets (distance to nearest city, major town, trading centre, health facility, and good road) have higher impacts in the western zones than in other zones (CH and EL).

Table 3.6: Per cent change of selected significant variables at sample means by zone

Variables	Eastern lowland	Western transitional	Western lowland	Central highland
Male household head	-10	-11	-22	-8
Household head education (secondary & above)	15	16	33	13
Fraction of adults w/t >=secondary education	2	5	10	2
Land owned (acres)	-3	-1	-16	-2
Local dairy cattle	10	8	25	0
Improved dairy cattle	11	15	15	9
Non-dairy cattle	8	16	29	2
Sheep, goats and poultry value	8	7	31	28
Irrigation equipment dummy	53	57		45
Distance to nearest major town (km)	2	3	18	2
Distance to nearest trading centre (km)	-3	-6	-11	-3
Distance to nearest health facility (km)	-4	-7	-7	-3
Distance to nearest good road (km)	-6	-5	-9	-3
Distance to nearest city (km)	-24	-5	-24	-4

3.4.4 Decomposing welfare transitions

The poverty transition matrices in Table 3.4 do not distinguish structural from stochastic transitions. In this section, we decompose poverty transitions into stochastic and structural components using definitions (3) and (4) as discussed earlier (in section 3.3.2).

The majority of households that escaped poverty over the period 2000–2004 experienced stochastic movements, with only 18% escaping poverty through asset accumulation (Table 3.7). Consequently, the upward mobility of this group of households can be largely attributed to a return to their expected level of income rather than successful asset accumulation (or escape from structural poverty), or by a spell of good luck — a lucky break. Of the households declining into poverty, 53% experienced stochastic transitions, whereas 47% were potentially structurally poor in 2004. Looking at the twice poor households, we find that 9% were stochastically poor. We therefore estimate an upper bound of 91% of the twice poor to be structurally poor.

We subsequently examined poverty transitions over the period 2004–2007. Seventy per cent of households rising from poverty experienced stochastic transitions, and only 30% (upper bound) escaped poverty through asset accumulation (Table 3.7). Of the households declining into poverty, 34% were due to stochastic transitions, while over 66% were structural transitions. For the twice-poor households, we found that 11% were stochastically poor and thus we estimate that almost 90% of the twice-poor households were structurally poor.

Table 3.7: Decomposing poverty transitions into stochastic and structural components (per cent of households) [a]

2000	**2004**	
	Poor	Non-poor
Poor	*16.6% Twice poor* – 8.8% stochastically poor – 91.2% structurally poor	*11.4% Rising from poverty* – 82.1% stochastically mobile – 18% structurally mobile
Non-poor	*22.2% Declining into poverty* – 52.6% stochastically mobile – 47.4% structurally mobile	*49.9% Twice non-poor*[b]
2004	**2007**	
	Poor	Non-poor
Poor	*20.7% Twice poor* – 11% stochastically poor – 89% structurally poor	*18.1% Rising from poverty* – 70.3% stochastically mobile – 29.7% structurally mobile
Non-poor	*11.6% Declining into poverty* – 34.2% stochastically mobile – 65.9% structurally mobile	*49.6% Twice non-poor*[b]
2007	**2009**	
	Poor	Non-poor
Poor	*26.6% Twice poor* – 8.5% stochastically poor – 91.5% structurally poor	*5.7% Rising from poverty* – 65% stochastically mobile – 35% structurally mobile
Non-poor	*24.9% Declining into poverty* – 40.9% stochastically mobile – 59.1% structurally mobile	*42.8% Twice non-poor*[b]

[a]For each transition period, we refer to the conventional chronic poor as *twice poor* and never poor *as twice non-poor*. [b]With the exception of transitions over the period 2007–2009, where two percent of the twice non-poor households were stochastically non-poor, all the twice non-poor households were structurally non-poor.

Similarly, a large proportion of households rising from poverty over the period 2007–2009 experienced stochastic movements (65%), while 35% (upper bound) escaped poverty through asset accumulation. Of the households declining into poverty over the period 2007–2009, 41% were stochastic transitions. About 60% became structurally poor in 2009. Looking at the twice poor households, 9% were stochastically poor, thus slightly over 90% of the twice poor were structurally poor.

The results from the analysis of structural transitions, however, denote the upper bound limits of potentially structurally mobile households, and thus should be interpreted with caution. We were unable to clearly identify whether some of these structurally mobile households had experienced good or bad luck in the previous or later years. For example, of the 47% structurally downward mobile households over the period 2000–2004, it is not

possible to clearly identify whether some experienced good luck in 2000 and simply regressed to their expected level of well-being below the poverty line in 2004.

In summary, our analysis of poverty dynamics over multiple periods — 2000–2004, 2004–2007, 2007–2009 — shows that a large proportion of the twice-poor households were structurally poor. Of the households escaping poverty, the proportion escaping through asset accumulation was relatively small. Nevertheless, this proportion increased over time. In comparison, the proportion of households declining into poverty through asset depletion is higher than those declining as a result of stochastic factors. Our results are consistent with the findings among households in South Africa (Carter and May, 2001). Their study found modest patterns of upward structural mobility, coupled with large amounts of structural poverty over the period 1993–1998. Of the observed transitions out of poverty, less than half (about 42%) were structural. In contrast, a large proportion of the downward movements (up to 85%) were structural. Of the twice poor households, over 90% were structurally poor.

3.5 Exploring transition patterns from event-histories

In this section, we further explore observed transition patterns using data from household event-histories. An asset framework on its own is narrow and may be inadequate to explain fully patterns of economic mobility. In 2009, we conducted participatory poverty appraisals in the same communities, using the Stages-of-Progress approach. The Stages-of-Progress is a community and household-level approach that relies on community-based poverty definitions to assess household welfare. The Stages-of-Progress borrows insights from panel data studies, participatory poverty assessments and ethnographic examinations (Krishna, 2010a), and captures many of the advantages of quantitative approaches, including the ability to aggregate numerical information. In this paper, we use the Stages-of-Progress to examine the factors behind poverty transitions. We briefly describe the aspects of the Stages-of-Progress that are relevant to this paper only.

First, we conducted community-level focus group discussion (FGDs)[27] to establish a local common understanding of poverty, and to describe the characteristics of poor households. Second, we defined locally applicable stages of progress that poor households typically follow on their pathways out of poverty by each community group, based on the actual experiences of typical households. Using the stages of progress developed as a yardstick, the third component involved ascertaining the position of households in the

[27] The FGD comprised of individuals who were knowledgeable about the community and representative of the different groups of households within a community.

community for each time period, through consensus. We used well-known significant events to demarcate the time periods used in this study, to ensure that all community groups across the study sites referred to the same time periods. Fourth, we explored reasons for change or stability through household event-histories for a sample of the households. The sample selected included all the panel households. The event-histories were collected through community-level FGDs, and triangulated with in-depth case studies of individual households. The FGDs and in-depth case studies retrospectively traced events that had impact on household well-being over the period 1999–2009, particularly in terms of making them poorer or wealthier. For each event, we probed for the specific year in which it occurred and duration. The event-histories provided a detailed account of the role of livelihood strategies, household-level (idiosyncratic) shocks, and other factors (positive or negative) in explaining welfare transitions over the period 2000–2009.

We link transition patterns to household event-histories in subsequent analysis. First, we examine welfare transitions over the entire nine year period (2000–2009). Second, we explore the characteristics of poor households as defined by the communities. Third, we link the structural transitions to livelihood strategies, shocks, and other factors that were indicated as having impact on household welfare. The welfare transition patterns over the period 2000–2009 (Table 3.8) are similar to those observed in the intervening periods; i.e. limited structural upward transitions and relatively large structural downward transitions. More than three-quarters (78%) of the households that moved up experienced stochastic transitions, implying limited asset accumulation or a tenuous escape from poverty. Conversely, almost three-quarters (76%) of the movements into poverty were structural. Over 95% of the twice poor households were structurally poor. In addition, almost half (49%) of the 71 structurally poor households over the period 2000–2009, have been structurally poor across all transition periods (i.e. since 2000).

Table 3.8: Decomposing poverty transitions (per cent of households), 2000–2009

2000	**2009**	
	Poor	Non-Poor
Poor	***21.3%*** *Twice poor* – 2.7% stochastically poor – 97.3% structurally poor	***6.7%*** *Rising from poverty* – 78.3% stochastically mobile – 21.7% structurally mobile
Non-poor	***30.3%*** *Declining into poverty* – 24% stochastically mobile – 76% structurally mobile	***41.6%*** *Twice non- poor*

Across the communities, poor households were defined on the basis of their asset holdings, ability to meet basic needs, access to services (health services and primary education), and livelihood strategies. Many of the poor households were involved in casual farm labour — characterized by low income — as their main livelihood strategy. Poor households lack decent shelter, with small houses made of mud walls and poor roofing materials. They lack enough food coupled with unbalanced diets that can lead to malnutrition among young children in these households, and they have inadequate clothing. The majority cannot afford to provide basic education for their children, have poor access to health services, and poor access to water in the drier areas of the Eastern lowland. In addition, they own few assets. They own very little land and are often unable to cultivate due to lack of resources to purchase farming inputs. In some cases they rent out their land for income, and lack other productive assets such as livestock, with the exception of a few chickens.

Other characteristics of the poorest households were more specific to particular zones: low levels of education in Eastern lowland, no cash crop in the high potential areas (Western transitional and Central highland zones), and physical disability and alcohol-related problems in the transitional zone. These findings support the observations of Sen, where the poor are identified as those who share common income-claiming strategies or 'entitlements' (Sen, 1981). Our results are also consistent with findings by Place *et al*. (2007) in Western Kenya, where lack of food, lack of income, lack of various assets, and inability to meet important needs such as educating children were the most commonly cited indicators of poverty.

3.5.1 Livelihood strategies and idiosyncratic shocks

The ability to pursue different livelihood strategies depends on livelihood assets. Livelihood strategies in turn shape the livelihood outcomes for households, for example, improved welfare and increased income. Idiosyncratic shocks impact on welfare directly and indirectly (through their influence on assets). In case of a severe shock such as death, households are often forced to dispose of their assets as a coping mechanism. We used cluster analysis techniques to characterize the range of livelihood strategies, and shocks experienced by the households using data from the event-histories. We performed separate cluster analysis for livelihood strategies and shocks.

For livelihood strategies, the cluster analysis aimed at identifying relatively homogenous clusters of households engaged in similar economic activities. With regard to shocks, the cluster analysis aimed at characterizing the different shocks that households experienced over the period 2000–2009. In each case, we used hierarchical agglomerative

clustering to determine the number of clusters. We confine our analysis of the event-histories to poverty transitions over the period 2000–2009 (i.e. over the entire nine years) as it was impossible to separate certain event-histories into the distinct periods. Livelihood strategies, for example, can spread over several years. We use the livelihood strategies and shock clusters, and other factors to explore the characteristics of households in different mobility groups.

Since households pursue a wide range of livelihood activities, our cluster analysis was preceded by an initial factor analysis. The factor analysis identified a smaller number of factors explaining the majority of the variation observed among the groups. Out of 15 livelihood activities, five 'factors' were obtained in this initial step. Next, we performed a cluster analysis of the five factors. The cluster analysis identified eight principal livelihood clusters with relatively homogeneous households pursuing a similar mix of livelihood activities. All households were involved in food crop farming. A detailed description of each livelihood cluster is presented in Table B1 (Appendix B). A brief description of the livelihood clusters is as follows:

Diversified sugarcane farming. This livelihood cluster accounts for 11% of the total sample households (39 households). All households in this group are sugarcane farmers, with almost 70% having increased land under sugarcane cultivation over time by renting in land. In addition, these households have intensified livestock production through adoption of improved breeds of cattle — mainly cross-bred dairy cows. One-third earns their livelihood from formal employment, while slightly over half are involved in trade of non-food products.[28] The majority of these households (80%) are from the Western transitional zone.

Indigenous livestock and trade. This is the largest livelihood cluster, made up of 22% of the total households in the sample (78 households). Households in this cluster are mainly from the Western transitional zone. Over 90% of these households earn their livelihood from indigenous livestock farming. Trade in non-food products and formal employment in private or public sectors are also livelihood activities for this cluster.

Diversified livestock farming. This cluster includes households earning their livelihoods primarily from indigenous livestock production. Over half of the households are involved in a range of other livelihood activities: petty trade in food products (77%), sugarcane farming (61%), intensified production of food crops (55%) — vegetables and tomatoes for sale, and

[28] The different types of trade in non-food products included livestock trade, retail shops, posho mills, hiring out oxen and plough, weaving (baskets, pots and ropes) and second hand clothes.

trade in non-food products (55%). Over 80% of these households are from the Western lowland and Western transition zones.

Sugarcane farming, trade and farm labour. Virtually all households in this cluster are sugarcane farmers. Over 40% are also involved in trade in non-food products and farm labour, while another one-third are involved in petty trade of food-products. One-third are also farm laborers. Almost 70% of these households are from the Western transitional zone, while 30% are from the Western lowland.

Farm labour and trade. This is the second largest livelihood cluster, making up 20% of total households in the sample (70 households). In addition to subsistence food crop farming, these households pursue relatively low income livelihood strategies: farm labor, trade in non-food products and food products. Over half of these households reside in the Western lowland.

Dairy farming and trade. This is the smallest livelihood cluster, accounting for 6% of the total sample (21 households). About 90% of households in this group are dairy farmers. Over half are also involved in trade in non-food products, while less than 40% are sugarcane farmers. Another 29% earn their livelihood from skilled wage labor.

Tea and dairy farming. This cluster includes households involved in tea and dairy farming as their main livelihood strategy. Other livelihood activities include business in small towns (rental properties, retail shops and transport business), farm labor, and skilled wage labor.

Coffee and dairy farming. Households in this cluster are coffee and dairy farmers, in combination with intensified food crop production, formal employment, and skilled wage labor. One-quarter of households in this cluster have intensified their livestock production strategies by investing in new or different types of animals — dairy goats, pure exotic dairy cows and improved chicken, and the majority of households in this cluster are located in the Central highland.

We identified various idiosyncratic shocks experienced by the households over the period 2000–2009: health shocks, death of a wage earner supporting the household, expenses related to funerals, livestock losses, crop losses, loss of regular employment, and accidental losses (fire, theft of livestock and break-ins for business assets). Since the different types of shocks were few, we did not perform an initial factor analysis. The cluster analysis revealed five groups of households. We distinguish two critical types of health shocks: those related to ill-health that affect the productivity of the household (inability to work), and those related to expenses incurred to access treatment (health expenses). Limited access to health insurance,

poor services in public health facilities, and also cost-sharing in many of the public health facilities, implies that the majority of rural households in Kenya incur expenses for treatment. Often, the two types of health shocks occur simultaneously. Shocks related to livestock losses were experienced across all groups, but to a limited extent, compared to other types of shocks. Most of these shocks often lead to asset losses. Death, for example, leads to loss of human capital and in some cases households have to dispose of other assets such as livestock as a coping mechanism. However, some are also related to cultural values — for example heavy funeral expenses that includes the slaughter of a household's livestock that is prevalent in the western zones. Detailed description of each cluster of shocks is presented in Table B2 (Appendix B). A brief description of the five shock clusters is as follows:

Few shocks. Households in this cluster experienced very few shocks, mainly related to livestock losses and accidental losses due to burglary or fire.

Death and funeral expenses. This cluster includes households who experienced shocks related to death of a major income earner and funeral related expenses. This the smallest cluster of shocks with 8% of sample households (29 households).

Health shocks. This is the largest cluster of shocks, comprising 33% of the sample households (115 households). This cluster represents households that experienced two types of health shocks — ill-health and health related expenses. One-quarter of these households also lost some livestock.

Health and funeral expenses. Virtually all households in this cluster experienced a combination of health shocks (medical expenses) and funeral expenses. This cluster accounted for 14% of the total sample.

Multiple shocks. Households in this cluster experienced multiple shocks compared to the other groups. The shocks included death of primary wage earner, health shocks (ill-health and health related expenses), funeral expenses and also some (26%) lost livestock.

Apart from livelihood strategies and shocks, we identified a number of other factors (positive and negative) that were likely to impact on household welfare over the period 2000–2009. These factors included help from relatives, large number of dependants (including orphans), land subdivision, dowry payments (bride price), old age, alcohol dependency, and in some cases paying school fees among others. Help from relatives can take various forms: direct remittances (most common), providing education assistance or school fees, assistance with food in extreme cases, and providing capital for starting up a business.

3.5.2 Linking transition patterns to event-histories

We explore the livelihood strategies, shocks and other factors characterizing households that were structurally poor, structurally moved up, structurally moved down and structurally non-poor (Table 3.9). No single livelihood strategy, shock or other factor is responsible, in most cases, for a household's mobility status. We used non-parametric tests (Pearson chi-square statistic) to determine whether the observed differences in livelihood strategies, shocks and other factors across different structural transition classes were statistically significant. The overall chi-square statistics reported for livelihood strategies (χ^2=101.3), and for shocks (χ^2=27.5) shows that there are significant differences in livelihood and shock clusters across structural transition categories. The last column of Table 3.9 shows the chi-square statistic for each livelihood cluster, shock cluster, and other factors. Below is a detailed analysis of the characteristics of the structural transition classes.

Structurally poor. Households in this group account for 21% of the total sample. These households are characterized by farm labour and petty trade, and indigenous livestock and trade as their main livelihood strategies in order of importance. More than 10% are involved in diversified sugarcane farming and diversified livestock farming livelihood strategies. This group had the largest proportion of households who experienced multiple shocks (24%), with 36% losing a primary wage earner. The majority (31%) experienced health shocks as well. In many cases, poor health of one or several family members leads to decreases in productivity or an inability to work. In addition, these households incurred high costs for treatment, hospitalisation expenses associated with long illnesses, and regular and or particularly high use of medication. Death of a major earner on account of illness results in dependence of survivors, including orphans upon other households, and thereby increases the burden on these households. Thus high number of dependents was an important factor impacting on the welfare of these households as mentioned by 31% of them.

The majority of households in this welfare group were from the Western lowland (68%), consistent with the very high incidence of HIV/AIDS and malaria found in this zone. The Western lowland has the highest HIV prevalence rate in Kenya (NASCOP, 2009). While some households in this group also experienced positive influences such as receiving dowry (24%) and help from relatives in the form of remittances (44%), other factors such as land sub-division, alcohol-related problems and old age combine to trap these households in poverty. The severity of a shock, household resilience and level of susceptibility determine the impact on household welfare and thus vulnerability of the household. These findings

underscore the fact that some kinds of shocks can have permanent effects on already vulnerable households with low resilience — resulting in poverty traps.

Table 3.9: Livelihood strategies, shocks and other factors associated with structural poverty transitions – per cent of households

	Structurally poor	Structurally upward mobile	Structurally downward mobile	Structurally non-poor	Pearson Chi-square (χ^2) statistic
Livelihood strategies					
Diversified sugarcane farming	12.7	0	15.2	11.4	1.4
Indigenous livestock and trade	28.2	20	20.3	19.2	2.4
Diversified livestock farming	12.7	20	10.1	5.7	4.0
Sugarcane farming , trade and farm labour	9.9	0	13.9	2.8	10.2**
Farm labour and trade	33.8	20	22.8	6.4	26.6***
Dairy farming and trade	1.4	40	5.1	7.1	13.8***
Tea and dairy farming	1.4	0	2.5	25.5	36.0***
Coffee and dairy farming	0	0	10.1	22.0	21.7***
Livelihood clusters overall χ^2					101.3***
Household-level (idiosyncratic) shocks					
Few shocks	18.3	40	26.6	39.0	10.4**
Death and funeral expenses	15.5	0	15.2	2.1	16.3***
Health shocks	31.0	40	31.7	31.9	0.2
Health and funeral expenses	11.3	20	13.9	13.5	0.5
Multiple shocks	23.9	0	12.7	13.5	5.7
Shock clusters overall χ^2					27.5***
Other factors					
Help from friends and relatives in Kenya	43.7	40.0	40.5	53.2	3.9
Many dependents	31.0	0.0	29.1	17.0	8.4**
Received dowry	23.9	0.0	19.0	22.0	1.9
Paying school fees	14.1	40.0	11.4	31.2	15.7***
Land sub-division	11.3	0.0	13.9	15.6	1.6
Old age	5.6	0.0	15.2	12.1	4.2
Alcohol dependency	5.6	0.0	15.2	5.7	7.5*
Observations	71	5	79	141	
Per cent of households	21	2	23	42	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Structurally upward mobile. Less than 5% of the households moved up structurally over the period 2000–2009. Upward movements were largely stochastic (Table 3.8). Because few households are in this category, no clear pattern emerges with regard to livelihood strategies. However, unlike the structurally poor, none of these households experienced multiple shocks or death of a principle income earner. Other notable characteristics of this group included receiving remittances and paying school fees.

Structurally downward mobile. This is the second largest welfare group accounting for 23% of the sample (79 households). In contrast to the structurally poor, this group of households is diverse, spread across different livelihood clusters (except tea and dairy, and dairy farming and trade). Almost one-quarter of these households lost a principle income earner and slightly more than 10% experienced multiple shocks. Health shocks were equally important for this group of households affecting almost one-third of them. Previous studies show that in cases of serious illness or death, households may be forced to sell land, livestock or other assets as a coping mechanism (De Weerdt, 2010; Krishna *et al.*, 2004). Other characteristics of this group of households included high dependency levels including orphans (29%), received remittances (41%), land subdivision, alcohol dependency, and old age. Over 60% of these households were from Western transitional (40%) and Eastern lowland (25%) zones.

Structurally non-poor. This is the largest group, with 42% of the sample households. More than half (57%) of households in this mobility group were involved in cash crop farming (tea, coffee and sugarcane), in combination with other livelihood strategies (mainly dairy farming). Some were involved in indigenous livestock farming and trade (20%), with another 10% having formal employment in the private or public sector. The rest were spread across other livelihood clusters. A large proportion of these households (39%) did not experience any shocks. Health shocks were experienced by 32%, and very few (14%) experienced multiple shocks. While some of these households also experienced shocks just like those in other mobility categories, because they are involved in high return livelihood strategies and have a strong asset base, these households are more resilient to shocks and are affected less. These households recover more quickly and may be able avoid certain shocks altogether. Wagstaff and Lindelow (2010), for example, found that wealthier and better educated households were better able to limit the health impacts of a health shock in Laos. Other notable characteristics of these households, in order of importance, include receiving remittances (50%), 22% received dowry, high dependency levels and land subdivision. A significant proportion cited paying school fees as a major constraint.

Our findings are consistent with those from rural Uganda (Bird and Shinyekwa, 2005). Declines in well-being among households were associated with meso-level constraints and shocks, combined with household-level shocks and socio-cultural factors. Multiple shocks and loss of assets pushed a number of previously non-poor households into severe and long-term poverty. The poorest had suffered recurrent and multiple shocks. The findings on the significance of health shocks are consistent with those of previous studies in Kenya (Krishna *et al*., 2004; Barrett *et al*., 2006; Kristjanson *et al*., 2010). Barrett *et al*. (2006) found health shocks largely unrelated to nutrition such as HIV/AIDS, malaria, tuberculosis, were the most common reasons households become and stay poor in different agro-ecological zones in Kenya and Madagascar, underscoring the importance of preventive and curative health care. Similarly, Kristjanson *et al*. (2010) found that increases in poverty in marginal zones in Kenya were mainly due to health problems and their related human and financial costs. Krishna *et al*. (2004) also found that health shocks (poor health and health-related expenses) were the most often cited reason for households' declining into poverty across communities in western Kenya over the period 1978–2003. Nearly 73% of households that declined into poverty mentioned health shocks as a principal reason for their decline into poverty. Health shocks have been shown to be more common than other shocks, and more pronounced among the poor (Wagstaff and Lindelow, 2010). Evidence from other countries and regions of the world — Uganda, Vietnam, India and Laos also point to the adverse effects of ill-health and health-related expenses (Ensor and San, 1996; Deininger and Okidi, 2003; Krishna *et al*., 2005; Wagstaff and Lindelow, 2010).

3.6 Conclusion

Rural poverty incidence remains high in Kenya. The coexistence of strong macroeconomic growth and high rural poverty levels underscores the fact that causes of poverty are complex. Moreover, this raises questions about why macroeconomic growth policies have failed to stimulate broad based sustainable economic growth leading to poverty reduction. Drawing on the concept of asset-based approaches to analyzing poverty and poverty dynamics, this paper has used panel survey data over the period 2000–2009, to address a key challenge facing the empirical analysis of poverty dynamics — that of distinguishing between structural and stochastic transitions.

Our findings show a variable but increasing trend in poverty headcount and poverty gap. Poverty headcount increased from 28% in 2000 to 52% in 2009, while the poverty gap doubled over the same period. We find substantial mobility among the different classes of

well-being using economic transition matrices, except for the well off and poorest households. Of the households rising from poverty, a large proportion (between 65% and 82%) was characterized by stochastic transitions, suggesting limited asset accumulation or successful long-run escape from poverty. In contrast, the majority of the twice poor households in each time period were structurally poor.

More than half of the declines over the period 2004–2007 and 2007–2009 were structural. Overall, the findings suggest that a large number of rural households in our sample have been unable to benefit from macroeconomic growth. Thus it would appear that poor households also face constraints to productively using the few assets they own. Our results are consistent with findings from previous studies, that suggest that poverty is not only a matter of having few assets, but also due to constraints limiting the effectiveness with which the few assets are used (Carter and May, 1999).

To understand the processes underlying welfare transition patterns, we retrospectively traced events at the household level over the period 1999–2009. These household event-histories identified various livelihood strategies, idiosyncratic shocks and other factors (positive and negative) associated with structural welfare transitions. In most cases, a combination of livelihood strategies, shocks, and other factors interact to influence welfare transition patterns. We identified groups of livelihood strategies and shocks associated with welfare transition patterns using cluster analysis. We found significant differences in livelihood clusters, shocks clusters, and other factors across structural welfare transition categories using non-parametric tests. Structurally poor households were characterized by low income livelihood strategies, health shocks, and multiple shocks — death of a primary income earner, ill-health, health related expenses, and funeral expenses in some cases. Households structurally declining into poverty were involved in diverse livelihood activities. The structurally non-poor households engaged in high return livelihood strategies (cash crops) and diversified their income sources. Almost 40% of the structurally non-poor households did not experience any significant shocks.

Macroeconomic growth policies alone are insufficient as a poverty reduction strategy. Policies aimed at aiding the structurally poor households out of poverty — referred to as ‘cargo net’ policies — and those aimed at preventing households from declining into poverty — ‘safety net’ policies — are also needed (Barrett, 2005b). The importance of diversification of income sources among the structurally poor and structurally downward mobile households suggest that policies aimed at encouraging expansion of small businesses are options for aiding households to climb out of poverty; for example, improved access to credit, adequate

access to market information, and reducing the cost of starting and doing business — improving infrastructure and security. The significance of high-value cash crops (tea, coffee and sugarcane) and dairy farming among the structurally non-poor suggest that increasing market participation through diversification into high-value food crops, for example, horticultural crops (fruits and vegetables), and livestock diversification, have the potential to reduce poverty.

The significance of health shocks and their related human and financial costs across all welfare groups imply that 'safety net' health policies aimed at improving preventative health care (e.g. better sanitation and hygiene, and safe drinking water), and improving access to curative health care (e.g. expanding the coverage of health insurance) are actions that can prevent even more households from falling into poverty. Other health-related safety nets such as improved access to anti-retroviral drugs would prevent households from losing a prime income earner. In addition, the rapid growth of private health care provision in Kenya implies that strengthening the regulatory framework governing the operations of private health care providers is also necessary. Shocks affecting human capital also indirectly affect other productive asset endowments. Health shocks or death, for example, may force households to sell their land, livestock or other assets as a coping mechanism. Findings from the event-histories show that households often dispose of their livestock assets to offset medical and funeral expenses.

This paper has demonstrated the benefits of using mixed methods for poverty analysis. The panel survey data allowed measurement of changes in welfare over multiple periods and provided an overall picture of poverty transition trends. In addition, without panel survey data, we would not have been able to assess the extent to which the observed transitions were structural versus stochastic. Panel surveys, however, rarely capture the processes of change and therefore limit the ability to understand poverty transitions. The household event-histories identified the processes underlying the poverty transitions, some of which are often missed out in panel survey questionnaires, but are equally informative for policy. The event-histories enabled us to fill in these gaps and identified various livelihood strategies, idiosyncratic shocks, and other factors (positively or negatively) associated with structural transition patterns, and thus offered more insights into the underlying causal processes. For example, structural processes that decrease a household's stock of human capital such as alcohol or drug dependency are often difficult to explicitly measure in a panel survey yet are important for policy. In addition, the event-histories identified long-term livelihood activities households were engaged in. Households typically invest in livelihood

activities over longer time horizons, and these long-term livelihood activities are important drivers of poverty transitions. The event-histories also identified certain cultural practices in some communities associated with poverty transitions. For example, the slaughter of a household's livestock assets during funerals is prevalent in western Kenya. Adopting a more rigorous analysis of the event-histories data — cluster analysis, also allowed us to identify the impact of multiple shocks on structurally poor households. The mixed approach we adopted, therefore, contributed to a better understanding of poverty transitions and the underlying processes than using either approach individually.

Appendix B

Table B1: Descriptive statistics of livelihood strategies by cluster (mean)

	Diversified sugarcane farming	Indigenous livestock & trade	Diversified livestock farming	Sugarcane, trade & farm labour	Farm labour & trade	Dairy & trade	Tea & dairy farming	Coffee & dairy farming
Coffee farming	0	0.04	0	0	0	0.05	0	0.98
Crop intensification & commercialization	0.08	0.10	0.55	0.07	0.06	0.19	0.02	0.35
Sugarcane farming	1	0.21	0.61	1	0.03	0.38	0	0
Dairy farming	0	0	0	0	0	0.90	0.74	0.74
Petty trade in food products	0.28	0.14	0.77	0.33	0.26	0.29	0.07	0.02
Business in small towns	0.18	0.09	0.10	0	0.07	0.14	0.29	0.12
Food crops - subsistence	0.77	0.96	0.29	0.52	0.64	0.86	0.93	0.70
Increased farm size	0.67	0.09	0.13	0	0.01	0.19	0.14	0.14
Indigenous livestock	0.21	0.94	0.97	0.04	0.17	0	0.10	0.02
Livestock intensification	0.54	0.04	0	0.04	0.01	0.10	0.07	0.23
Formal employment in public or private sector	0.33	0.37	0.16	0.07	0.03	0.14	0.19	0.23
Skilled wage labour	0.23	0.19	0.19	0.22	0.17	0.29	0.21	0.21
Farm labour	0	0.01	0.03	0.44	0.54	0.14	0.29	0.14
Tea farming	0	0	0	0	0	0.10	**1**	0.07
Trade in non-food products	0.51	0.35	0.55	0.44	0.30	0.52	0.10	0.14
Observations	39	78	31	27	70	21	42	43
Per cent of households	11.1	22.2	8.8	7.7	19.9	6.0	12.0	12.3

Table B2: Descriptive statistics of shocks by cluster (mean)

	Few shocks	Death and funeral expense	Health shocks	Health and funeral expense	Multiple shocks
Funeral expenses	0.02	0.83	0.10	1	0.66
Death of income earner	0	0.62	0.04	0	1
Ill health	0	0.17	0.64	0.35	0.81
Health expenses	0.03	0	0.83	1	0.96
Loss of private job	0	0	0.12	0	0
Livestock losses	0.25	0.14	0.25	0	0.26
Accidental losses	0.13	0.03	0.10	0	0
Observations	105	29	115	49	53
Per cent of households	30	8	33	14	15

Chapter 4

Exposure to Shocks and Welfare: Evidence from Rural Villages in Kenya[29]

[29] This paper was co-authored with Marrit van den Berg and Rob Schipper, Development Economics Group, Wageningen University, 6706 KN Wageningen, The Netherlands. To be submitted.

Abstract

We characterize shocks facing rural households in Kenya and explore whether welfare level and geographical location affect exposure to *specific* shocks and the *number* of shocks reported across diverse regions. Health expenses, ill-health, funeral expenses, livestock losses, land sub-division, and death of major income earner were the most frequently reported shocks. We find significant differences in the prevalence of shocks across geographical locations. However, the differences in prevalence of shocks across welfare levels were not significant. Once we control for household characteristics, we find no evidence that welfare level affects exposure to specific shocks at the aggregate level (for the entire sample), but a significant geographical effect. Moreover, even within regions we find limited evidence that welfare level affects exposure to specific shocks, and the effects are not systematic across regions. Welfare level and geographical location had no effect on the number of shocks reported for the entire sample. Even within regions we find limited evidence that welfare level affects the number of shocks reported or experienced.

4.1 Introduction

Households in low income countries are exposed to various economic, political, social and environmental shocks. Exposure to shocks has been identified as one of the main causes of vulnerability to poverty (World Bank, 2001). Shocks can cause poverty, increase the depth of poverty, and also influence the dynamics of poverty and wealth (see Dercon and Krishnan, 2000b; Dercon, 2004; Tesliuc and Lindert, 2004). Therefore, shocks may be seen as one of the many dimensions of poverty. Shocks can be classified into various categories. First, shocks can be natural (e.g. drought and floods) or the result of human activity (e.g. conflict). Second, shocks can affect individuals or households in an unrelated manner (idiosyncratic), they can be correlated among individuals or households (covariate), across time (repeated) or with other shocks (bunched). The idiosyncratic-covariant classification also reflects the micro-meso-macro scaling.

Exposure to shocks and ability to cope with shocks defines a household's level of vulnerability (Elbers and Gunning, 2003; Guimarães, 2007). Various approaches to assessing vulnerability have been proposed (see Chaudhuri *et al.*, 2002; Christiaensen and Subbarao, 2005; Ligon and Schechter, 2003; Pritchett *et al.*, 2000; Tesliuc and Lindert, 2004). Hoddinott and Quisumbing (2003) classify the various approaches into three main categories: vulnerability as expected poverty, vulnerability as low expected utility, and vulnerability as uninsured exposure to risk. Traditional vulnerability assessments are particularly concerned with assessing welfare and welfare losses that result from negative shocks. In particular, vulnerability as uninsured exposure to risk is an *ex post* assessment of the extent to which a negative shock causes welfare loss. For poor households, dealing with risk and uncertainty pre-occupies their livelihoods and their inability to effectively deal with shocks often lies at the core of their poverty (World Bank, 2001). Vulnerability to shocks can induce precautionary behaviours in which poor households rationally trade-off higher expected earnings for reduced exposure to risk, thereby remaining trapped in poverty.

Shocks can have differential impacts for different sub-populations or household types. Several studies document that the poor are more vulnerable to certain shocks. For example, poor households living in areas with poor sanitation facilities are likely to face higher risk of contracting certain diseases (e.g. cholera). In Pakistan, the ultra-poor and poor respondents were far more likely than the non-poor to suffer health shocks (illness, death of household member

and births and surgery, accidents and disability), while the non-poor were more likely to suffer economic shocks (Heltberg and Lund, 2009). In Guatemala, the poor were more exposed to natural shocks (natural disasters and agricultural-related shocks) and less to economic shocks specific to the formal economy than the better-off (Tesliuc and Lindert, 2004).

In recent years, the literature examining shocks and household welfare in Africa has been increasing, contributing to the empirical literature on vulnerability (e.g. Dercon and Krishnan, 2000b; Dercon, 2004; Dercon *et al.*, 2005; Hoddinott, 2006). Most studies examining the impact of shocks on welfare or welfare losses have two main limitations. First, the majority are constrained by limited information on a full range of shocks. As a consequence, only few studies examine a wide range of shocks (e.g. Dercon *et al.*, 2005). Concentrating on selected shocks does not allow for an analysis of the relative importance of various shocks. In Africa where the risk of exposure to shocks is relatively high and resources are scarce, it is important to identify which shocks should be given priority. Second, there are a number of econometric challenges confronting studies that rely on standard regression analysis (OLS) to study the impact of shocks on welfare (Günther and Harttgen, 2009). Of particular concern is the problem of reverse causality in the case of idiosyncratic shocks (see also Hoddinott and Quisumbing, 2003). While certain shocks such as drought are exogenous to household welfare level, others such as health shocks can be influenced by welfare levels (endogenous) as argued before. Prolonged illness of an economically active adult, for example, affects the stock of human capital. Yet, the likelihood of a prolonged illness can be as a result of a household's welfare status such that poor households who cannot afford health care are likely to be ill for longer periods. Empirical studies, therefore, need to take into account reverse causality issues in estimation.

This study examines vulnerability to shocks among rural households in Kenya. Like rural households in low income countries elsewhere, rural households in Kenya are exposed to various shocks. The objective of the study is twofold. First, we characterize the shocks facing rural households and explore if there are spatial patterns in the distribution of shocks. Second, we examine whether poor households are more vulnerable to certain shocks. Unlike studies examining the impact of shocks on welfare and welfare losses, we assess vulnerability as exposure to shocks based on pre-shock welfare levels. In doing so, we also test or check for reverse causality that may plague studies that examine the impact of shocks on welfare. Characterizing shocks and their distribution is important for the formulation of appropriate risk

management strategies. Differentiating vulnerable groups of households based on pre-shock welfare levels, geographical location, and household characteristics is useful for improving targeting of interventions by policymakers. Health expenses, ill-health, funeral expenses, livestock losses, land sub-division, and death of a major income earner were the most frequently reported shocks. Our main results show a significant geographical effect on exposure to *specific* shocks, and limited evidence on the effect of welfare level.

The paper is organized as follows. In section 4.2 we introduce the setting and data. In section 4.3 we describe the shocks rural households in Kenya face. In section 4.4 we explore the effects or impact of welfare level and geographical location on exposure to specific shocks and the number of shocks reported. Finally, in section 4.5 we present the conclusions.

4.2 Data

We use household survey data. The households are drawn from 28 rural communities across four diverse agro-ecological zones in Kenya. These zones represent low and high agricultural potential areas and include Eastern lowland, Western lowland, Western transitional and Central highland. In addition to agro-ecological diversity, these zones reflect diversity in poverty incidence, population density, and culture. The zones are inhabited by culturally diverse ethnic communities — Kamba, Luo, Luhya and Kikuyu.

The Eastern lowland is low potential. Population densities are low compared with other zones and ranged from 30 to 97 persons per km^2 in 1999. Poverty rates are high. Over 60% of the population lived below the rural poverty line in 2005/06 (KNBS, 2007). Market access is low in this zone. The area is suitable for livestock and small-holder farming. The HIV prevalence rate for the zone is lower than the national average, estimated to be 4.7% in 2007 (the provincial prevalence rate) (NASCOP, 2009).[30] The Eastern lowland is mainly inhabited by Kambas.

The Western lowland is low potential. Sugarcane is the main cash crop in the relatively better potential areas. In the drier areas, livestock keeping is the main activity. Poverty incidence is relatively high and market access is medium. About half of the population (47-50%) lived below the rural poverty line in 2005/06 (KNBS, 2007). The population density ranged from 257 to 549 persons per km^2 in 1999. This zone is among the regions with very high HIV prevalence

[30] The HIV prevalence rates for the zones are based on their respective provincial HIV prevalence rates according the Kenya Aids Indicator Survey of 2007 (NASCOP, 2009). Kenya is made up of eight provinces. A province is the second highest level of administration in Kenya after the national level.

rates in Kenya. The HIV prevalence rate of 15.3% in 2007 was more than double the national prevalence rate of 7.4% (NASCOP, 2009). The Western lowland is mainly inhabited by Luos.

The Western transitional zone is high potential. Sugarcane is the main cash crop. However, the zone is also suitable for dairy, tea and coffee farming. Poverty incidence is relatively high and market access is medium. Over 50% of the population lived below the rural poverty line in 2005/2006 (KNBS, 2007). High population pressure is a significant characteristic of this region. This zone is one of the most densely populated regions in Kenya. The population densities across the study sites within the zone ranged from 433 to 508 persons per km^2 in 1999. Therefore, land fragmentation as well as land exhaustion is common in this area. The HIV prevalence rate of 5.1% is lower than the national average (NASCOP, 2009). The Western transitional zone is mainly inhabited by Luhyas.

The Central highland is also high potential. The main agricultural activities include cash crop (tea and coffee) and dairy farming. This zone has better living standards compared with other rural areas in Kenya and relatively good market access (close to the capital city of Nairobi). The poverty incidence was estimated to be 33% in 2005/06 (KNBS, 2007). This region is also characterized by high population pressure. Average population density in 1999 was estimated to be 197 persons per km^2. HIV prevalence rates are low. The HIV prevalence rate in 2007 was 3.8%, the lowest across all the zones (NASCOP, 2009). The Central highland is mainly inhabited by Kikuyus.

The communities selected for the study were part of a panel dataset collected by Tegemeo Institute of Agricultural Policy and Development. Within each community households were randomly selected and interviewed in 1997, 2000, 2004 and 2007. The panel surveys were designed to collect information on various aspects of household livelihoods that included income from crops, livestock and off-farm income, and various household assets such as land holdings, livestock holdings, agricultural assets, and housing.

In 2009, we conducted a participatory poverty assessment study in the same communities. We used the Stage-of-Progress approach (see Chapter 2 and Krishna (2010a) for a detailed description of the approach). The Stage-of-Progress approach has several components. We used the household event-histories component for this paper. We revisited the survey households and collected information on their event-histories that retrospectively captured information on livelihood strategies, shocks experienced, and other events (positive and

negative) (see appendix C). This study focuses on the information related to shocks only. Similar to other studies, we define shocks as adverse events that lead to loss of household income, loss of productive assets, and/or huge expenses (e.g. Dercon *et al.*, 2005; Quisumbing, 2007). Our shock data, however, lacks information on the severity or magnitude of the particular shocks.

This study, therefore, uses a cross-sectional retrospective shock data similar to other studies of household shocks (e.g. Dercon *et al.*, 2005; Heltberg and Lund, 2009; Quisumbing, 2007; Wagstaff and Lindelow, 2010), but differs in terms of the recall period. Different studies have used different recall periods. Heltberg and Lund's (2009) shock survey, for example, is based on a three-year recall period. Dercon *et al*. (2005) study in rural Ethiopia is based on a 5-year recall period (1999–2004), whereas Quisumbing (2007) used a 10-year recall period (1997–2006/2007) for Bangladesh. Our data on event-histories is collected for the period 1996–2009. However, because of possible recall biases we focus on the shocks that were experienced in the last five years — over the period 2005–2009.

4.3 Description of shocks in rural Kenya

We begin by examining the incidence of various shocks that households experienced, focusing on the main shocks to explore broad patterns. Over two-thirds (68%) of all households reported having experienced at least one shock over the period 2005–2009. The average number of shocks across all households was 1.4. However, conditional on experiencing a shock the average was two.

We find that health shocks — health expenses and ill-health — were more common than other shocks (Figure 4.1). About 40% of the households reported health expenses, and another 26% reported ill-health shocks. Health expenses refer to expenditures associated with ill-health. These include hospitalisation expenses associated with long illnesses and high medication expenditures that lead to depletion of family resources especially cash and livestock. Ill-health refers to poor health of a family member(s) that leads to decreased productivity or inability to work, or even job loss.

Other commonly reported shocks included funeral expenses, livestock losses, land sub-division, and death of an income earner. Funeral expenses refer to expenses related to death in a family to cater for coffin and food (in the form of livestock slaughtered in some communities). Less than one-fifth of the households reported funeral expense shocks. Livestock losses are those

related to livestock diseases, predation, and drought. Land sub-division refers to sub-division of land among sons (and daughters in some cases), but in particular for cases where sub-division results in very small unsustainable agricultural plots. Livestock losses and land sub-division shocks were reported by about 11% of the households each. Death of income earner refers to death of a major income earner living within the household (e.g. household head, wife) or supporting the household (e.g. son or daughter) within the period of study. Less than 10% of the households reported the death of an income earner. Other miscellaneous shocks included accidental losses, accidental injury, crop losses, conflicts and disputes with other family members, dowry payments, loss of employment and legal shocks related to litigation (court cases). Accidental losses result from fire or burglary. Crop losses result from crop diseases, pests, and drought. Loss of employment refers to loss of regular private or public sector employment as a result of retrenchment or dismissal. Dowry payments can be monetary or in form of livestock assets. The miscellaneous shocks were rare and reported by less than 5% of the households each.

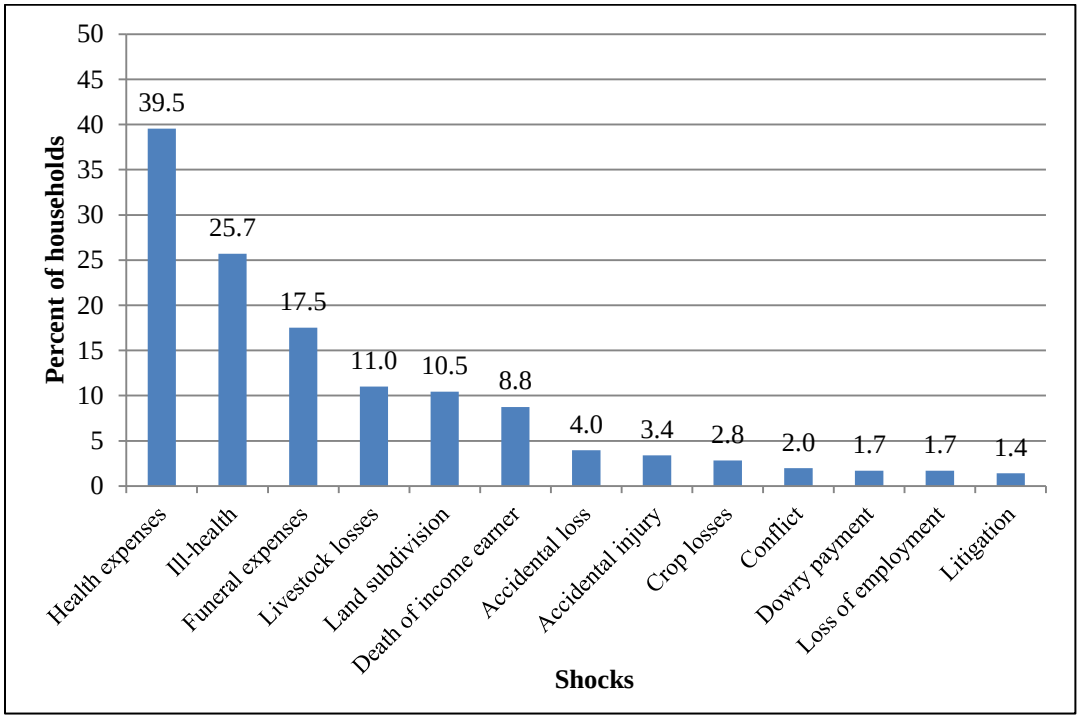

Figure 4.1: Per cent of households reporting various shocks (2005-2009)

Our findings on the distribution of shocks are similar to those reported for Pakistan (Heltberg and Lund, 2009) among relatively poor households, where health shocks (especially illness or death of household members) dominated other shocks in terms of incidence, cost, and severity of outcomes. Previous studies in Kenya also show that health shocks are the most commonly cited reason for households' declining into poverty in some regions (Barrett *et al.*, 2006; Krishna *et al.*, 2004; Kristjanson *et al.*, 2010). Quisumbing (2007) also found health shocks (combined expenses related to illness and forgone income) to be the most frequently reported shocks among households in Bangladesh over a 10-year period (1997–2006/2007), although the prevalence of shocks varied slightly across different sites. In Ethiopia, Dercon *et al*. (2005) found that illness and drought shocks were the most important shocks reported over the period 1999–2004. In contrast, Wagstaff and Lindelow (2010) found pest infestation, crop and livestock diseases were the most common shocks in Laos over a 12 month period, although illness shocks were also reported by a substantial proportion of households (23%). However, we should be cautious with comparisons across countries due to differences in the survey modules and recall periods.

4.3.1 Geographical distribution of shocks

Next, we explore the incidence of various shocks across zones. As discussed in section 4.2, the study sites reflect diversity in agro-ecological potential, poverty incidence, population density, and culture (ethnicity). We find significant differences in prevalence of shocks across zones. Certain shocks are more prevalent in some zones than others (Table 4.1). The differences in distribution of the most commonly reported shocks (those reported by four per cent or more of all households) were statistically significant. Across divisions within the zones, the incidence of shocks do not differ significantly, except for livestock losses in Eastern lowland (Table C1 in appendix). [31]

Health expenses, ill-health and livestock losses were the most commonly reported shocks in Eastern lowland (EL). The proportion of households reporting ill-health (37%) and livestock losses (22%) was higher in this zone than other zones. The high proportion of households reporting livestock losses is consistent with the fact that Eastern lowland is prone to droughts

[31] Within each zone, we sub-divided the sample further into divisions (relatively homogenous units). Overall, the sample cuts across eight divisions, each with a sample size ranging from 30 to 56 households.

that result in livestock death. The recent droughts were experienced in 2005 and 2009 (as reported from the community focus group discussions). Funeral expenses and land sub-division shocks were reported by less than 10% of the households each.

Table 4.1: Distribution of shocks across regions (per cent of households)

	Eastern lowland	Western lowland	Western transitional	Central highland	Chi2 (3)[1]
Health expenses	37.3	25.6	50.0	43.2	12.69***
Ill-health	37.3	18.9	25.5	24.2	7.03*
Funeral expenses	9.0	21.1	25.5	11.6	11.01**
Livestock losses	22.4	11.1	7.8	6.3	12.03***
Land subdivision	7.5	4.4	12.7	15.8	7.57*
Death of income earner	4.5	18.9	3.9	7.4	16.31***
Accidental loss	0.0	8.9	4.9	1.1	10.87**
Accidental injury	1.5	4.4	4.9	2.1	
Crop losses	4.5	4.4	2.9	0.0	
Dowry payment	0.0	0.0	6.9	0.0	
Loss of employment	4.5	1.1	2.0	0.0	
Conflict	0.0	0.0	0.0	6.3	
Litigation	1.5	0.0	2.0	2.1	
N	67	90	102	95	

[1]The Chi-square statistic is calculated for the most commonly reported shocks only.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Health expenses, ill-health, funeral expenses and death of major income earner were the most commonly reported shocks in Western lowland (WL). This zone had the highest proportion of households reporting death of a major income earner (19%) compared with other regions. These results are consistent with the high disease burden (HIV and malaria) in this zone. The HIV prevalence rate in Western lowland was estimated to be 15.3% in 2007 — the highest in Kenya (NASCOP, 2009). This region is also one of the areas with relatively high risk of malaria in Kenya as some areas within the zone are located around the shores of Lake Victoria (Noor *et al.*, 2009). Surprisingly, this zone also had the lowest proportion of households reporting ill-health shocks. In situations where ill-health is widespread among a population, it might not be considered a shock to individual households. Also, in the context of health shocks and health status, people's perceptions of their own health are likely to be related to their education, occupation, and household income (see Gertler *et al.*, 2000). Funeral expenses were reported by a substantial proportion of households in the region (the second highest after the Western

transitional zone). Among the Luos, adult deaths are often associated with heavy funeral expenses that include customary slaughter of a household's livestock assets coupled with extended periods of mourning. Therefore, the death of an adult not only leads to loss of human capital, but is often associated with expenditure shocks. Other common shocks reported in the region were livestock losses (11%) and accidental losses (9%). The WL is occasionally affected by drought, explaining the substantial proportion of the households reporting livestock losses.

Health expenses, ill-health, funeral expenses and land sub-division were the most commonly reported shocks in the Western transitional zone (WT). This zone had the highest proportion of households reporting health expenses (50%) and funeral expenses (26%) compared with other zones. The findings for funeral expenses reflect the underlying cultural differences across the zones. Similar to the Western lowland zone, the death of an adult among the Luhyas is often associated with heavy funeral expenses, and is thus often associated with expenditure shocks. Similarly, land sub-division shocks reflect the high population pressure in this area leading to land fragmentation. Livestock losses were reported by less than 10% of the households. Surprisingly, the WT is the only zone where dowry payment shocks were reported. This may be explained by the underlying customs and traditions surrounding marriage among the Luhyas. Regardless of welfare status, it is customary for men to pay bride price (dowry) — mostly in the form of livestock (particularly cattle). Failure to pay dowry can lead to lack of respect for the man (husband) by his relatives, community members, and in-laws. In addition, there are cultural penalties in the event that a wife dies before dowry is paid that include compulsory payment of dowry before the man can be allowed to bury the wife.[32] In the worst case, the in-laws may decide to bury their daughter.[33]

In Central highland (CH), the most commonly reported shocks are similar to those of the Western transitional zone. The Central highland had the highest proportion of households (16%) reporting land sub-division. Among the Kikuyu, property is often sub-divided among sons and unmarried daughters. The prevalence of land sub-division may also be a reflection of the high population pressure in this area. The average land holding per household of 3.4 acres is lower than in other zones. Land sub-division may also be highly driven by the cultivation of cash crops

[32] The man is also expected to give separate cattle specifically to the wife's family for slaughter during the funeral or to take it away after the funeral. All these are done under tough negotiations and threats by in-laws who normally would have an upper hand in such situations.

[33] If this happens, it is traditionally believed that the spirits of the dead wife would remain to haunt the man and the community forever.

(tea and coffee). In some sites within the zone, for example, smaller plots may not be sub-divided further, yet the tea bushes on these plots are sub-divided among sons. Surprisingly, this is the only region where households reported conflicts (6%). These conflicts may be attributed to alcoholism and other underlying cultural factors specific to our sites within the Central highland.[34]

Other studies also report an association between the incidence of shocks and geographical location. Tesliuc and Lindert (2004) found that the largest relative differences in the incidence of shocks in Guatemala occurred across geographical locations, with regional characteristics explaining most of the variation in incidence of shocks. Other household characteristics such as poverty status, gender, and ethnicity of the household head were also associated with the relative incidence of shocks. However, these associations were partly due to the association between poverty, geographical location and ethnicity. Geographical clustering of certain shocks such as those related to human diseases — malaria, tuberculosis, typhoid and cholera — have been reported in Kenya and Madagascar (Mills *et al.*, 2004; Noor *et al.*, 2009).

4.3.2 Shocks and initial welfare conditions

Are certain types of shocks more prevalent among poor households? In this section, we examine the distribution of various shocks across pre-shock household welfare levels. There are various ways of deriving welfare indicators in the literature (Filmer and Pritchett, 2001; Moser and Felton, 2007; Sahn and Stifel, 2003). Wealth is less likely to be affected by short-term fluctuations than income and thus a long-term indicator of the socioeconomic status of the household. Some studies have used household wealth constructed from factor or principal component analysis of household durable assets and characteristics of their dwellings as welfare indicator (e.g Tesliuc and Lindert, 2004; Wagstaff and Lindelow, 2010). Others have used land holding as a proxy for household wealth (e.g. Dercon *et al.*, 2005). We used predicted income in 2004 as derived in Chapter 3 as our pre-shock welfare indicator. The predicted income is derived from a fixed effects regression model that relates reported household income to the bundle of assets held by the household.[35] We used an alternative to the standard fixed effect estimator —

[34] It is not unusual for a drunk husband to be beaten up by his wife following a domestic argument among some communities in Central highland where we collected our data.

[35] The predictor variables included indicators of human, natural, physical and geographical capital or assets, and a set of control variables.

the ‘‘fixed effects vector decomposition’’ — that allows estimation of time-invariant variables and is more efficient than the standard fixed effects model in estimating variables that have very little longitudinal variance (Plümper and Troeger, 2007). The predicted income is derived from four panel surveys in 2000, 2004, 2007 and 2009. Predicted income reflects the underlying income generating capacity of a household.

We disaggregated the sample into predicted income quintiles from poorest to richest (i.e. poorest quintile, 2nd, 3rd, 4th and richest quintile). The income quintiles were cross-tabulated against the shocks reported over the period 2005-2009 (Table 4.2). Such information provides some clues as to what types of households are most likely to be affected by various shocks, and a probable indicator of household vulnerability to certain shocks. However, it does not take into account the severity of the shock or the magnitude of their impact. We hypothesize that certain shocks such as ill-health and death of income earner are likely to be more prevalent among poor households because they are less likely to have access to health care. In contrast, well-off households are more likely to report health expense shocks as they are more likely to seek health care services.

Table 4.2: Distribution of shocks across predicted income quintiles (per cent of households)

Shocks	Poorest quintile	2nd quintile	3rd quintile	4th quintile	Richest quintile	Average	Chi2 (4)[1]
Health expenses	35.2	33.8	40.0	40.8	48.6	39.7	3.97
Ill-health	16.9	29.6	24.3	29.6	28.6	25.8	4.36
Funeral expenses	23.9	14.1	12.9	19.7	17.1	17.6	3.90
Livestock losses	12.7	15.5	7.1	11.3	8.6	11.0	3.15
Land subdivision	8.5	12.7	7.1	14.1	10.0	10.5	5.58
Death of income earner	12.7	11.3	5.7	9.9	4.3	8.8	2.52
Accidental loss	4.2	5.6	5.7	1.4	2.9	4.0	
Accidental injury	4.2	1.4	5.7	1.4	4.3	3.4	
Crop losses	4.2	5.6	2.9	0.0	1.4	2.8	
Conflict	1.4	2.8	2.9	2.8	0.0	2.0	
Dowry payment	2.8	1.4	1.4	2.8	0.0	1.7	
Litigation	0.0	0.0	0.0	4.2	2.9	1.4	
Loss of employment	1.4	1.4	2.9	1.4	0.0	1.4	
N	71	71	69	71	69	353	

[1]The Chi-square statistic is calculated for the most commonly reported shocks only.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

We focus on the main shocks to discern broad patterns — those that were reported by at least 15% of the households in any quintile. The Pearson chi-square statistic shows that the incidences of these commonly reported shocks — health expenses, ill-health, funeral expenses, livestock losses, land sub-division and death of income earner — do not differ significantly across income quintiles (last column of Table 4.2). This finding is consistent with the distribution of the most commonly reported shocks across reported income quintiles (Table C2 in Appendix C).

4.4 Impact of welfare and geographical location on shocks

The discussion in section 4.3 provides an overview of the distribution of various shocks across geographical locations and welfare levels. While the results suggest that only geographical location is important, we do not control for the effects of other variables such as household characteristics. In this section, we attempt to separate out the impact of geographical location and welfare level on exposure to *specific* shocks and on the *number* of shocks reported controlling for household characteristics.

First, we estimate the *probability* of experiencing a particular shock using probit regression models. We regress the most commonly reported shocks on initial welfare levels (predicted income quintiles), geographical location (zone dummies) and a set of household control variables that include age, gender and education of the household head, proportion of educated adults in the households (more than primary education), households size, and proportion of non-dependent household members. We use predicted income quintiles as opposed to continuous predicted income since the relationship between shocks and welfare is likely to be non-linear. We include distance to the nearest public health facility as an additional control variable for ill-health, health expenses, and death of an income earner. We estimated separate probit models and a multivariate probit model. The multivariate probit is a more efficient estimator when the error terms of the outcomes are correlated. Second, we examine whether geographical location and welfare level affects the *number* of shocks reported. We use a Poisson regression model because our dependent variable (number of shocks) is based on a count. We use the same set of predictor variables as those used for the probit models.

The results show that the multivariate probit is more efficient than estimating separate probit models for each shock (the null hypothesis that $\rho = 0$ is rejected) (Table 4.3). We therefore

present and discuss only the results of the multivariate probit model for the most commonly reported shocks. The richest welfare quintile and the Eastern lowland zone are the omitted categories in our models. Welfare levels had no effect on the probability of reporting any of the common shocks. Geographical location was important for ill-health, funeral expenses, livestock losses, and death of major income earner. The likelihood of reporting ill-health and livestock losses was higher for households from the Eastern lowland compared with other zones. Households from the Western lowland and Western transitional zones were more likely to report funeral expense shocks compared with Eastern lowland. The likelihood of reporting the death of major income earner was higher for households in the Western lowland zone compared with Eastern lowland. These findings confirm the results from the descriptive analysis that showed significant differences in the distribution of shocks across geographical locations and no significant differences across welfare levels (Table 4.1 and 4.2).

The control variables (age and education level of household head, and household size) had mixed effects across various shocks. As expected, the likelihood of reporting the death of an income earner increased with the age of the household head. Age of household head also had effects on the likelihood of reporting ill-health and land sub-division shocks. The education level of the household head decreased the likelihood of reporting health expenses and ill-health shocks. High education is likely to enable a household to better understand and enhance their response to health shocks. Male-headed households were less likely to report land sub-division compared with female headed households. These results suggest that land is often sub-divided upon the death of the male household head, and may also reflect high dependency on agriculture for female headed households. In contrast, male-headed households were more likely to report death of a major income earner. Of the households reporting the death of an income earner, 84% were male-headed in 2004. In 2009, only 35% of these households were still male-headed, suggesting that majority of the deaths reported were related to death of the male household head. Surprisingly, household size decreased the likelihood of reporting ill-health shocks.

Table 4.3: Multivariate probit model for probability of experiencing various shocks

	Sample (mean)	Sample (sd)	Health expenses	Ill-health	Funeral expenses	Livestock losses	Land division	Death
Wealth levels (dummies)								
Poorest quintile	0.20	0.40	-0.163	-0.210	0.062	0.186	0.315	0.235
			(0.247)	(0.279)	(0.292)	(0.316)	(0.355)	(0.423)
2nd quintile	0.20	0.40	-0.274	0.252	-0.310	0.233	0.568	0.541
			(0.249)	(0.248)	(0.290)	(0.314)	(0.358)	(0.396)
3rd quintile	0.20	0.40	-0.250	-0.138	-0.268	-0.333	0.009	0.191
			(0.229)	(0.241)	(0.292)	(0.315)	(0.340)	(0.367)
4th quintile	0.20	0.40	-0.194	0.130	0.080	0.046	0.344	0.390
			(0.224)	(0.227)	(0.252)	(0.288)	(0.299)	(0.360)
Zone (dummies)								
Western lowland	0.25	0.44	-0.276	-0.59**	0.563**	-0.573**	-0.511	0.822**
			(0.218)	(0.241)	(0.268)	(0.252)	(0.319)	(0.321)
Western transitional	0.29	0.45	0.282	-0.435*	0.743***	-0.593**	0.249	-0.062
			(0.209)	(0.228)	(0.243)	(0.245)	(0.274)	(0.350)
Central highlands	0.27	0.44	0.089	-0.59**	0.154	-0.697**	0.392	0.212
			(0.221)	(0.232)	(0.272)	(0.274)	(0.305)	(0.373)
Household characteristics								
Age of household head	57.5	12.9	0.007	0.012*	0.006	0.000	0.016*	0.024***
			(0.006)	(0.006)	(0.007)	(0.008)	(0.008)	(0.008)
Head has > primary education	0.21	0.41	-0.437*	-0.457*	-0.067	-0.136	-0.272	0.105
			(0.232)	(0.249)	(0.265)	(0.282)	(0.333)	(0.374)
Male headed	0.73	0.44	0.137	0.167	0.252	-0.018	-0.511**	0.437*
			(0.165)	(0.176)	(0.202)	(0.217)	(0.203)	(0.237)
Household size (adults equivalents)	4.96	2.43	-0.019	-0.09***	0.011	0.041	-0.025	-0.032
			(0.034)	(0.030)	(0.034)	(0.039)	(0.046)	(0.042)
Proportion of non-dependents	0.59	0.24	0.002	0.197	0.198	-0.120	0.152	-0.281
			(0.305)	(0.344)	(0.336)	(0.408)	(0.393)	(0.441)
Proportion of educated adults	0.31	0.31	0.352	0.152	-0.222	0.627*	-0.159	-0.451
			(0.300)	(0.309)	(0.393)	(0.381)	(0.400)	(0.494)
Distance to public health facility (km)	2.23	1.00	0.103	0.041				0.058
			(0.073)	(0.078)				(0.109)
Constant			-0.805	-0.739	-1.906***	-1.132*	-2.12***	-3.47***
			(0.537)	(0.594)	(0.571)	(0.623)	(0.778)	(0.923)

Likelihood ratio test of rho=0: chi2(15) = 181.457 Prob > chi2 = 0.0000

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

As a robustness analysis, we estimated a similar multivariate probit model using the relative welfare levels within the zones (Table 4.4). For each zone, we disaggregated the sample into predicted income quintiles (similar to section 4.3.2). In contrast to the welfare levels used in Table 4.3, households belonging to a similar welfare quintile in each of the zones were grouped together. However, these households are likely to differ in terms of their absolute welfare level. According to this ranking, for example, households in the poorest income quintile in each zone all belong to the same welfare group, yet the average absolute welfare level for the poorest quintile in a well-off zone might be comparable to the average absolute welfare level of the richest quintile in the poorest zone. The results are consistent with the earlier findings in Table 4.3, showing that relative welfare levels had no effect on the probability of reporting any of the common shocks (Table 4.4).

The Poisson regression results show that welfare level has no effect on the number of shocks reported (column 2 of Table 4.5), consistent with findings from the probit models (Tables 4.3 and 4.4). In contrast to the results from the probit model, geographical location had no effect on the number of shocks reported. Age of household head had a positive impact on the number of shocks a household reported or experienced. The average number of shocks reported significantly increased with age of the household head. Again as a robustness analysis, we estimated a similar Poisson model using the relative welfare levels within the zones and the findings as similar as before (column 3 of Table 4.5).

Overall, at the aggregate level (for the entire sample) we find no evidence that welfare levels affect exposure to *specific* shocks and the *number* of shocks reported. Instead, we find a significant geographical effect on the likelihood of reporting ill-health, funeral expenses, livestock losses, and death of income earner. Geographical location, however, had no effect on the number of shock reported. Other factors that had impact on exposure to shocks for the entire sample were age and gender of household head, education level of household head, and household size. These findings contradict the perception that welfare level affects exposure to shocks, and in particular that poor households are more vulnerable to shocks (e.g. Dercon *et al.*, 2005; Tesliuc and Lindert, 2004).

Table 4.4: Multivariate probit model for the probability of experiencing various shocks – robustness analysis using relative welfare levels within regions

	Health expenses	Ill-health	Funeral expenses	Livestock losses	Land division	Death
Wealth levels (dummies)						
Poorest quintile	-0.307	-0.380	-0.092	0.388	0.263	0.022
	(0.228)	(0.251)	(0.279)	(0.276)	(0.328)	(0.325)
2nd quintile	-0.267	0.004	0.141	-0.082	0.506	0.470
	(0.238)	(0.239)	(0.256)	(0.308)	(0.335)	(0.334)
3rd quintile	-0.419*	-0.368	-0.061	0.107	0.448	0.040
	(0.225)	(0.247)	(0.260)	(0.287)	(0.312)	(0.316)
4th quintile	-0.287	-0.024	-0.208	0.243	0.013	-0.492
	(0.215)	(0.234)	(0.259)	(0.288)	(0.316)	(0.324)
Zone (dummies)						
Western lowland	-0.302	-0.637***	0.603**	-0.427*	-0.413	0.920***
	(0.212)	(0.221)	(0.269)	(0.237)	(0.312)	(0.312)
Western transitional	0.266	-0.439*	0.793***	-0.584**	0.277	-0.028
	(0.211)	(0.227)	(0.247)	(0.245)	(0.278)	(0.354)
Central highlands	0.141	-0.566**	0.224	-0.664**	0.351	0.169
	(0.214)	(0.232)	(0.267)	(0.282)	(0.304)	(0.347)
Household characteristics						
Age of household head	0.007	0.010*	0.007	-0.000	0.016*	0.022**
	(0.006)	(0.006)	(0.007)	(0.008)	(0.008)	(0.010)
Head has > primary education	-0.442*	-0.521**	-0.033	-0.066	-0.246	0.102
	(0.232)	(0.252)	(0.262)	(0.284)	(0.327)	(0.375)
Male headed	0.120	0.196	0.247	-0.032	-0.485**	0.293
	(0.167)	(0.179)	(0.209)	(0.217)	(0.208)	(0.270)
Household size (adults equivalents)	-0.017	-0.078**	-0.001	0.051	-0.024	-0.027
	(0.033)	(0.032)	(0.033)	(0.038)	(0.048)	(0.047)
Proportion of non-dependents	0.007	0.176	0.173	-0.072	0.076	-0.478
	(0.308)	(0.345)	(0.346)	(0.418)	(0.399)	(0.634)
Proportion of educated adults	0.328	0.238	-0.118	0.524	-0.161	-0.238
	(0.300)	(0.312)	(0.383)	(0.377)	(0.386)	(0.486)
Distance to public health facility (km)	0.105	0.042				0.060
	(0.074)	(0.080)				(0.111)
Constant	-0.728	-0.611	-2.043***	-1.309**	-2.119***	-3.050***
	(0.540)	(0.603)	(0.572)	(0.639)	(0.801)	(1.014)

Likelihood ratio test of rho=0: chi2(15) = 174.801 Prob > chi2 = 0.0000

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4.5: Poisson regression estimates

	Absolute welfare levels	Robustness analysis (Relative welfare)
Wealth levels (dummies)		
Poorest quintile	-0.022	-0.089
	(0.191)	(0.155)
2nd quintile	0.043	0.036
	(0.171)	(0.160)
3rd quintile	-0.047	-0.099
	(0.173)	(0.165)
4th quintile	0.041	-0.123
	(0.174)	(0.155)
Zone (dummies)		
Western lowland	-0.119	-0.123
	(0.160)	(0.151)
Western transitional	0.035	0.037
	(0.145)	(0.145)
Central highlands	-0.187	-0.176
	(0.170)	(0.164)
Household characteristics		
Age of household head	0.012***	0.012***
	(0.004)	(0.004)
Head has > primary education	-0.264	-0.268
	(0.190)	(0.187)
Male headed	0.186*	0.178
	(0.111)	(0.110)
Household size (adult equivalents)	-0.023	-0.020
	(0.020)	(0.020)
Proportion of non-dependents	0.081	0.075
	(0.222)	(0.222)
Proportion of educated adults	0.136	0.156
	(0.219)	(0.213)
Distance to public health facility (km)	0.065	0.066
	(0.049)	(0.049)
Constant	-0.514	-0.478
	(0.378)	(0.368)

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

We conclude our analysis by exploring whether there are welfare effects on exposure to specific shocks within zones. For each zone, we disaggregated the sample into predicted income quintiles (similar to section 4.3.2). We used the same set of predictor variables (as in Table 4.3) to estimate a series of probit and Poisson regression models for each of the four zones. The probit regression models were estimated only for the most commonly reported shocks in each

zone (i.e. those reported by more than 10% of the households in the zone). While some shocks such as health expenses, ill-health and funeral expenses are common across all zones, others such as livestock losses, land sub-division, and death of income earner are more common in particular zones (see Table 4.1). We estimated separate probit models because the sample sizes for each of the zones were too small for estimating a multivariate probit model.

In contrast to findings at the aggregate level, within geographical locations (zones), we find limited evidence that welfare level affects exposure to certain shocks (Table 4.6). The effects are, however, not systematic across the regions. In Eastern lowland, the poorest households were more vulnerable to livestock losses compared with the richest households. Welfare levels also had effects on the likelihood of reporting ill-health in this zone. Households in the second quintile were more likely to report ill-health shocks compared with the richest households. Surprisingly, welfare levels had a negative effect on ill-health shocks in the Western lowland, where the poorest households were less likely to report ill-health shocks.[36] Again, this finding for ill-health in the Western lowland zone contradicts the perception that poor households are more vulnerable to ill-health shocks. For health expense shocks, welfare level had effects in the Western lowland and Western transitional zones. In both zones, households in the third welfare quintile were less likely to report health expense shocks compared with the richest households. These findings do not confirm our hypothesis that well-off households are more likely to report health expense shocks. For funeral expenses, welfare level had significant effects in the Western transitional zones, but it is the poorer households (in the poorest, 2nd and 3rd quintiles) who were less likely to report funeral expense shocks compared with the richest households. In Central highland, welfare level had effects on land sub-division and funeral expense shocks. Households in the second quintile were more likely to report funeral expense shocks, whereas those in the third quintile were more likely to report land sub-division shocks compared with the richest households. Altogether, with the exception of livestock losses in the Eastern lowland, these findings show that even within zones, there is limited evidence that the poor are more vulnerable to *specific* shocks.

[36]Ill-health has some problems of perfect prediction for education of household head – some of the observations dropped from the estimation.

Table 4.6: Probit models for probability of experiencing various shocks by zone[1]

	Eastern Lowland				Western Lowland				Western Transitional				Central Highland			
	Health expense	Ill-health	Funeral expense	Livestock losses	Health expense	Ill-health[2]	Funeral expense	Death	Health expense	Ill-health	Funeral expense	Land division	Health expense	Ill-health	Funeral expense	Land division
Poorest quintile	-0.412	0.193	-0.025	0.931*	-0.120	-1.317**	0.400	0.042	-0.355	-0.205	-0.852*	0.635	-0.425	-0.728	0.057	0.461
	(0.579)	(0.636)	(0.904)	(0.557)	(0.489)	(0.614)	(0.537)	(0.542)	(0.425)	(0.459)	(0.499)	(0.658)	(0.484)	(0.544)	(0.666)	(0.573)
2nd quintile	0.213	1.218*	-0.558	-0.734	0.042	-0.295	0.690	0.275	-0.581	0.038	-0.903*	0.999	-0.634	-0.254	1.184**	0.541
	(0.594)	(0.633)	(0.866)	(0.647)	(0.454)	(0.592)	(0.534)	(0.491)	(0.456)	(0.479)	(0.491)	(0.651)	(0.443)	(0.484)	(0.552)	(0.533)
3rd quintile	0.076	-0.300	0.564	0.207	-1.240*	-0.879	0.422	0.344	-0.903**	-0.619	-1.26***	0.769	-0.154	0.005	0.835	0.982*
	(0.590)	(0.602)	(0.785)	(0.591)	(0.637)	(0.658)	(0.541)	(0.545)	(0.441)	(0.485)	(0.477)	(0.708)	(0.438)	(0.443)	(0.576)	(0.519)
4th quintile	-0.301	0.152		-0.331	-0.254	0.488	0.411	-0.241	-0.299	-0.084	-0.597	0.891	-0.336	-0.675	-0.077	0.056
	(0.580)	(0.600)		(0.699)	(0.484)	(0.604)	(0.540)	(0.512)	(0.420)	(0.425)	(0.416)	(0.664)	(0.426)	(0.450)	(0.597)	(0.535)
Constant	-0.145	-0.665	-9.02***	-2.653**	-3.066**	-4.88***	-3.496**	-2.841*	0.736	-0.757	1.840*	-1.605	-0.819	-1.883	-2.829**	-2.675**
	(1.677)	(1.860)	(3.462)	(1.296)	(1.270)	(1.829)	(1.567)	(1.601)	(0.941)	(1.172)	(1.030)	(1.272)	(1.141)	(1.161)	(1.207)	(1.319)
N	67	67	54	67	90	75	90	90	101	101	101	81	95	95	95	95

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[1]Household characteristics and distance to the nearest public health facility control variables are included.

[2]Ill-health has some problems of perfect prediction for education of household head – some of the observations dropped from the estimation

The Poisson regression results for each zone show that welfare level had a marginal effect on the number of shocks reported in the Western transitional zone only (Table 4.7), consistent with findings for the entire sample in Table 4.5.

Table 4.7: Poisson regression estimates by zone

	Eastern lowland	Western lowland	Western transitional	Central highland
Wealth				
Poorest quintile	0.059	0.025	-0.185	-0.169
	(0.429)	(0.374)	(0.254)	(0.284)
2nd quintile	0.229	0.166	-0.157	-0.042
	(0.416)	(0.335)	(0.235)	(0.364)
3rd quintile	0.089	0.048	-0.597*	0.123
	(0.399)	(0.344)	(0.308)	(0.331)
4th quintile	-0.321	0.264	-0.103	-0.551
	(0.473)	(0.351)	(0.207)	(0.342)
Household characteristics				
Age of household head	0.008	0.018**	0.004	0.020*
	(0.009)	(0.009)	(0.006)	(0.010)
Head has > primary education	-0.881**	-0.368	-0.062	0.213
	(0.354)	(0.406)	(0.332)	(0.330)
Male headed	0.368	0.257	0.083	0.111
	(0.296)	(0.241)	(0.180)	(0.244)
Household size (adult equivalents)	-0.056	-0.035	-0.018	0.048
	(0.062)	(0.025)	(0.035)	(0.058)
Proportion of non-dependents	0.109	0.103	0.121	0.026
	(0.724)	(0.489)	(0.364)	(0.374)
Proportion of educated adults	0.796	0.070	0.065	-0.415
	(0.494)	(0.504)	(0.401)	(0.439)
Distance to public health facility (km)	-0.228	0.372	0.064	0.135
	(0.292)	(0.229)	(0.054)	(0.146)
Constant	0.229	-1.721	0.185	-1.283
	(1.040)	(0.910)	(0.509)	(0.805)
N	67	90	101	95

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.5 Conclusions

Shocks have been identified as a cause of vulnerability to poverty. For poor households, the inability to effectively deal with shocks often lies at the core of their poverty (World Bank, 2001). The literature on the impact of shocks on welfare and welfare losses has been increasing. These studies document that shocks have a greater impact on poorer households (see Carter *et al.*, 2007; Hoddinott and Kinsey, 2001; Hoddinott, 2006; Wagstaff and Lindelow, 2010). Household welfare level can also influence the likelihood of exposure to specific shocks. This paper contributes to the literature on shocks and vulnerability by providing evidence on the various shocks rural households in Kenya face and by exploring the effect of welfare level and geographical location on exposure to *specific* shocks and the *number* of shocks reported. Understanding shocks and who is vulnerable is a necessary step for the design of appropriate programs and interventions for reducing vulnerability. As Hoddinott and Quisumbing (2003) argue, to inform policy for reducing vulnerability requires an understanding of who is vulnerable, sources of vulnerability, household risk and vulnerability coping strategies, and identifying the gap between risks and risk management mechanisms.

More than two-thirds of the households in our study experienced shocks over the period 2005–2009. Health expenses, ill-health, funeral expenses, livestock losses, land sub-division, and death of a major income earner were the most frequently reported shocks. The high prevalence of health expense and ill-health shocks is consistent with previous studies in Kenya and elsewhere (Heltberg and Lund, 2009; Krishna *et al.*, 2004; Kristjanson *et al.*, 2010; Quisumbing, 2007). We find significant differences in the prevalence of shocks across geographical locations. Certain shocks were more prevalent in certain regions than others, reflecting the underlying agro-ecological and cultural diversity across the regions. In contrast, we do not find significant differences in prevalence of shocks across welfare levels.

Overall, we find no evidence that welfare level affects exposure to specific shocks and the number of shocks reported at the aggregate level — for the entire sample. Instead, we find that geographical location significantly effects exposure to ill-health, funeral expenses, livestock losses, and death of income earner. In contrast, geographical location had no effect on the number of shocks reported. The findings suggest that policies and programs aimed at reducing vulnerability to shocks should take into account regional differences or needs. Other factors that had impact on exposure to shocks at the aggregate level were age and gender of household head, education level of household head, household size, and distance to public

health facilities. Within regions, we find limited evidence that welfare level affects exposure to certain shocks and the number of shocks reported, but the effects are not systematic across regions. For example, the poorest households in Eastern lowland were more vulnerable to livestock losses compared with the richest households. In contrast, poorer households in the Western transitional zone were less vulnerable to funeral expense shocks compared with the richest households. Yet in Central highlands, households in the lower second welfare quintile were more likely to report funeral expense shocks. Altogether, both findings at the aggregate-level and within-regions seem to contradict the perception that the poor are most exposed to shocks.

While our findings show limited evidence that welfare level affects exposure to specific shocks, perhaps the impact of shocks on welfare change is likely to differ by initial household wealth. It would be interesting to look at the differential impacts of shocks on welfare change for poor and well-off households. Based on our findings of the most frequently reported shocks, the policies that can reduce vulnerability to shocks among rural households in Kenya include investment in preventive health care and expanding the coverage of public health insurance, provisions for widow or widower and children in the event of death of income earner, funeral micro-insurance[37], and livestock micro-insurance in drought prone areas.

[37] Currently a new product in Kenya offered by some funeral homes and few insurance companies (e.g. Microensure Company)

Appendix C

Event-histories module at the household level

This section looks at the chronology of events for the household between 1996 and 2009. The aim is to link particular **livelihood strategies**, **positive events** and **negative shocks** that had an impact on the household well-being (in terms of making them poorer/wealthier) within the 12 year period to specific years when the events occurred starting with **1996 as the base year**. (Note: Only fill in the years when the major events that had an impact on the household well-being occurred).

Year	Brief description of the events (to be filled only when an event that had an impact on household well-being took place)	Impact on household well-being (poorer/wealthier)	Event code
1996			
1997			
1998			
1999			
2000			
2001			
2002			
2003			
2004			
2005			
2006			
2007			
2008			
2009			

Table C1: Distribution of shocks across divisions within zones

	Eastern lowland		Western lowland		Western transitional		Central highland	
Shocks	Kilome	Migwani	Winam/Kadibo	Nyando	Kabras	Mumias	Mukurweini	Othaya
Health expenses	35.1	40.0	30.4	20.5	51.8	47.8	43.9	42.6
Ill-health	40.5	33.3	26.1	11.4	21.4	30.4	17.1	29.6
Funeral expenses	2.7	16.7	23.9	18.2	26.8	23.9	14.6	9.3
Livestock losses	8.1	40.0	15.2	6.8	12.5	2.2	7.3	5.6
Land subdivision	2.7	13.3	6.5	2.3	14.3	10.9	9.8	20.4
Death of income earner	2.7	6.7	15.2	22.7	3.6	4.3	7.3	7.4
Accidental loss	0.0	0.0	8.7	9.1	7.1	2.2	0.0	1.9
Accidental injury	0.0	3.3	6.5	2.3	3.6	6.5	2.4	1.9
Crop losses	0.0	10.0	8.7	0.0	0.0	6.5	0.0	0.0
Dowry payment	0.0	0.0	0.0	0.0	8.9	4.3	0.0	0.0
Loss of employment	2.7	6.7	2.2	0.0	1.8	2.2	0.0	0.0
Conflict	0.0	0.0	0.0	0.0	0.0	0.0	4.9	7.4
Litigation	2.7	0.0	0.0	0.0	3.6	0.0	0.0	3.7
N	37	30	46	44	56	46	41	54

Table C2: Distribution of shocks across reported income quintiles

Shocks	Poorest quintile	2nd quintile	3rd quintile	4th quintile	Richest quintile	Average	chi2(4)
Health expenses	35.2	38.0	36.6	35.2	52.9	39.5	6.63
Ill-health	18.3	35.2	23.9	18.3	32.9	25.7	9.42*
Funeral expenses	21.1	14.1	15.5	22.5	14.3	17.5	3.16
Livestock losses	4.2	16.9	12.7	12.7	8.6	11.0	6.67
Land subdivision	8.5	9.9	15.5	8.5	10.0	10.5	2.58
Death of income earner	7.0	14.1	9.9	8.5	4.3	8.8	4.65
Accidental loss	2.8	2.8	7.0	2.8	4.3	4.0	
Accidental injury	4.2	2.8	2.8	2.8	4.3	3.4	
Crop losses	4.2	5.6	4.2	0.0	0.0	2.8	
Dowry payment	5.6	2.8	1.4	0.0	0.0	2.0	
Loss of employment	2.8	0.0	4.2	1.4	0.0	1.7	
Conflict	1.4	1.4	2.8	1.4	1.4	1.7	
Litigation	0.0	2.8	2.8	1.4	0.0	1.4	
	71	71	69	71	69	353	

[1]The Chi-square statistic is only calculated for the most commonly reported shocks
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Chapter 5

Determinants of Rural Income: The role of Geography and Institutions in Kenya[38]

[38] This paper was co-authored with Erwin Bulte, Development Economics Group, Wageningen University, 6706 KN Wageningen, The Netherlands. Submitted to *Journal of African Economies*.

Abstract

We revisit the debate about the root causes of income divergence, and ask whether geographical variables or institutions are the main determinants of income. Complementing earlier cross-country work, our focus is on the *local* level. Analysing Kenyan household data, we find that certain geographical variables appear more important drivers of per capita income levels than local institutions. Once we control for geography, our measures of community-level institutions do not explain within-Kenya differences in income.

Key words: drivers of local development; institutions-versus-geography debate

5.1 Introduction

A rapidly growing literature explores the factors explaining differences in per capita incomes across countries. Two main hypotheses have emerged from this literature. One identifies geographical variables as the main determinant of long-term income, the other points to institutions as the key driver.[39] In light of ongoing efforts to enhance the effectiveness and efficiency of development assistance, the question which hypothesis is correct is clearly an issue of first-order relevance. If geographical factors are the main impediment to economic growth, then "big push, top-down" approaches based on a careful diagnosis of the geographical impediments combined with a blueprint of technical fixes may potentially be appropriate to lift societies out of poverty. Matters are arguably more complex if it were true that "institutions rule." Then, institutional reform may be a prerequisite for successful follow-up intervention (e.g. Easterly, 2006). But our understanding of which institutions to reform, and how to go about reforming them, is quite imperfect (Rodrik, 2006).

Most research into the root causes of income inequalities focus on a global sample of countries. Such studies face several challenges, and Brock and Durlauf (2001) note "*This literature does rely on assumptions that may be argued to be […] dubious and whose implausibility renders the inferences typically claimed by empirical workers to be […] suspect*" (p.232). Among the potential problems, consistent measurement of relevant variables, especially institutional proxies, is difficult. Also, the open-endedness of growth theories (so that validating one theory does not imply falsifying another one) implies a risk of omitted variables — variables not included in the regression models, but correlated with both regressors and the dependent variable (biasing estimates). This point is aggravated by the simple observation that the set of countries included in most income regressions is quite diverse. In addition, one may doubt whether the "one-size-fits-all" approach of most linear income models adequately captures the diversity of mechanisms linking institutions and geography to economic outcomes (the concern of parameter heterogeneity). For example, the link between malaria ecology and incomes varies with the quality of health interventions in countries.

Recent evidence by Bhattacharya (2009b) suggests that the nature of the geography-versus-institutions debate varies with the aggregation level of the analysis. Specifically, while the empirical evidence for global samples typically points to institutions as the main

[39] Alternative explanations for income differences include policies (Sachs *et al*., 1995) and, for the African continent, the history of slave raids (Nunn 2007).

determinant of income, geographical factors (notably malaria prevalence) best explain income differences in a sample of African countries. Regardless of the sample, however, cross-country studies gloss over within-country income differences, and take *mean* per capita income as the key dependent. It is an open question whether, from a policy perspective, cross-country income differentials are more or less relevant than within-country income differences.

The main objective of this paper is twofold. First, using local data we collected in Central, Western and Eastern regions in Kenya, we revisit the geography versus institutions debate at the local level, and aim to explain within-country income differences. Second, recognizing the multidimensionality of the institutional framework, we aim to "unbundle" institutions and distinguish between a number of institutional proxies. To attenuate concerns about the endogeneity of our institutional variables we use a novel set of instrumental variables. Our main results provide support for the geography-based perspective on underdevelopment — at least within Kenya. Both geography and institutions may therefore matter for promoting growth and reducing income inequality, depending on whether the focus is on domestic or international income differentials.

The paper is organized as follows. In section 5.2 we will briefly summarize the theories and evidence underpinning the perspectives that, respectively, geography or institutions are the key determinants of income. In section 5.3 we introduce the setting. In section 5.4 we outline our identification strategy and introduce our data. Section 5.5 contains our empirical results, including a robustness analysis. Finally, in section 5.6 we discuss our findings and place them in perspective.

5.2 Geography versus institutions: Theory and evidence

The geography-based view on underdevelopment identifies two broad categories of geographical factors that determine long-term income growth: *transport costs* and *intrinsic productivity*. While transport cost may not be invariant with respect to institutional variables, it is evident that geographical variables affect the ease with which regions or countries can trade with the rest of the world. Variables like coastal access, the presence or absence of navigable rivers, distance to major consumer or producer areas, but also mountain ranges, potentially have a large effect on transport cost. Africa, for example, has few navigable rivers and many landlocked countries, and is relatively far away from 'core markets' in Europe (Gallup *et al.*, 1999).

The geographical determinants of intrinsic productivity are potentially varied. For example, prevalence of infectious diseases, such as malaria, affects human productivity and lowers life expectancy (attenuating incentives to invest in various forms of capital). The prevalence of malaria and other infectious diseases is to an important extent determined by the ecology of the parasites (different species of malaria *Plasmodia*) and the vectors (different species of *Anopheles* mosquitoes). Geography also affects productivity via the direct link between agro-ecological conditions and agricultural output (Gallup and Sachs, 2001; Gallup *et al.*, 1999; Sachs and Malaney, 2002; Sachs, 2003). Lastly, resource endowments affect income, albeit not necessarily in a positive sense (see Brunnschweiler and Bulte, 2009 on the resource curse).

How might institutions matter? Institutions refer to the social, economic, legal, and political organization of a society. They shape the incentive structure of economies, and determine economic performance via their impact on accumulation and investment decisions of economic agents. Institutions affect information flows, transaction costs, investment risk, and the ability of societies to coordinate on collective action to address social dilemmas. For example, secure private land rights may spur investments in land via a so-called "assurance effect" (agents invest if they expect to collect the future returns); a "collateralisation effect" (security enhances the scope for using land as collateral — facilitating access to credit and enabling productive investments); or a "realisability effect" (capturing that investments in land may be encouraged if land can be rented out or sold). But the concept of institutions is broader, and also includes a political dimension (e.g., checks on the executive, degree of authoritarianism), governance-type of variables (e.g. corruption, rent seeking), and social capital (shared norms and values, trust).

Sometimes the dividing line between institutions (rules of the game) and policies (play of the game) is fuzzy. Glaeser *et al*. (2004) make the point that some of the so-called institutional variables commonly used in empirical studies reflect policy choices as much as they reflect constraints on decision-making. For example, Bhattacharyya (2009a) shows that both strong market-creating institutions, including effective contract enforcement, as well as market-stabilizing institutions, capturing macroeconomic stability and non-distortionary policies, are growth enhancing. However, such market-creating and stabilizing institutions arguably reflect both constraints for policy makers as well as choices made by them. That is, they are both inputs and outputs of the political decision-making process.

The African continent faces both geographical and institutional challenges. While the "geography school" points to malaria, depleted soils and prohibitive transport costs as the main impediments to development, political scientists like Rowley (2000) emphasize the link between political culture and economic performance. Many economic problems of Africa have their roots in public-choice impediments (see also Bates, 2006; 2008). According to this view, African leaders and the elites that support them, have deliberately crafted governance systems to promote rent-seeking (see also Congdon Fors and Olsson, 2007).

Which perspective is correct? As hinted above, the evidence supporting one view versus another varies with the aggregation level. Cross-country evidence from a sample of former European colonies suggest that institutions predominantly explain cross-country variation in per capita incomes (e.g. Acemoglu *et al.*, 2001; Easterly and Levine, 2003; Hall and Jones, 1999; Rodrik *et al.*, 2004). After controlling for (predicted) institutional quality — often instrumented by settler mortality — these studies find no evidence that geography or policies matter. However, Bhattacharyya (2009b) pits geography versus institutions in the context of a much smaller, and more homogenous, sample. He focuses on African countries, and examines the relative contributions of the history of slave trade, the legacy of extractive colonial institutions and the prevalence of malaria in explaining variation in incomes. Interestingly, for this sample malaria risk is a significant determinant of long-term economic development (or the lack of it), and the remaining factors — including the quality of institutions — do not enter significantly. The channel via which malaria affects growth could be reduced savings. Increased mortality and morbidity raise current consumption at the expense of savings and investments.

Scaling down the aggregation level, the logical next level of analysis focuses on *intra-country* income differentials. Since local data on income, geography and institutions are not readily available, combined with the fact that there are no "routine" instrumental variables for institutions, it is no surprise that few such studies exist. Yet, it is likely that studies based on local variation in institutions would be especially informative for policy makers. Grimm and Klasen (2008) and Voors and Bulte (2010) focus on the local income determinants in, respectively, Indonesia and Burundi. Both papers identify tenure security as the critical institutional link fostering investment and higher incomes. Hence, moving from the global sample of former colonies via a sample of African nations and onwards to samples of villages within specific nations, we observe that the nature of the evidence swings — from institutions to geography, and then back to institutions, as the main determinant of income levels.

5.3 Geography and institutions in Kenya

This paper aims to contribute new micro-level evidence to the geography versus institutions debate. We examine how geography and institutions affect income levels among rural households across different villages in Central, Western and Eastern regions, in Kenya. Earlier studies have explored the link between geography and poverty in Kenya (e.g. Kristjanson *et al.*, 2005; Okwi *et al.*, 2007), but the role of institutions has largely been ignored.

In the 1980s and 1990s, the Kenyan economy grew very slowly and erratically. At the dawn of a new millennium, the new government embarked on an economic recovery process through a broad nationwide development framework. While Kenya's economic growth accelerated between 2003 and 2007, with growth in real GDP estimated at about 7 per cent in 2007, the growth momentum faltered in 2008.[40] Not surprisingly, low mean incomes are also reflected in a high incidence of poverty. Official statistics indicate the incidence of rural poverty was 49 per cent in 2005/06 (KNBS, 2007), with significant regional and sub-regional differences (see also CBS, 2003; Okwi *et al.*, 2007; Suri *et al.*, 2009). What explains these differences?

Geographical and agro-ecological conditions display significant variation across Kenya. These include rainfall, soil fertility, and altitude, but also infrastructure (such as access to markets and public facilities), and the presence or absence of natural resources (forests or water bodies). Kristjanson *et al*. (2005) use spatial data analysis to examine the geographical correlates of meso-, or community-level poverty incidence in Kajiado district, Kenya. They identified pasture potential (NDVI), livestock density, distance to a major town, road density, access to education and security, soil fertility, and agricultural potential as relevant factors explaining variation in poverty levels across sub-locations. Okwi *et al*. (2007) also relate the incidence of rural poverty to geographical conditions, and find mixed effects of geographic variables at regional (provincial) levels. Slope, soil type, distance or travel time to public resources, elevation, type of land use, demographic and income inequality variables significantly explained spatial patterns of poverty. However, controlling for these variables, provincial dummies remained significant. This suggests that provinces in Kenya are heterogeneous along multiple relevant dimensions — not just geographical ones.

[40] Restrained by internal and external factors – including the 2008 post-election conflict, the global financial crisis, and high fuel and food prices – economic growth slowed from 7.1 per cent in 2007 to 1.7 per cent in 2008.

Burke and Jayne (2008) examined the relative importance of spatial versus household-level factors in explaining variation in wealth and poverty across regions, communities and households in Kenya. They provide evidence that spatial factors — remoteness and isolation, weak economic integration, and in particular agricultural potential — play a substantial role herein. Poverty was prevalent in areas with binding land constraints and areas with relatively low agricultural potential. Household-specific factors explain an equal proportion of the variation in household wealth as spatial factors.

The latter finding suggests that while geographical variables are important, other factors matter as well. Possibly institutional proxies are among such other factors. Obviously our "micro-level" analysis fails to pick up any effects due to ill-functioning (political) institutions at the macro level. National institutions affect all villages alike, and the counterfactual (i.e., an alternative set of Kenyan macro institutions) does not exist. However, the institutional framework encompasses national as well as local institutions, and arguably there is variation in the quality of institutions at the local level. This is what we set out to explore in the remainder of this paper, and we distinguish between four dimensions of institutional quality at the community (village) level. A detailed description of our institutional variables is provided in the next section.

5.4 Data and empirical strategy

In 2009 we collected data from 430 households in 28 communities, across four agro-ecological zones in Kenya. These data are summarized in Table D1 (Appendix D). The survey covers various important aspects of household livelihoods. First, we collected a comprehensive measure of household income, Y_{i} for household *i*. Household income sums crop income (value of total output less input costs), livestock income (value of livestock and livestock product sales less production costs), salaried income, remittances, business income, and income from casual labour and dividends. To control for differences in family size across households, we computed per capita income levels. Average per capita income in 2009 was KSh 32,564 (USD 434). We use the log of per capita income as our dependent variable.

Next, we collected information on four dimensions of institution quality; vector $\boldsymbol{I}_j$ for village *j*. To attenuate endogeneity concerns in our income model and to reflect that institutional quality is a characteristic of the community (and not of individual villagers) we consistently measure institutions at the village level — sometimes by aggregating household responses and creating a community average. Vector $\boldsymbol{I}_{\mathrm{j}}$ includes measures of (*i*) the quality of

local governance, (*ii*) social capital, (*iii*) political participation, and (*iv*) trust in local government institutions.

Information on governance quality was collected through focus group discussions (FGDs). We asked respondents to rate, on a five-point scale, the performance of the sub-chief[41] regarding (*a*) working in the best interest of the community; (*b*) working in the best interest of the people in general; and (*c*) the level of confidence in the sub-chief.

Social capital is a fuzzy term, and typically captures trust, norms and networks that reduce transaction cost and enable collective action (Bowles and Gintis, 2002; Knack and Keefer, 1997). We quantified two dimensions of social capital; community-level trust and cooperation. To measure trust, we followed the World Value Survey approach, and asked respondents to rate their level of trust in household members, extended family, and community members. Trust was measured on a ten-point scale, and scores for the sub-indices were added, normalized between zero and one, and aggregated at the community level. On average, the trust level was rather high with a score of 0.7. To measure the level of cooperation, respondents were asked whether most people in their village would help them in case of need. On average, 83% of the households provided a positive response.

Political participation may matter for development as well. Arguably political participation fosters accountability of village leaders, and facilitates the flow of information from the people to the leaders. We measure participation as the average proportion of adults that voted in the 2005 referendum and 2007 general elections. Because these two measures are highly correlated (ρ=0.91), we use participation in the 2005 referendum in our models.

Our final institutional dimension — trust in local government institutions — is based on the stated level of confidence in the justice system, police, and local political authorities. These were measured at the household level on a ten-point scale. The scores for the sub-indices were added and normalized between zero and one, and aggregated at the community level. The average score across communities equals 0.42, indicating modest trust.

To what extent do these different institutional variables indeed capture different dimensions of the institutional framework? To probe into this issue we computed the correlation between these variables, and found that they were not highly correlated. The correlation coefficient ranges from ρ=-0.004 to ρ=-0.495, suggesting that each variable picks up something that is "distinct." The greatest correlation exists between social capital (trust level) and political participation (ρ=-0.495 and significantly correlated at the 1% level). This

[41] A sub-chief is a government representative at the lowest administrative unit — the sub-location. A sub-location is made up of a cluster of villages or communities.

implies multicollinearity may emerge when both proxies are included in one regression model.

Next, we turn to the set of variables inspired by the alternative hypothesis that geographical factors explain income (differences). Our vector with geography variables ($\boldsymbol{G}_i$) contains data from primary and secondary sources. We collected GPS coordinates for each household in 2009, and combined these coordinates with existing data for a number of geography variables. Following the literature, we include altitude, latitude, rainfall, temperature, indicators of soil quality (different landscape attributes and soil types), normalized differential vegetation index (NDVI), malaria risk, distance to markets, distance to major towns, distance to good road, and population density (from the 1999 census). The rainfall data were collected by the National Weather Service Climate Prediction Centre as part of a Famine Early Warning System.[42] We calculated average main season rainfall for each household as well as the variance of rainfall. However, when controlling for rainfall levels, the variance never enters significantly (so this variable is dropped in what follows). For latitude, we use the absolute value measure of latitude (distance from the equator). Soil data are based on the Exploratory Soil Map and Agro-climatic Map of Kenya.[43] We used the new malaria risk data based on the work by Noor *et al*. (2009), which is exogenous to per capita incomes as it is based on climatic conditions.

We also collected information on a number of household and community controls. Household controls, vector $\boldsymbol{X}_i$, are the age, gender and education of the household head, and per capita land holdings (in acres). The vector of community controls ($\boldsymbol{C}_j$) includes population density, ethnicity, availability of clean water, distance to health facilities, availability of transport, having a primary school within the community, number of years of mobile phone coverage, religious composition, perceived security changes (subjective assessment of whether security had improved, stayed the same or worsened over the last 12 years), and the presence of illegal "ngangs" (mainly Mungiki ngangs; travelling gangs of robbers).[44]

The religion variables warrant extra discussion. Below we explore whether the religious composition of a village affects the quality of local institutions. There are various mechanisms via which religion may affect local institutions. For example, as religion may

[42] This data has been compiled by the Tegemeo Institute of Agricultural Policy and Development.
[43] For details on the actual soil types and the associated information see the documentation "Exploratory Soil Map and Agro-climatic Zone Map of Kenya, 1980".
[44] Mungiki is a political-religious group and a banned criminal ngang in Kenya. The group operates mainly in Central, Nairobi and parts of the Rift Valley, and involved in criminal activities including illegal taxation of businesses, murders among others.

prescribe certain behaviors and impose norms of conduct, it helps villagers to form consistent expectations about the responses of their peers — facilitating cooperation and trust. Religious values or traditions can also influence the views of individuals about community members, and indeed people in general. Moreover, participation in religious groups (direct interaction) builds social capital. Religion can, therefore, via several channels enhance intra-group trust, and facilitate collective action (see also Welch *et al.*, 2004).[45] Religion can also potentially influence civic and political participation via certain social norms. Civic participation is facilitated by social capital, as reflected in social networks characterized by norms of reciprocity and trust. In addition, churches are avenues for providing political information. In Kenya for instance, some churches are more vocal in political matters than others. Religious institutions, therefore, hold the potential to reconnect people to politics, and provide political information and participatory opportunities to their followers (Greenberg, 2000). They can make demands upon the state, and influence political outcomes so that its potential effect on income may be indirect. We will empirically explore these issues below.

We calculate the proportion of the adult population in our sample belonging to different religious groups: Catholics, Protestants, Pentecost, and other religious affiliation (Muslim and others; the omitted category in our regression models). These data were collected at the household-level and aggregated at the community level. On average, there were more protestants than other religious groups. The average proportion of Protestants was 0.53, followed by Catholics (0.26), and Pentecostals (0.17). A small minority were Muslims or members of other religious groups.

In addition to controlling for the religious composition of villages, we also tried to control for the ethnic composition. Ethnolinguistic diversity (fractionalization or polarization) may directly hinder economic development and indirectly shape the underlying institutions and policies that influence economic development. Evidence suggests ethnically fragmented societies tend to suffer from reduced social cohesion and a smaller supply of public goods.[46] In rural Kenya, however, villages tend to be ethnically homogenous, even if the ethnic identity of villagers varies from one region to the next. Hence we do not include an ethnic fractionalization variable. We did set out to control for the ethnic identity of the villages. Our study sites spread across four major ethnic communities: Kikuyu (Central region), Luhya and

[45] In Italy, Putnam (1993) attributes the prevailing lack of trust toward others in the South to the strong Catholic tradition, which emphasizes the vertical bond with the Church and tends to undermine the horizontal bond with fellow citizens.

[46] The incumbent leader may implement policies aimed at expropriating resources from ethnic losers, restricting the rights of other groups, and discouraging the growth of industries or sectors that might threaten the position of the ruling group (e.g., Alesina *et al.*, 1999; Easterly and Levine, 1997)

Luo (Western region), and Kamba (Eastern region). The Kikuyu, Luyha, and Luo communities comprised some 28% each of our sample, while the rest (16%) were Kamba. When including ethnicity dummies to represent these groups, we found they were correlated with some geographical variables. Hence we do not include them explicitly in most analysis (but including them does not affect our main results; details available on request).

Finally, we turn to our identification strategy, which is inspired by standard macro level income regressions. Indeed, we follow Pande and Udry (2005) who recommend to exploit synergies between research on specific institutions (based on micro data) while addressing the "big macro questions" of growth. We first explore correlations between geography, institutions and income using simple OLS models, specified as:

$$Y_{ij} = \beta_1 + \beta_2 G_{ij} + \beta_3 I_j + \beta_4 X_{ij} + \beta_5 C_j + \varepsilon_{ij} \qquad (1)$$

where Y_i refers to per capita income of household i, and $i = 1, \ldots, 430$. $\boldsymbol{I}_j$ refers to a vector of community-level institutional variables, and $\boldsymbol{G}_{ij}$ is a vector of geography variables. Finally, $\boldsymbol{X}_{ij}$ and $\boldsymbol{C}_j$ are vectors of household and community controls, respectively. We enter $\boldsymbol{I}_{\mathrm{j}}$ and $\boldsymbol{G}_{\mathrm{ij}}$ separately and in combination. Virtually all geography variables are exogenous to household income. This is perhaps not true for the institutional variables. While income is measured at the household level and institutions are measured at the community level — attenuating concerns about *reverse causality* — we cannot rule out endogeneity concerns due to measurement error or omitted variables. For that reason we augment our OLS analysis with a series of 2SLS models. For the IV model, our first stage regression is specified as:

$$I_j = \gamma_1 + \gamma_2 G_{ij} + \gamma_3 X_{ij} + \gamma_4 C_j + \gamma_5 V_j + \mu_{ij}, \qquad (2)$$

where V_j refers to a vector of excluded instruments. Our identifying assumption is that the religious composition of the village is exogenous to household income, and does not influence income other than through its impact on institutions (i.e., our religion variables are correlated with local institutional quality, but not with the error term of the income model). We explore the empirical basis for these assumptions below. The second stage of the IV model is akin to model (1), but replaces our vector of institutional variables $\boldsymbol{I}_{\mathrm{j}}$ by their predicted values, $\boldsymbol{I}_{\mathrm{j}}$* (as predicted in accordance with the model in (2)).

As mentioned above, when testing for multicollinearity we found high correlations between some community control variables, notably population density, ethnicity, water source, distance to health facilities, availability of transport, and geography variables (e.g. malaria endemicity). We only included community controls that are not highly correlated

with the geography variables. Since some of our soil variables were highly correlated, we estimated models with soil type and landscape attributes separately. Based on the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) we decided to retain models with landscape attributes. However, our results are robust to including all these additional controls.

Finally, and as a robustness analysis, we have also done a factor analysis to reduce the dimensionality of our institutional vector. We selected three factors for inclusion in a series of estimates.

5.5 Regression results

We first explore simple correlations between income, geography and institutions, and start by examining the correlation between income and geography or institutions separately. Later we proceed by combining geography and institutions together in one model. We estimate OLS models using robust standard errors. Table 5.1 explores the link between geography and per capita incomes — controlling for a range of household and community level variables. Column 1 is a parsimonious model with only geographical variables (and a constant). In column 2 we add household controls, and in column 3 we add community controls. Column 4, finally, is the complete geographical model.

Several geographical variables are significantly correlated with per capita income. Specifically, main season rainfall, latitude, distance to a major town, landscape attributes (our soil proxy) and malaria risk enter significantly. The signs are as expected. High rainfall, distance from the equator, and proximity to a major town are all associated with high income levels. These results are robust across the OLS models. Malaria risk is weakly correlated with income levels, where medium, high and very high malaria risk dummies have a negative and significant correlation with income. Of the household level control variables, gender and education level of the household head, as well as per capita land holdings are significantly and positively correlated with income. None of the community level control variables is significantly correlated with income levels. These results for household and community controls are robust across virtually all models, and in what follows we will not report the details of these variables even if they are included in the estimations (but of course these estimation results are available on request).

Table 5.1: Geographical variables and household income in Kenya – OLS results

Dependent variable: Log of per capita income	OLS (1)	OLS (2)	OLS (3)	OLS (4)
Geography variables				
Mean main season rainfall (1997-2007) – log	24.258*	18.600*	28.518**	21.897*
	(12.673)	(10.845)	(13.302)	(11.924)
Mean maximum temp (^{0}C)	0.010	-0.001	-0.018	-0.044
	(0.120)	(0.102)	(0.144)	(0.129)
Altitude (log)	2.547	1.792	2.129	1.001
	(2.407)	(2.060)	(2.433)	(2.075)
Latitude (absolute value)	11.635**	9.154*	13.232**	10.189**
	(5.462)	(4.699)	(5.545)	(4.895)
Distance to nearest market (km)	-0.064	-0.061	-0.088	-0.101
	(0.118)	(0.104)	(0.124)	(0.111)
Distance to nearest major town (km)	-0.091***	-0.086***	-0.098***	-0.089***
	(0.023)	(0.020)	(0.023)	(0.021)
Distance to a good road (km)	-0.028	-0.031	-0.043	-0.048
	(0.063)	(0.056)	(0.066)	(0.060)
Mountains, scarps and hiUs	-6.254	-4.861	-6.938*	-5.163
	(3.882)	(3.328)	(3.812)	(3.299)
Volcanic foot ridges	-6.695*	-5.399	-7.570*	-5.850*
	(4.011)	(3.433)	(3.989)	(3.486)
Upper & lower middle-level uplands	-7.071*	-5.541	-7.695**	-5.633*
	(3.918)	(3.365)	(3.817)	(3.300)
Lower level upland	-3.843**	-3.258**	-4.131**	-3.231**
	(1.858)	(1.603)	(1.820)	(1.593)
Mean NDVI (1997-2009) - log	3.712	3.721	3.417	3.253
	(4.682)	(4.322)	(4.765)	(4.356)
Low malaria risk	1.189	0.952	1.018	0.618
	(1.658)	(1.468)	(1.740)	(1.543)
Medium malaria risk	-13.295*	-10.399*	-15.701**	-12.317*
	(7.305)	(6.263)	(7.638)	(6.835)
High malaria risk	-13.324*	-10.441*	-15.679**	-12.245*
	(7.325)	(6.276)	(7.560)	(6.721)
Very high malaria risk	-13.507*	-10.455*	-15.924**	-12.424*
	(7.326)	(6.294)	(7.590)	(6.754)
Household control variables				
Male household head		0.214*		0.206*
		(0.109)		(0.109)
Education of household head		0.395***		0.398***
		(0.110)		(0.112)
Age of household head		-0.005		-0.006
		(0.004)		(0.004)
Land size (acres) per capita		0.335***		0.341***
		(0.052)		(0.052)
Household has title deed		0.001		0.008
		(0.114)		(0.116)
Community control variables				
No. of years of mobile phone coverage			0.018	0.040
			(0.056)	(0.053)
Proportion of Catholics			1.923	1.557
			(1.868)	(1.747)
Proportion of Protestants			1.817	1.522
			(1.815)	(1.688)
Proportion of Pentecost			1.701	0.873
			(2.143)	(2.015)
Constant	-172.339*	-132.603	-194.306**	-144.497*
	(94.556)	(81.553)	(94.027)	(82.415)
Adjusted R-square	0.27	0.39	0.27	0.39
Observations	429	429	429	429

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In Table 5.2 we explore the correlations between incomes and our institutional proxies. As before, the first model only includes our variables of interest (in this case dimensions of the institutional framework). In columns 2 and 3 we introduce, respectively, household and community controls. Column 4 is the complete model. Based on cross-country evidence we expect a positive correlation between institutional quality and income levels. Surprisingly, the reverse seems to be the case in the countryside of Kenya. Apart from local cooperation, most institutional quality indicators are negatively correlated with income levels. We argue that some of these unexpected results may be due to endogeneity bias.

Table 5.2: Institutions and household income in Kenya – OLS results

Dependent variable: Log of per capita income	OLS (1)	OLS (2)	OLS (3)	OLS (4)
Institutional variables				
Trust index	-2.549***	-2.248***	-4.157***	-3.604***
	(0.805)	(0.706)	(1.144)	(1.006)
Cooperation	1.345***	0.873***	1.190***	0.962***
	(0.352)	(0.354)	(0.430)	(0.419)
Local justice and police	-2.080**	-1.672***	-2.793***	-2.396***
	(0.935)	(0.800)	(0.970)	(0.845)
Local political authorities	-0.457	-0.685	1.431	1.091
	(1.020)	(0.906)	(1.208)	(1.055)
Local governance quality (subjective assessment)	-0.453**	-0.441**	-0.213	-0.174
	(0.193)	(0.174)	(0.214)	(0.195)
Political participation (2005 referendum)	-1.428**	-0.833	-2.237***	-1.702***
	(0.553)	(0.517)	(0.661)	(0.602)
Household controls included?	No	Yes	No	Yes
Community controls included?	No	No	Yes	Yes
Constant	12.585***	11.667***	18.929***	17.526***
	(0.736)	(0.687)	(2.321)	(2.126)
Adjusted R-square	0.13	0.28	0.18	0.32
Observations	431	431	431	431

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

For example, households with relatively high incomes may feel insecure as they perceive themselves as attractive targets for ngangs or begging family members. This may explain low levels of trust and levels of confidence in extended family and community members. Political participation and voter turnout may be influenced by responses to changes in the economy (Aguiler and Pacek, 2000; Pacek and Radcliff, 1995; Radcliff, 1992). In an emerging democracy as Kenya, poor economic performance may drive voters to the polls

(Radcliff, 1992). Economic hardships encourage political participation as a means of seeking redress for grievances. We return to these concerns below.

Table 5.3 shows the results of a series of OLS models that simultaneously includes geography as well as institution quality variables (and household and community controls). We include indicators of institutional quality one at a time. Across all models, proximity to the nearest major town has a positive and significant correlation with income. Other geography variables (average rainfall, landscape attributes) are significantly correlated with income when controlling for various institutional proxies. However, interestingly and perhaps somewhat surprisingly, none of the institutional variables enters significantly.

For various reasons — reverse causality, omitted variables, and possible measurement error — the above relationships should not be interpreted as causal relationships. We next follow the literature and use an IV estimation strategy to attenuate endogeneity concerns. Specifically, we adopt a 2SLS framework, and use as excluded instruments two types of variables: (*i*) the religious composition variables (proportion of Catholics, Protestants and Pentecost) and (*ii*) a sub-set of geography variables that until now was never significantly correlated with income (i.e., mean maximum temperature, altitude and NDVI). We have also included other community level variables that until now entered non-significant — ngang and security dummies (but this does not affect any of the results). The idea that geography may matter via institutions follows the line of argument of Acemoglu *et al*. (2001), who propose settler mortality as an instrument for expropriation risk in a sample of former colonies. We postulate that, at the local level, geography has shaped the evolution of local communities and their livelihoods, and therefore impacted on the dynamics of local governance and institutions. Our IV approach seeks to identify exogenous variation in institutional variables, and thus includes geographical variables that do not affect income directly as excluded instruments. As a robustness analysis we have also estimated our 2SLS models using only religion dummies as excluded instruments, and found that the estimation results are consistent with the ones reported here (details available in the appendix — Table D6).

Table 5.3: Geography, institutions and income at household level - OLS Evidence

Dependent variable: Log of per capita income	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)
Geography variables						
Mean main season rainfall (1997-2007) – log	23.438*	28.916**	28.965**	25.224**	17.137	19.135
	(12.944)	(14.380)	(14.388)	(12.407)	(14.624)	(16.955)
Latitude (absolute value)	5.437	6.704	7.088	7.557	3.121	-4.148
	(9.337)	(7.686)	(8.027)	(7.630)	(8.233)	(11.818)
Distance to nearest market (km)	-0.091	-0.131	-0.130	-0.085	-0.079	-0.141
	(0.132)	(0.156)	(0.157)	(0.124)	(0.124)	(0.157)
Distance to nearest major town (km)	-0.087***	-0.095***	-0.096***	-0.091***	-0.080***	-0.077**
	(0.023)	(0.023)	(0.024)	(0.023)	(0.025)	(0.027)
Distance to a good road (km)	-0.037	-0.035	-0.031	-0.042	-0.020	-0.004
	(0.065)	(0.064)	(0.069)	(0.066)	(0.069)	(0.076)
Mountains, scarps and hiUs	-4.327	-5.150	-5.289	-5.045	-2.901	-1.322
	(3.719)	(3.525)	(3.638)	(3.523)	(3.828)	(4.576)
Volcanic foot ridges	-4.724	-5.741	-5.898	-5.736	-3.462	-1.963
	(3.965)	(3.737)	(3.852)	(3.727)	(4.051)	(5.021)
Upper & lower middle-level uplands	-4.982	-5.976*	-6.120*	-5.706	-3.512	-2.163
	(3.712)	(3.569)	(3.689)	(3.541)	(3.857)	(4.602)
Lower level upland	-3.375**	-3.967**	-3.956**	-3.577**	-2.484	-2.698
	(1.652)	(1.777)	(1.779)	(1.613)	(1.831)	(2.031)
Low malaria risk	-2.841	-3.643	-3.356	-1.945	-2.650	-8.203
	(6.740)	(6.094)	(6.413)	(5.154)	(4.993)	(7.345)
Medium malaria risk	-21.063	-25.585	-25.102	-19.815	-16.658	-28.614
	(17.093)	(16.973)	(17.303)	(13.735)	(14.211)	(18.460)
High malaria risk	-20.946	-25.460	-24.993	-19.734	-16.615	-28.546
	(16.931)	(16.846)	(17.163)	(13.608)	(14.064)	(18.313)
Very high malaria risk	-21.132	-25.689	-25.261	-19.939	-16.893	-28.717
	(16.795)	(16.724)	(17.002)	(13.545)	(13.978)	(18.154)
Mean maximum temp (^{0}C)	-0.042	-0.034	-0.038	-0.066	-0.097	-0.177
	(0.136)	(0.130)	(0.130)	(0.148)	(0.131)	(0.150)
Altitude (log)	1.783	1.373	1.322	1.624	0.808	0.731
	(2.174)	(2.093)	(2.098)	(2.104)	(2.195)	(2.219)
Mean NDVI (1997-2009) – log	5.346	6.217	6.141	4.674	3.987	5.017
	(4.780)	(4.844)	(4.828)	(4.875)	(4.687)	(4.833)
Institution quality variables (community-level)						
Trust index	0.759					1.542
	(1.852)					(2.238)
Cooperation	-0.273					0.571
	(0.860)					(0.936)
Local justice, police, and political authorities		1.028				0.674
		(1.628)				(1.693)
Local justice and police			0.914			
			(1.432)			
Local political authorities			0.073			
			(1.238)			
Local governance quality (subjective assessment)				0.185		0.167
				(0.468)		(0.513)
Political participation (2005 referendum)					-1.177	-1.826
					(1.069)	(1.248)
Household and community controls included?	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-161.52*	-194.19**	-194.18**	-168.49*	-107.79	-111.53
	(87.646)	(95.509)	(95.605)	(85.866)	(101.083)	(112.695)
Adjusted R-square	0.380	0.382	0.380	0.381	0.383	0.378
Observations	429	429	429	429	429	429

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

One important problem of IV models is that of weak instruments. If instruments are only weakly correlated with the endogenous regressors, the properties of IV estimator can be poor, and estimations can be biased (Verbeek, 2004). Several diagnostics and tests for weak instruments exist, based on analysis of the first-stage reduced-form equations. We use the minimum eigenvalue test as defined by Stock and Yogo (2005) for models with more than one endogenous regressor.

Since our number of excluded instruments is smaller than the number of potentially endogenous variables, we include our institutional proxies sequentially. Table 5.4 summarizes the regression results, including specification tests for endogeneity, overidentifying restrictions for validity of the instruments, and tests for weak instruments (Stock and Yogo test). Our minimum eigenvalues are greater than the critical values proposed by Stock and Yogo (2005).[47] The p-values of the Sargan's test tend to support the hypothesis that the exclusion restriction is satisfied (but note that this is not true for model 3). Results of the first stage regressions for Table 5.4 are presented in Table D4 (Appendix D), and support the perspective that religion variables are strongly correlated with local institutions.

The Durbin-Wu-Hausman (DWH) test statistic for endogeneity for many of our institution quality variables is not significant ($\alpha = 0.05$). However, the Hausman test has limitations. In theory, standard implementation of the Hausman test requires that one of the estimators is fully efficient under the null hypothesis (H_o). Our approach of using robust estimates, however, implicitly assumes that the estimates are not efficient, in which case the Hausman test would be incorrect. Cameron and Trivedi (2009) propose using a bootstrapped version of the Hausman test as one solution (which also increases the power of the Hausman test). We thus performed a Bootstrap Hausman test, and found that the results are similar to those obtained from using the standard Hausman test (Table D2).

The estimation results are not very robust across columns. While one geographical variable consistently enters significantly (distance to the nearest town), the significance level of other geographical variables varies across specifications. Latitude, distance to the nearest market, and malaria risk appear significant and with the expected sign in some models, but not all. Importantly, the IV models again provide no support for the idea that local institutions matter for income. One predicted variable enter significantly (trust index), but with the wrong sign. Social capital (trust index) appears to have a negative and significant effect on income levels, which we explain by noting that cultural values differ across ethnic groups which

[47] 2SLS relative bias critical values

conflates our results. The high-income individuals in our sample tend to be Kikuyu from the Central region, and these generally display little trust in their community members and people from other ethnic groups (Kimenyi and Romero, 2008).[48] When correlating income to trust for the sub-sample of Kikuyu only (or exclude Kikuyu from the sample), for example, we find that the two variables are not significantly correlated.

Finally, and as a robustness analysis, we reduce the number of institutional variables by performing a factor analysis. Factor analysis aims at identifying a number of underlying "factors" that explain the variation in various dimensions of the institutional framework. We find that the original five institutional variables can be collapsed into three such factors. These factors capture trust and confidence in government institutions (factor 1), political participation and cooperation (factor 2), and local governance (factor 3), respectively. Table 5.5 presents representative OLS and IV evidence. Results of the first stage regressions for Table 5.5 are presented in the appendix (Table D5). As before, the test statistics indicate that our IV approach is appropriate. And also as before, some geographical variables — distance to the nearest major town, distance to nearest market, and malaria risk — enter significantly in some, but typically not all, models. None of the institutional factors significant affect income levels. Taken together, we interpret the evidence on these pages as mixed support for the geography-based perspective on underdevelopment. There is very little evidence that institutions are an important determinant of income differentials within Kenya.

[48] Studies show that Kenyans mistrust members of other ethnic groups (Bratton and Kimenyi, 2008). Four out of ten Kenyans (39 per cent) express "a lot" of trust in people to whom they are related by blood or marriage. The Kikuyu generally have low levels of trust (for relatives) compared with other ethnic groups in our sample, yet per capita incomes are higher in Central Kenya, and poverty rates are also low compared with other regions.

Table 5.4: Geography, institutions and household income - IV Evidence

Dependent variable: Log of per capita income	IV (1) 2SLS	IV (2) 2SLS	IV (3) 2SLS	IV (4) 2SLS	IV (5) 2SLS	IV (6) 2SLS
Geography variables						
Mean main season rainfall (1997-2007) – log	12.660	0.814	0.658	1.521	-3.754	18.510
	(9.133)	(10.236)	(10.357)	(7.592)	(9.706)	(21.354)
Latitude (absolute value)	6.362*	1.266	1.173	1.557	-0.768	8.469
	(3.827)	(4.108)	(4.205)	(3.034)	(4.042)	(9.119)
Distance to nearest market (km)	-0.122*	-0.157	-0.153	-0.165***	-0.138*	-0.207
	(0.070)	(0.125)	(0.127)	(0.063)	(0.074)	(0.148)
Distance to nearest major town (km)	-0.067***	-0.051***	-0.050**	-0.051***	-0.046***	-0.077**
	(0.017)	(0.017)	(0.020)	(0.013)	(0.014)	(0.035)
Distance to a good road (km)	-0.061	-0.039	-0.045	-0.039	-0.019	-0.054
	(0.039)	(0.041)	(0.062)	(0.036)	(0.045)	(0.056)
Mountains, scarps and hiUs	-1.575	0.906	0.982	0.724	1.528	-3.234
	(2.170)	(2.147)	(2.287)	(1.782)	(1.924)	(4.177)
Volcanic foot ridges	-2.333	0.646	0.722	0.533	1.355	-4.291
	(2.483)	(2.534)	(2.664)	(2.013)	(2.183)	(4.906)
Upper & lower middle-level uplands	-2.368	0.266	0.363	0.115	0.968	-3.997
	(2.290)	(2.229)	(2.434)	(1.788)	(1.982)	(4.552)
Lower level upland	-1.650	-0.630	-0.650	-0.684	-0.154	-2.132
	(1.121)	(1.245)	(1.246)	(0.957)	(1.131)	(2.344)
Low malaria risk	-0.897*	-0.887*	-0.931	-0.822*	-0.767	-0.888
	(0.484)	(0.529)	(0.639)	(0.465)	(0.476)	(0.567)
Medium malaria risk	-6.487	-0.193	-0.125	-0.599	1.982	-10.450
	(5.013)	(5.800)	(5.846)	(4.374)	(5.227)	(11.173)
High malaria risk	-6.476	-0.144	-0.059	-0.533	1.884	-10.545
	(5.057)	(5.677)	(5.756)	(4.348)	(5.065)	(10.954)
Very high malaria risk	-6.416	-0.051	0.090	-0.416	1.919	-10.642
	(5.003)	(5.647)	(5.821)	(4.277)	(4.992)	(10.957)
Institution quality variables (community-level)						
Trust index	-2.942**					-4.417*
	(1.459)					(2.176)
Cooperation	-0.265					-0.879
	(1.197)					(1.431)
Local justice, police, and political authorities		-0.180				3.023
		(1.863)				(2.524)
Local justice and police			-0.492			
			(3.452)			
Local political authorities			0.264			
			(3.044)			
Local governance quality (subjective assessment)				-0.147		-0.204
				(0.287)		(0.323)
Political participation (2005 referendum)					-0.864	-1.592
					(1.139)	(1.444)
Household and community controls included?	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-63.615	5.595	6.577	1.330	33.796	-96.465
	(54.430)	(61.448)	(62.212)	(45.227)	(58.712)	(128.878)
Adjusted R-square	0.377	0.375	0.373	0.375	0.379	0.368
Observations	429	429	429	429	429	429
Specification tests						
Tests for weak instruments						
b. Stock and Yogo (minimum eigenvalue)[a]	39.64	31.90	7.18	120.55	66.81	10.22
Endogeneity tests						
Robust Durbin-Wu-Hausman (p-value)	0.2682	0.6374	0.8849	0.5596	0.8296	0.2155
Overidentifying restrictions test						
Score test (p-value)	0.6036	0.1930	0.1324	0.1464	0.2106	0.6206
Sargan's test (p-value)[a]	0.3339	0.1126	0.0732	0.1208	0.1485	0.6082

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a]Based on the model that assumes no heteroskedasticity. Excluded instruments are mean maximum temperature, altitude, NDVI, and the proportion of adults in the community belonging to different religious groups (Catholics, Protestants and Pentecosts), presence of illegal ngangs, security dummies (security stayed same; security worsened).

Table 5.5: Geography, institutions and income – Robustness analysis

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	IV (1) 2SLS	IV (2) 2SLS	IV (3) 2SLS	IV (4) 2SLS
Geography variables								
Mean main season rainfall (1997-2007) – log	2.559	3.642	1.251	5.112	0.970	12.396	1.464	14.695
	(9.400)	(11.914)	(7.788)	(13.501)	(10.500)	(13.435)	(7.587)	(19.765)
Latitude (absolute value)	1.963	2.481	1.449	3.083	1.331	6.303	1.523	7.260
	(3.750)	(5.020)	(3.110)	(5.636)	(4.188)	(5.710)	(3.029)	(8.297)
Distance to nearest market (km)	-0.183*	-0.170**	-0.168***	-0.194*	-0.160	-0.187***	-0.164***	-0.196
	(0.100)	(0.068)	(0.064)	(0.105)	(0.124)	(0.066)	(0.063)	(0.142)
Distance to nearest major town (km)	-0.054***	-0.055***	-0.053***	-0.059**	-0.052***	-0.068***	-0.052***	-0.070**
	(0.015)	(0.019)	(0.013)	(0.021)	(0.016)	(0.020)	(0.013)	(0.028)
Distance to a good road (km)	-0.045	-0.045	-0.037	-0.047	-0.039	-0.064	-0.043	-0.077
	(0.045)	(0.043)	(0.039)	(0.050)	(0.048)	(0.043)	(0.040)	(0.068)
Mountains, scarps and hiUs	0.603	0.378	0.807	0.105	0.870	-1.261	0.798	-1.643
	(2.000)	(2.477)	(1.819)	(2.695)	(2.112)	(2.711)	(1.772)	(3.664)
Volcanic foot ridges	0.269	0.014	0.490	-0.367	0.604	-1.933	0.538	-2.330
	(2.336)	(2.863)	(2.068)	(3.175)	(2.501)	(3.133)	(2.023)	(4.327)
Upper & lower middle-level uplands	-0.064	-0.318	0.129	-0.645	0.224	-2.128	0.165	-2.497
	(2.038)	(2.610)	(1.832)	(2.857)	(2.173)	(2.889)	(1.791)	(3.922)
Lower level upland	-0.842	-0.922	-0.667	-1.084	-0.644	-1.799	-0.714	-2.073
	(1.176)	(1.320)	(0.988)	(1.520)	(1.305)	(1.451)	(0.959)	(2.186)
Low malaria risk	-0.961*	-0.926**	-0.907*	-0.995*	-0.887	-1.004**	-0.905**	-1.044
	(0.550)	(0.470)	(0.464)	(0.563)	(0.587)	(0.456)	(0.452)	(0.638)
Medium malaria risk	-1.169	-1.657	-0.439	-2.470	-0.279	-6.101	-0.554	-7.309
	(5.344)	(6.390)	(4.483)	(7.276)	(5.945)	(7.104)	(4.367)	(10.496)
High malaria risk	-1.081	-1.578	-0.400	-2.380	-0.231	-5.945	-0.482	-7.088
	(5.239)	(6.318)	(4.457)	(7.140)	(5.770)	(6.990)	(4.337)	(10.170)
Very high malaria risk	-0.981	-1.489	-0.359	-2.337	-0.146	-5.855	-0.360	-6.901
	(5.146)	(6.287)	(4.383)	(7.095)	(5.675)	(6.968)	(4.270)	(10.055)

Institution quality variables (factors)								
Trust, local justice, police, political authorities (factor 1)	0.030			0.036	-0.010			0.017
	(0.104)			(0.106)	(0.165)			(0.179)
Political participation and cooperation (factor 2)		0.052		0.057		0.252		0.284
		(0.212)		(0.212)		(0.264)		(0.307)
Local governance (factor 3)			0.066	0.083			-0.046	-0.125
			(0.164)	(0.167)			(0.279)	(0.291)
Household and community controls included?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-4.850	-11.482	2.970	-20.187	4.597	-64.289	1.630	-78.157
	(55.986)	(71.499)	(46.400)	(80.895)	(62.505)	(80.781)	(45.217)	(118.633)
Adjusted R-square	0.376	0.376	0.376	0.373	0.375	0.374	0.375	0.369
F – statistic	12.450	12.775	12.433	11.715				
Observations	429	429	429	429	429	429	429	429
Specification tests								
Tests for weak instruments					34.37	77.49	36.49	21.74
b. Stock and Yogo (minimum eigenvalue)[a]								
Endogeneity tests								
Robust Durbin-Wu-Hausman (p-value)					0.7466	0.1849	0.5991	0.5650
Overidentifying restrictions test								
Score test (p-value)					0.1916	0.3026	0.1452	0.1660
Sargan's test (p-value)[a]					0.1123	0.1600	0.1132	0.0727

Robust standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a]Based on model that assumes no heteroskedasticity; Excluded instruments are mean maximum temperature, altitude, NDVI, and proportion of adults in the community belonging to different religious groups (Catholics, Protestants and Pentecosts), presence of ngangs, security remained same, security improved dummies.

5.6 Discussion and conclusions

The geography-versus-institutions debate on the root causes of underdevelopment has raged prominently on the pages of many journals and books. In this paper we aim to contribute to this debate by adopting a *micro focus* and by *unbundling* the institutional framework into a number of important components. Overall, our results provide very little evidence for the view that "institutions rule." Instead, the evidence identifies a number of geographical factors (related to infrastructure, malaria prevalence, and landscape attributes) that seem to contribute to income differences.

At first sight, these results appear to conflict with evidence provided in cross-country studies, typically identifying institutions as the main driver of long-term economic growth. They also appear inconsistent with existing micro-level evidence by Grimm and Klasen (for Indonesia) and Voors and Bulte (for Burundi), which also implicates institutions (tenure security) as a key determinant of income. In contrast, our findings match recent evidence provided by Bhattacharyya (2009b) for the sample of African countries.

But one should be careful with such cross-study comparisons. We focus on *within-Kenya* differences in income. The determinants of such differences may be different from factors explaining why Kenya is poor relative to the USA or Singapore. For domestic policy makers and international development agencies it is an open question which matter is most important — closing the gap between disadvantaged communities in Kenya relative to more advanced ones (by addressing geographical impediments, say), or bridging the gap between Kenya as a whole and the industrialized countries (perhaps by addressing institutional factors holding back development).

Our main result that key institutional variables do not explain income differences within Kenya could be due to two reasons. First, perhaps in early stages of development geography simply matters more than institutions. However, this flies in the face of evidence based on the studies in (relatively) nearby Burundi, which points to tenure security as an important determinant of investment and growth. Second, it could be that there is relatively little spatial variation for our institutional variables. For example, land tenure (whether or not a household holds a title deed to the land it cultivates – a household control variable in our regressions but a key institutional proxy in other studies) never enters significantly in our models. Arguably this simply reflects that the great majority of our respondents holds title deeds (75% of the farmers), and the rest has rented land on a rather well-functioning rental market. It does not need to imply that tenure security is unimportant – it is just much less of

an issue that in, say, post-conflict Burundi where tenure security is in a state of flux and land rights is contested.

Similarly, our data suggest limited variation in cooperation, political participation, or the quality of local government institutions. In this light it is not surprising that these variables fail to explain much of the intra-Kenya income differences. In contrast, geographical conditions vary widely. Our sample spreads across four agro-ecological zones, displaying significant variation in climatic and soil conditions. This is reflected in the summary of the institutional and geographical variables (Table D1).

This leaves us to speculate that the geography-versus-institutions debate could be a red herring. For countries like Kenya, domestic inequality and region-specific poverty can be reduced by tackling the most significant geographical challenges. But for Kenya as a whole to catch up with the industrialized world, perhaps institutional reform is necessary. Both elements should arguably be part of a balanced policy package.

Appendix D

Table D1: Summary of the data

Variable type	Description	Mean	SD
Income variables			
Household level annual income	Income from crops, livestock and off-farm (salary income, remittances, business income, and income from casual labor and dividends) in KSh.	120794	123327
Household level annual per capita income	Household annual income per adult equivalent unit (in KSh)	32564	42550
Geographical variables			
Mean main season rainfall	Average main season rainfall from 1997-2007 (mm)	563	178
Mean maximum temp (^{0}C)	Mean long term maximum temperatures (^{0}C)	26.86	2.33
Altitude	Altitude (m) – household level	1492	299
Latitude	Latitude –absolute value of latitude at household level	-0.35	0.62
Distance to market	Distance to the nearest market (km)	2.52	1.27
Distance to major town	Distance to the nearest major town (km)	20.39	9.41
Distance to a good road	Distance to all year motorable road (km)	8.56	4.33
Mountains, scarps and hiUs	Landscape dummy - mountains and major scarps, and hiUs and minor scarps	0.15	0.36
Volcanic foot ridges	Landscape dummy - volcanic foot ridges	0.17	0.38
Upper & lower middle-level uplands	Landscape dummy - upper and lower middle-level uplands	0.26	0.44
Lower level upland	Landscape dummy - lower level upland	0.14	0.34
Lacustrine plains	Landscape dummy - lacustrine plains	0.28	0.45
Phaeozems	Soil type dummy - Phaeozems	0.11	0.32
Greyzems	Soil type dummy - Greyzems	0.03	0.18
Podzols	Soil type dummy - Podzols	0.28	0.45
Regosols	Soil type dummy - Regosols	0.17	0.38
Rankers	Soil type dummy - Rankers	0.40	0.49
NDVI	Mean normalized differential vegetation index (1997 – 2009)	168	14.46
Malaria risk dummies	Based on *P. falciparum* parasite rate ((*Pf*PR) - (Noor *et al*., 2009)		
Very low malaria risk	*Pf*PR is <0.1%	0.37	0.48
Low malaria risk	*Pf*PR ranges from 0.1% to <1%	0.07	0.26
Medium malaria risk	*Pf*PR ranges from 1% to <5%	0.18	0.38
High malaria risk	*Pf*PR ranges from 20% to 40%	0.17	0.38
Very high malaria risk	*Pf*PR is greater than 40%	0.21	0.41
Household control variables			
Male household head	Household head is male	0.68	0.47
Education of household head	Household head has secondary and above education	0.26	0.44
Age of household head	Age of household head	58.55	14.20
Land size (acres) per capita	Total land holding in acres per adult equivalent	0.86	1.10
Land tenure	Household has title deed (yes/no)	0.75	0.43

Variable type	Description	Mean	SD
Community control variables			
Population density	Population density (per km^2) – based on 1999 census	427	159
Regular transport available	Availability of regular transport	0.64	0.48
Primary school in community	Primary school located within the community (yes/no)	0.65	0.48
Distance to health centre	Distance to the nearest health facility (km)	4.54	4.05
Clean water available	Availability of clean water for domestic use	0.58	0.49
No. of years of mobile phone coverage	Number of years of mobile phone coverage	4.43	2.48
Proportion of Catholics	Proportion of adults who are Catholics (community level)	0.26	0.23
Proportion of Protestants	Proportion of adult who are Protestants (community level)	0.53	0.23
Proportion of Pentecost	Proportion of adult who are Pentecostals (community level)	0.17	0.14
Presence of ngangs	Presence of illegal ngangs—Mungiki (community level)	0.28	0.45
Security improved	Security improved over the last 12 years (community level dummy)	0.33	0.47
Security stayed the same	Security stayed the same over the last 12 years (community level dummy)	0.24	0.43
Security worsened	Security worsened over the last 12 years (community level dummy)	0.43	0.50
Institution variables (community-level)			
Trust index	Trust index based on a household's rating of their level of confidence in a) household b) members of the extended family c) members of the community. The indices were scaled on a 1 (very low) - 10 (very high) point scale. The sub-indices scores were added and normalized to a 0-1 scale and aggregated at the community level	0.67	0.09
Cooperation	Dummy variable, taking a value of 1 if a household responded positive to the question "*Do most people in your village help you when you are in need?*", otherwise zero.	0.83	0.16
Quality of government institutions	Institutional quality index based on a household's rating of their level of confidence in a) local justice b) local police c) local political authorities. The indices were scaled on a 1 (very low) - 10 (very high) point scale. The sub-indices scores were added and normalized to a 0-1 scale and aggregated at the community level.	0.42	0.08
Governance quality	Based on the rating by the community on a number of indicators of level of performance of the sub-chief	0.68	0.26
Political participation (2005 referendum)	Average proportion of adults in our sample who voted during the 2005 referendum	0.59	0.13

Table D2: Bootstrap Hausman test statistics (p-values) – IV 2SLS models in Table 5.4

p-values	IV (1)	IV (2)	IV (3)	IV (4)	IV (5)	IV (6)
Institution quality variables						
Trust index	0.249					0.391
Cooperation	0.198					0.356
Local justice, police, political authorities		0.715				0.228
Local justice & police			0.707			
Local political authorities			0.686			
Local governance quality (subjective assessment)				0.841		0.674
Political participation (2005 referendum)					0.665	0.294

Table D3: Bootstrap Hausman test statistics (p-values) – IV 2SLS models in Table 5.5

p-values	IV (1)	IV (2)	IV (3)	IV (4)
Institution quality variables				
Trust, local justice, police, political authorities (factor 1)	0.782			0.691
Political participation and cooperation (factor 2)		0.764		0.590
Local governance (factor 3)			0.868	0.825

Table D4: First stage regressions for IV 2SLS – for models in Table 5.4

	IV (1) Trust index	IV (1) Cooperation index	IV (2) Local justice, police & political authorities index	IV (3) Local justice & police index	IV (3) Local political authorities index	IV (4) Local governance quality index	IV (5) Political participation (2005)
Mean main season rainfall (1997-2007)	-0.095	-6.062***	-3.789***	-4.055***	-3.257***	-1.100	-6.701***
	(0.263)	(0.622)	(0.310)	(0.363)	(0.410)	(1.105)	(0.502)
Latitude (absolute value)	2.779***	-0.167	0.862**	0.409	1.769***	0.184	-3.799***
	(0.204)	(0.514)	(0.302)	(0.369)	(0.358)	(0.650)	(0.447)
Distance to nearest market (km)	0.015***	0.006	0.049***	0.050***	0.047***	0.022*	0.002
	(0.003)	(0.006)	(0.003)	(0.004)	(0.004)	(0.011)	(0.005)
Distance to nearest major town (km)	-0.002***	0.009***	0.003***	0.005***	0.000	-0.004*	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Distance to a good road (km)	-0.003*	-0.012***	-0.001	-0.006**	0.008***	0.030***	0.013***
	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)	(0.005)	(0.003)
Mountains, scarps and hiUs	-0.630***	0.820***	0.119	0.307*	-0.256*	0.094	1.807***
	(0.076)	(0.197)	(0.112)	(0.130)	(0.124)	(0.257)	(0.156)
Volcanic foot ridges	-0.757***	0.994***	0.167	0.381**	-0.261*	0.900**	1.791***
	(0.082)	(0.214)	(0.120)	(0.141)	(0.132)	(0.277)	(0.169)
Upper & lower middle-level uplands	-0.586***	0.974***	0.277*	0.479***	-0.127	0.080	1.852***
	(0.078)	(0.203)	(0.113)	(0.131)	(0.127)	(0.270)	(0.158)
Lower level upland	0.044	0.804***	0.395***	0.403***	0.380***	0.090	0.915***
	(0.034)	(0.089)	(0.048)	(0.056)	(0.055)	(0.141)	(0.069)
Low malaria risk	1.893***	1.428***	1.798***	1.520***	2.354***	0.808	-0.727*
	(0.140)	(0.348)	(0.205)	(0.253)	(0.271)	(0.533)	(0.325)
Medium malaria risk	4.002***	6.417***	5.648***	5.320***	6.304***	0.197	2.653**
	(0.337)	(0.882)	(0.484)	(0.605)	(0.654)	(1.497)	(0.806)
High malaria risk	3.972***	6.352***	5.635***	5.328***	6.249***	0.362	2.593**
	(0.335)	(0.879)	(0.483)	(0.604)	(0.652)	(1.491)	(0.805)
Very high malaria risk	3.908***	6.364***	5.627***	5.369***	6.142***	0.184	2.560**
	(0.332)	(0.873)	(0.480)	(0.601)	(0.643)	(1.474)	(0.803)
Mean maximum temp (^{0}C)	0.011***	0.001	-0.001	0.005	-0.012**	0.168***	-0.053***
	(0.002)	(0.006)	(0.004)	(0.004)	(0.004)	(0.012)	(0.005)
Altitude (log)	-0.278***	-0.107	0.222***	0.301***	0.064	-0.124	-0.675***
	(0.058)	(0.117)	(0.066)	(0.077)	(0.073)	(0.213)	(0.118)
Mean NDVI (1997-2009) – log	-0.578***	-0.515	-1.137***	-1.099***	-1.214***	2.018***	-0.901**
	(0.105)	(0.303)	(0.198)	(0.236)	(0.204)	(0.382)	(0.291)

Proportion of Catholics	-0.280***	-0.525***	0.240**	0.196*	0.329***	2.935***	-0.080
	(0.049)	(0.128)	(0.077)	(0.087)	(0.085)	(0.214)	(0.097)
Proportion of Protestants	-0.282***	-0.223	0.194*	0.183*	0.216*	3.086***	-0.323***
	(0.048)	(0.122)	(0.075)	(0.085)	(0.085)	(0.210)	(0.092)
Proportion of Pentecosts	-0.312***	-0.058	0.130	0.092	0.205*	3.572***	-0.270*
	(0.055)	(0.134)	(0.084)	(0.096)	(0.090)	(0.235)	(0.110)
Ngang dummies	3.613***	3.060***	3.251***	2.814***	4.125***	-0.238	-0.788
	(0.257)	(0.669)	(0.388)	(0.484)	(0.495)	(0.995)	(0.620)
Security stayed the same	-0.086***	-0.102***	-0.104***	-0.104***	-0.106***	-0.196***	0.018
	(0.006)	(0.011)	(0.008)	(0.010)	(0.010)	(0.030)	(0.012)
Security worsened	-0.004	0.002	-0.040***	-0.045***	-0.030***	-0.341***	-0.056***
Household and community controls included?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.859	37.308***	23.243***	24.473***	20.785***	-9.769	53.123***
	(1.767)	(4.480)	(2.354)	(2.727)	(2.757)	(7.511)	(3.556)
Adjusted R-square	0.94	0.87	0.82	0.79	0.79	0.87	0.88
F - statistic	350	370	110	125	109	664	152
Observations	429	429	429	429	429	429	429

Table D5: First stage regressions for IV 2SLS – for models in Table 5.5 (factors)

	IV (1) 2SLS Trust, local justices, police, and political authorities	IV (2) 2SLS Political participation and cooperation	IV (3) 2SLS Local governance
Mean main season rainfall (1997-2007)	-41.643***	-29.637***	-1.265
	(3.801)	(1.584)	(2.050)
Latitude (absolute value)	12.266***	-25.425***	-1.636
	(3.372)	(1.499)	(1.779)
Distance to nearest market (km)	0.530***	0.011	0.057**
	(0.040)	(0.018)	(0.018)
Distance to nearest major town (km)	0.021*	0.056***	0.008*
	(0.009)	(0.003)	(0.003)
Distance to a good road (km)	0.052*	0.036***	-0.024*
	(0.023)	(0.010)	(0.010)
Mountains, scarps and hiUs	0.092	9.625***	0.857
	(1.240)	(0.521)	(0.561)
Volcanic foot ridges	0.290	10.591***	1.830**
	(1.318)	(0.561)	(0.611)
Upper & lower middle-level uplands	1.669	9.920***	1.032
	(1.255)	(0.536)	(0.589)
Lower level upland	4.656***	3.593***	-0.234
	(0.550)	(0.227)	(0.262)
Low malaria risk	22.237***	-8.813***	-0.729
	(2.421)	(1.056)	(1.372)
Medium malaria risk	66.220***	-0.941	-2.023
	(5.776)	(2.487)	(3.445)
High malaria risk	65.811***	-0.976	-1.642
	(5.765)	(2.481)	(3.427)
Very high malaria risk	65.121***	-0.642	-1.301
	(5.693)	(2.458)	(3.391)
Mean maximum temp (^{0}C)	-0.107**	-0.198***	0.226***
	(0.040)	(0.015)	(0.022)
Altitude (log)	1.247	0.196	1.216**
	(0.721)	(0.278)	(0.398)
Mean NDVI (1997-2009) – log	-13.449***	-1.479	1.999*
	(2.100)	(0.831)	(0.947)
Proportion of Catholics	3.333***	1.391***	2.402***
	(0.851)	(0.368)	(0.428)
Proportion of Protestants	2.208**	0.957**	2.917***
	(0.843)	(0.358)	(0.414)
Proportion of Pentecosts	1.808*	1.270**	2.987***
	(0.912)	(0.387)	(0.454)
Ngang dummies	39.588***	-15.171***	-2.529
	(4.465)	(1.961)	(2.552)
Security stayed the same	-1.120***	0.274***	-0.220***
	(0.099)	(0.038)	(0.040)
Security worsened	-0.418***	-0.206***	-0.336***
	(0.064)	(0.026)	(0.042)
Household and community controls included?	Yes	Yes	Yes
Constant	262.223***	207.021***	-17.710
	(27.041)	(10.908)	(13.511)
Adjusted R-square	0.818	0.966	0.707
F – statistic	100.136	623.620	292.114
Observations	429	429	429

Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table D6: Geography, institutions and household income - IV Evidence (Table 5.4), but without the geography variables as excluded instruments

Dependent variable: Log of per capita income	IV (1) 2SLS	IV (2) 2SLS	IV (3) 2SLS	IV (4) 2SLS	IV (5) 2SLS	IV (6) 2SLS
Geography variables						
Mean main season rainfall (1997-2007) – log	9.216	3.617	3.619	1.342	-3.968	70.057
	(9.745)	(10.934)	(11.244)	(7.600)	(9.658)	(148.834)
Latitude (absolute value)	4.855	2.396	2.398	1.478	-0.863	30.803
	(4.137)	(4.386)	(4.588)	(3.038)	(4.016)	(64.861)
Distance to nearest market (km)	-0.136*	-0.203	-0.203	-0.166***	-0.137*	-0.446
	(0.073)	(0.135)	(0.142)	(0.063)	(0.072)	(0.593)
Distance to nearest major town (km)	-0.062***	-0.056**	-0.056**	-0.052***	-0.046***	-0.158
	(0.019)	(0.018)	(0.022)	(0.013)	(0.014)	(0.228)
Distance to a good road (km)	-0.057	-0.045	-0.045	-0.041	-0.018	-0.142
	(0.038)	(0.042)	(0.061)	(0.037)	(0.044)	(0.260)
Mountains, scarps and hiUs	-0.832	0.385	0.384	0.820	1.559	-13.254
	(2.328)	(2.252)	(2.459)	(1.787)	(1.926)	(28.843)
Volcanic foot ridges	-1.442	0.006	0.004	0.515	1.390	-15.809
	(2.684)	(2.667)	(2.868)	(2.014)	(2.180)	(32.716)
Upper & lower middle-level uplands	-1.565	-0.310	-0.311	0.158	1.003	-14.967
	(2.478)	(2.350)	(2.641)	(1.790)	(1.983)	(31.493)
Lower level upland	-1.335	-0.954	-0.953	-0.697	-0.131	-7.630
	(1.183)	(1.323)	(1.315)	(0.959)	(1.129)	(15.694)
Low malaria risk	-0.917*	-0.979*	-0.978	-0.925*	-0.761	-1.082*
	(0.487)	(0.540)	(0.630)	(0.481)	(0.468)	(0.586)
Medium malaria risk	-4.706	-1.759	-1.761	-0.486	2.086	-36.825
	(5.269)	(6.188)	(6.318)	(4.378)	(5.212)	(75.528)
High malaria risk	-4.671	-1.661	-1.663	-0.429	1.981	-36.428
	(5.353)	(6.038)	(6.216)	(4.353)	(5.054)	(74.038)
Very high malaria risk	-4.603	-1.591	-1.593	-0.346	2.014	-36.414
	(5.298)	(6.012)	(6.334)	(4.279)	(4.977)	(73.557)
Institution quality variables (community-level)						
Trust index	-2.044					-9.797
	(1.793)					(15.975)
Cooperation	-0.330					1.390
	(1.230)					(6.973)
Local justice, police, and political authorities		0.718				8.096
		(2.178)				(12.259)
Local justice and police			0.483			
			(3.884)			
Local political authorities			0.235			
			(3.161)			
Local governance quality (subjective assessment)				0.034		-0.856
				(0.353)		(2.315)
Political participation (2005 referendum)					-0.900	0.839
					(1.149)	(8.322)
Household and community controls included?	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-43.404	-11.428	-11.445	2.381	35.119	-408.219
	(58.035)	(65.734)	(67.674)	(45.270)	(58.425)	(900.805)
Adjusted R-square	0.378	0.376	0.374	0.375	0.379	0.301
Observations	429	429	429	429	429	429
Specification tests						
Tests for weak instruments						
b. Stock and Yogo (minimum eigenvalue statistic)[b]	51.17	35.41	8.33	81.22	68.06	na
Endogeneity tests						
Robust Durbin-Wu-Hausman (p-value)	0.945	0.919	0.988	0.7290	0.896	0.6138
Overidentifying restrictions test						
Score test (p-value)	0.294	0.141	0.082	0.1594	0.178	0.2883
Sargan's test (p-value) [a]	0.157	0.123	0.070	0.1174	0.159	0.3394

Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a]Based on the model that assumes no heteroskedasticity or any other form of misspecification; Excluded instruments are proportion of adults in the community belonging to different religious groups (Catholics, Protestants and Pentecosts), presence of illegal ngangs, security dummies (security stayed same; security worsened).

Table D7: Geography, institutions and income – Robustness analysis (Table 5.5) (without geography variables as excluded instruments)

Dependent variable: Log of per capita income	IV (1) 2SLS	IV (2) 2SLS	IV (3) 2SLS	IV (4) 2SLS
Geography variables				
Mean main season rainfall (1997-2007) – log	3.537	7.257	1.151	13.043
	(11.100)	(13.487)	(7.596)	(25.920)
Latitude (absolute value)	2.352	4.059	1.414	6.451
	(4.421)	(5.740)	(3.034)	(10.943)
Distance to nearest market (km)	-0.198	-0.177***	-0.170***	-0.232
	(0.130)	(0.065)	(0.064)	(0.157)
Distance to nearest major town (km)	-0.055***	-0.061***	-0.053***	-0.069**
	(0.017)	(0.021)	(0.014)	(0.035)
Distance to a good road	-0.049	-0.053	-0.034	-0.072
	(0.050)	(0.042)	(0.041)	(0.088)
Mountains, scarps and hiUs	0.438	-0.299	0.810	-1.314
	(2.192)	(2.741)	(1.774)	(4.691)
Volcanic foot ridges	0.062	-0.790	0.467	-2.028
	(2.604)	(3.168)	(2.029)	(5.462)
Upper & lower middle-level uplands	-0.241	-1.065	0.112	-2.167
	(2.262)	(2.925)	(1.796)	(4.995)
Lower level upland	-0.964	-1.284	-0.646	-1.949
	(1.380)	(1.462)	(0.963)	(2.839)
Low malaria risk	-1.006*	-0.958**	-0.908**	-1.138*
	(0.603)	(0.451)	(0.453)	(0.681)
Medium malaria risk	-1.716	-3.492	-0.385	-6.607
	(6.282)	(7.126)	(4.372)	(13.627)
High malaria risk	-1.604	-3.381	-0.361	-6.389
	(6.080)	(7.036)	(4.343)	(13.158)
Very high malaria risk	-1.494	-3.292	-0.358	-6.258
	(5.972)	(7.003)	(4.277)	(12.892)
Institution quality variables (community-level – factor)				
Trust, local justice, police, political authorities (factor 1)	0.055			0.088
	(0.187)			(0.213)
Political participation and cooperation (factor 2)		0.134		0.188
		(0.276)		(0.441)
Local governance (factor 3)			0.118	-0.010
			(0.335)	(0.477)
Household and community controls included?				
Constant	-10.658	-33.289	3.597	-67.894
	(66.077)	(81.081)	(45.270)	(155.868)
Adjusted R-square	0.376	0.375	0.376	0.371
Observations	429	429	429	429
Specification tests				
Tests for weak instruments				
b. Stock and Yogo (minimum eigenvalue statistic)[a]	39.29	64.18	30.93	7.71
Endogeneity tests				
Robust Durbin-Wu-Hausman (p-value)	0.8730	0.6634	0.8624	0.9874
Overidentifying restrictions test				
Score test (p-value)	0.1404	0.2042	0.1648	0.0667
Sargan's test (p-value) [a]	0.1227	0.1283	0.1224	0.0414

Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

[a]Based on the model that assumes no heteroskedasticity; Excluded instruments are proportion of adults in the community belonging to different religious groups (Catholics, Protestants and Pentecosts), and presence of illegal ngangs, security dummies (security stayed same; security worsened).

Chapter 6

Discussion and Conclusions

6.1 Introduction

High and persistent poverty remains a significant challenge for Sub-Saharan Africa. Although estimates based on households surveys show that poverty rates have been declining in developing countries, the rate of poverty decline has been much slower in Sub-Saharan Africa (from 58% in 1990 to 51% in 2005). Moreover, global poverty trends indicate that Sub-Saharan Africa's share of the world's poor is increasing. The region's share of the world's poor increased from 13% in 1984 to 28% in 2005 (Chen and Ravallion, 2009). As a result, it is unclear whether countries in the region are likely to achieve the first MDG of halving poverty and reducing hunger by 2015. In contrast, studies based on aggregate statistics over the period 1995–2006[49] show that African poverty is falling rapidly (Pinkovskiy and Sala-i-Martin, 2010). Pinkovskiy and Sala-i-Martin argue that the rate of poverty reduction in Africa since 1995 puts it on track to achieve the MDG of halving poverty relative to 1990 by 2015 on time, or at worst a couple of years late. In addition to high poverty incidence, Sub-Saharan Africa faces other challenges that include high prevalence rates of HIV/AIDs, slow economic growth, rising population, civil strife, and poor governance. The effects of the global economic crisis and the potential impacts of climate change are among other emerging challenges for the region.

Persistent poverty in Sub-Saharan Africa has motivated a number of poverty studies that are aimed at informing policy. Poverty measurement and monitoring are necessary if poverty reduction is to appear on the political and economic agenda — focusing the attention of policy makers on the living conditions of the poor. Poverty monitoring is also important for supporting the targeting of domestic and worldwide interventions, for monitoring and evaluating projects and policy interventions designed to help poor people, and for evaluating the effectiveness of institutions including governments. Several Sub-Saharan African countries have undertaken nationally representative household surveys to collect information on consumption expenditures and/or income and other welfare indicators that are aimed at monitoring poverty. In some cases, these surveys have been repeated over time. Data from the household surveys have formed the basis of many of the poverty studies in Sub-Saharan Africa. The household surveys have been complemented by participatory poverty assessments.

[49] National accounts purchasing-power-parity (PPP)-adjusted GDP data from Penn World Tables, Mark 6.2, and inequality data from the WIDER-DS dataset.

While it is necessary to aggregate the poor to identify the scale of national poverty, for example, the poor are heterogeneous. Incorporating this heterogeneity through a dynamic perspective to poverty analysis distinguishes *transitory* from *chronic* poverty and is useful for understanding the underlying causes of poverty. Appropriate policy responses may differ depending on the type of poverty of the target population. Barrett (2005b), for example, describes how policies for helping people climb out of poverty ('cargo net' policies) differ from those that help them avoid falling into chronic poverty ('safety net' policies). Similarly, Krishna (2010a) describes how two sets of policies are required in parallel to reduce poverty: those that help to enhance and accelerate escapes from poverty, and another set that can prevent descents into poverty.

Although poverty measurement and monitoring is necessary, it is not a sufficient condition for poverty reduction. To reduce poverty also requires specific public actions and programs. These specific public actions and programs form the basis of the Poverty Reduction Strategy Papers (PRSP) formulated by several Sub-Saharan African countries including Kenya. A PRSP describes a country's macroeconomic, structural, and social policies and programs to promote broad-based growth and reduce poverty, as well as associated external financing needs and sources of financing.

This study explores various dimensions of rural welfare and welfare dynamics in Kenya within the sustainable livelihoods conceptual framework (SLF). We examine temporal and spatial dimensions of welfare for the same set of households. The temporal dimension examines an individual household's welfare level over multiple periods using different approaches. More specifically, the first aim is to compare participatory and income approaches to studying poverty and poverty dynamics. This research aim is addressed in Chapter 2. The second aim is to explore the nature of rural poverty dynamics using asset-based approaches to distinguish *stochastic* from *structural* poverty transitions, and to examine the livelihood strategies, shocks and other factors (positive and negative) associated with poverty transitions. This research aim is addressed in Chapter 3. The third aim is to characterize shocks facing rural households and examine whether poor households are vulnerable to certain shocks. This research aim is addressed in Chapter 4. The fourth aim is to explore spatial dimensions of poverty by examining the relative contributions of geography and local-level institutions in explaining variations in income across households in diverse communities. This research aim is addressed in Chapter 5.

The study contributes to a broader understanding of the nature of rural poverty and poverty dynamics, economic growth and vulnerability to shocks. The thesis makes four main

contributions. First, we add micro-level empirical evidence to the debate on methods for analysing poverty and poverty dynamics. Second, the combined quantitative and qualitative approach that we adopt to analyse poverty dynamics contributes to a better understanding of poverty and the processes underlying poverty transitions and to the increasing need to combine quantitative and qualitative research methods in poverty analysis — referred to as 'Q-Squared' (Carvalho and White, 1997; Kanbur, 2003). Third, by adopting a micro focus to the geography-versus-institutions debate on the root cause of underdevelopment, this study enhances our understanding of the relative importance of geography and institutions at different scales and contexts. Fourth, we add micro-level empirical evidence to the body of literature on vulnerability to shocks among rural households in developing countries.

In the remainder of the chapter, we discuss the main findings and policy implications. In section 6.2 we summarize and discuss the main findings in the context of the poverty and economic growth literature. Section 6.3 discusses the policy implications and relevance of the findings. In section 6.4 we present some of the limitations of the study and identify further areas of research.

6.2 Synthesis of the main findings

In this section, we present an overview and discussion of the main findings. In Chapter 2 we compared participatory and income approaches to analyzing poverty and poverty dynamics. We compared the extent to which evidence as to poverty trends, poverty dynamics and duration in poverty from a participatory poverty assessment approach (Stages-of-Progress) and income poverty measures are similar or differ. The main finding shows a significant positive correlation between the income and Stages-of-Progress poverty measures, with both approaches showing evidence of geographical clusters of poverty. Other studies have also found similarities between household survey approaches, wealth ranking and participatory approaches (Kozel and Parker, 1999; Scoones, 1995). Nevertheless, we find discrepancies in poverty levels and dynamics as well, consistent with studies comparing monetary and non-monetary welfare measures (e.g. Baulch and Masset, 2003; Ravallion and Lokshin, 2002).

We attribute the differences to a number of factors. First, the Stages-of-Progress approach captures broad and more stable welfare indicators than income. These indicators are a combination of expenditures for meeting household basic needs (of food, clothing and shelter), assets such as livestock, and livelihood strategies (Krishna, 2006; Kristjanson *et al.*, 2007). In general, participatory approaches often adopt a broader view of poverty than monetary measures of income or consumption. Second, participatory approaches are unlikely

to explicitly take into account household size in welfare ranking in contrast to income or consumption expenditure measures. Third, participatory poverty measures might be influenced by people's values and attitudes and relative welfare within the communities. Lastly, differences in recall periods for the two welfare measures might explain the discrepancies. The Stages-of-Progress method is retrospective, recovering information on past events over long recall periods while the income measure is based on a series of household surveys collecting data on the past year. As Krishna (2010b) points out, while retrospective methods that collect data through recall provide more immediate results, they are likely to be prone to recall biases especially over longer periods of time. Consequently, a great deal of caution is necessary while working with retrospective methods.

The findings in Chapter 2 underscore the fact that poverty is complex and multi-dimensional. Poverty reflects resource insufficiency — low incomes and expenditures, low achievements in education and health, vulnerability and exposure to adverse shocks, voicelessness and powerlessness in the political, social and economic life of one's community (World Bank, 2001). Consequently no single approach can capture all dimensions of poverty. In practice the research objective determines the welfare measure to be used as various poverty measures are suitable for different purposes. To conclude, these findings show that in order to understand the different facets of poverty, it is important to combine different methods. Multidimensional measures of poverty can provide a better understanding of poverty and overcome the biases that are encountered when only one approach is used leading to formulation of more effective poverty reduction strategies.

In recent years, there is increasing attention focusing on using mixed quantitative and qualitative methods in poverty analysis — commonly referred to as Q-Squared (see Barrett, 2005a; Carvalho and White, 1997; Kanbur, 2003; Kanbur and Shaffer, 2007; Thomas, 2008; White, 2002). The use of mixed methods is a new and growing practice in poverty and poverty dynamics analysis (for Africa studies see Adato *et al.*, 2006; Barahona and Levy, 2007; Barrett *et al.*, 2006; Lawson *et al.*, 2006; Lawson *et al.*, 2008). In Chapter 3 we combine quantitative and qualitative approaches to explore the nature of rural poverty dynamics in Kenya. The quantitative approach uses asset-based approaches to distinguish *structural* and *stochastic* poverty transitions (Carter and May, 2001; Carter and Barrett, 2006). In contrast, the qualitative approach uses household event-histories for the same set of households to examine the factors underlying poverty mobility patterns.

Chapter 3 demonstrates the benefits of using mixed approaches for poverty analysis. The panel data provided an overall picture of *structural* and *stochastic* poverty transition

trends over multiple periods: 2000–2004, 2004–2007, and 2007–2009. The main findings in Chapter 3 show that a large proportion of households that were poor in two consecutive survey periods were structurally poor. Of the households escaping poverty, the proportion escaping through asset accumulation was relatively small. In contrast, the proportion of households declining into poverty through asset depletion was higher than those declining as a result of stochastic factors. These results are consistent with findings among households in South Africa (Carter and May, 2001). Carter and May (2001) found modest patterns of upward structural mobility, coupled with large amounts of structural poverty over the period 1993–1998.

The household event-histories identified the processes underlying the poverty transitions. Some of the processes underlying poverty transitions such as those that decrease a household's stock of human capital (e.g. alcohol or drug dependency), are often difficult to capture explicitly in a panel survey questionnaire, but are equally informative for policy. Findings from the event-histories show that in most cases, a combination of livelihood strategies, shocks, and other factors interact to influence welfare transition patterns. The structurally poor households were characterized by low income livelihood strategies. Households structurally declining into poverty were involved in diverse livelihood activities. The structurally non-poor households engaged in high return livelihood strategies (cash crops) and diversified their income sources. The findings from the event-histories underscore the significance of health shocks and their related human and financial costs among rural households in Kenya.

Economic growth in Kenya improved remarkably over the period 2003–2007 with growth in real GDP increasing from 3% in 2003 to 7% in 2007. The high rural poverty rates in Chapter 2 and limited asset accumulation or successful escapes from poverty in Chapter 3 suggest that a large number of rural households in Kenya have been unable to benefit from macroeconomic growth. Moreover, the national absolute poverty rate of 46.1% in 2005/2006 is high in comparison to neighbouring Uganda (31% in 2006) and Tanzania (about 36% in 2001).[50] These findings suggest that macroeconomic growth policies alone are insufficient as a poverty reduction strategy in Kenya. While economic growth is systematically associated with poverty reduction in the literature, poverty reduction following economic growth can differ remarkably across countries and over time (Dollar and Kraay, 2002). The initial level of inequality in the income distribution and changes in income distribution over time

[50] Source: World Databank (2010). World Development Indicators and Global Development Finance (http://databank.worldbank.org/)

determine the rate at which macroeconomic growth translates into lower poverty (Ravallion, 2009). High initial inequality makes poverty less responsive to economic growth. Therefore, unless there are sufficient changes in the income distribution, the higher the initial income inequality the less likely the poor are to share from gains in economic growth.

While the absence of detailed inequality assessments in Kenya makes it difficult to assess the actual trends in income distribution, inequality in Kenya remains high. Income distribution measured by the Gini coefficient[51] of expenditures per adult equivalent in 2005/2006 was estimated to be 0.38 in rural areas and 0.45 in urban areas (KNBS, 2007). Moreover, other sources estimate even higher levels of income inequality in Kenya: an income Gini coefficient of 0.47 in 2007 among agricultural households in rural areas (Ndirangu and Mathenge, 2010), and an income Gini coefficient of 0.48 over the period 2000–2010 (UNDP, 2010). In countries with high inequality, unusually high economic growth rates are needed to achieve rapid poverty reduction. Similarly, the Kenya poverty profile reveals strong regional disparities in poverty incidence. Rural poverty incidence based on the 2005/2006 survey ranged from 30.3% in the most well-off region (province) to 74% in the poorest region (KNBS, 2007). Even within regions poverty incidence can vary widely.

The event-histories in Chapter 3 identified shocks associated with structural poverty transitions over the period 2000–2009. While the structurally poor category had the highest proportion of households who experienced multiple shocks compared with other groups, the differences were not statistically significant. In contrast, a large proportion of households belonging to the structurally non-poor category experienced fewer shocks compared with other groups. In Chapter 4 we delved further and characterized shocks rural households face in Kenya. We explored whether welfare level and geographical location affects exposure to *specific* shocks and the *number* of shocks experienced. In doing so, we also tested for reverse causality that confronts studies that examine the impact of shocks on household welfare. Understanding shocks and who is vulnerable is necessary for designing appropriate programs and interventions for reducing vulnerability. Reducing vulnerability of the poor to shocks such as ill health, economic shocks, and helping poor people cope with adverse shocks when they occur has been identified as one of the ways of reducing poverty (World Bank, 2001).

We find that health expenses and ill-health dominate all other shocks in terms of incidence. These findings confirm those from the event-histories in Chapter 3 and are consistent with previous studies in Kenya indicating that health shocks are the most

[51] Gini coefficient is a measure of inequality of income distribution — the higher the index the higher the level of inequality.

commonly cited reason for households' declining into poverty in some regions (Barrett *et al.*, 2006; Krishna *et al.*, 2004; Kristjanson *et al.*, 2010). The significance of health shocks is also consistent with studies in Pakistan, Bangladesh and Ethiopia (Dercon *et al.*, 2005; Heltberg and Lund, 2009; Quisumbing, 2007). We find significant differences in the distribution of shocks across geographical locations, but no differences across welfare levels. Other studies also report an association between the incidence of shocks and geographical location (Mills *et al.*, 2004; Tesliuc and Lindert, 2004).

To separate out the impact of geographical location and welfare level on *exposure* to *specific* shocks and on the *number* of shocks reported, controlling for households characteristics, we estimated probit and poisson regression models. Our main finding shows no evidence that welfare level affects exposure to specific shocks at the aggregate level — for the entire sample, but a significant geographical effect. Geographical locations significantly affects exposure to certain shocks — ill-health, funeral expenses, livestock losses, and death of income earner shocks. Moreover, even within the regions we find only limited evidence that welfare level affects exposure to specific shocks, and the effects are not systematic across regions. With regard to the *number* of shocks reported, both welfare level and geographical location had no effect for the entire sample. Even within regions we find limited evidence that welfare level affects the *number* of shocks reported or experienced. These findings appear to contradict the perception that poor households are more vulnerable to shocks and are inconsistent with findings from studies in Ethiopia and Guatemala. In rural Ethiopia, Dercon *et al.* (2005) found that illness shocks were more important for richer households (as measured by relative landholdings). In Guatemala, Tesliuc and Lindert (2004) found that the poor were disproportionally more exposed to natural shocks (natural disasters and agricultural-related shocks) and less to economics shocks specific to the formal economy than the non-poor.

Chapter 5 contributes to the geography-versus-institutions debate on the root cause of underdevelopment by adopting a micro focus. We examine the relative contributions of geography (such as land type and malaria prevalence) and local-level institutions in explaining within-Kenya income differences. Our indicators of local-level institutions included quality of local governance, social capital, political participation and trust in local government institutions. The main results provide very little evidence for the view that "institutions rule." Instead, the evidence identifies a number of geographical factors — related to infrastructure, malaria prevalence, and land type that seem to contribute to income differences across households. These findings are consistent with recent evidence provided

by Bhattacharyya (2009b) that geographical factors (notably malaria prevalence) best explain income differences for a sample of African countries only. In contrast, evidence from the cross-country studies typically identify institutions as the main driver of long-term economic growth (Acemoglu *et al.*, 2001; Easterly and Levine, 2003; Hall and Jones, 1999; Rodrik *et al.*, 2004). The findings also appear inconsistent with micro-level evidence provided for Indonesia and for Burundi (Grimm and Klasen, 2008; Voors and Bulte, 2010). However, while the subject of study — geography-versus-institutions — is the same across studies, the object of study varies. The determinants of income differences in Kenya may be quite different from the factors explaining why Kenya is poor relative to other countries.

We attribute the findings in Chapter 5 that institutional variables do not explain income differences within Kenya to two reasons. First, it may be possible that in the early stages of development geography simply matters more than institutions. Second, it could be that there is relatively little variation across space for the institutional variables of interest. Our data shows limited variation in some of our institutional quality indicators such as cooperation, political participation, or the quality of local government institutions. In contrast, geographical conditions vary widely as our sample spreads across four agro-ecological zones with significant variation in climatic and soil conditions. To conclude, these findings suggest that the geography-versus-institutions debate is likely to be scale and context specific. Therefore, within Kenya, closing the gap between disadvantaged communities relative to more advanced ones by addressing geographical impediments is important.

Altogether, our findings in Chapter 2, 3 and 5 underscore the importance of geographical targeting of poverty reduction interventions. While agro-climatic conditions and endowments of natural resources explain differences in income and poverty across regions, geographical pockets of poverty may also arise as a result of differences in the geographical distribution of public spending, especially spending on infrastructure. Differences in geographical distribution of public spending may reflect limited political power of certain regions or government efforts to concentrate investment in areas with high growth potential (e.g. areas with good agricultural potential or with a concentration of natural resources) rather than in marginal areas. Low quality public social services such as education and health services can hinder human capital accumulation and earning capacity or employment opportunities in some regions.

Targeting of rural areas and reducing regional inequality by improving the growth potential of lagging regions has been identified as a critical component of pro-poor growth

(Klasen, 2009). Baker and Grosh (1994) simulated the potential impacts of geographical targeting on poverty at different levels in Venezuela, Mexico and Jamaica, and found that geographical targeting is a useful mechanism for transferring benefits to the poor. Moreover, Baker and Grosh show that targeting smaller geographic areas can improve efficiency and reduce poverty considerably. Similarly, Elbers *et al.* (2007) simulated *ex ante* the impact on poverty of transferring an exogenously given budget to geographically defined poverty sub-groups (in terms of relative poverty status) in Ecuador, Madagascar and Cambodia. In all the three countries, they found potentially large gains from targeting smaller administrative units such as districts or villages. Consistent with the findings by Baker and Grosh (1994), their study found that the gains from targeting could be improved by combining fine geographic targeting (e.g. using poverty maps) with within-community targeting mechanisms.

The significant difference in the distribution of shocks across geographical locations in Chapter 4 also suggests a central role of geographical targeting of programs for reducing vulnerability to shocks. Within homogenous geographical areas, targeting can be further improved using within-community targeting mechanisms such as differences in welfare levels and other household characteristics. While health shocks cut across all geographical areas, the impact might differ across different geographical areas. Moreover, other shocks such as livestock losses, death of income earner tend to be more severe in particular geographical locations.

6.3 Policy implications

The dissertation explored various dimensions of rural welfare in Kenya and characterized shocks facing rural households. The findings have a number of policy implications. The findings in Chapter 2 and Chapter 3 of high poverty incidence coupled with limited asset accumulation at a time when the Kenyan economy experienced macroeconomic growth suggest that macroeconomic growth policies alone are insufficient as a poverty reduction strategy. Policies aimed at improving macroeconomic growth need to be complimented with pro-poor growth policies that promote opportunity for the poor.

How can the poor benefit from macroeconomic growth? Since the World Bank's study on redistribution with growth (Chenery *et al.*, 1974), the literature on pro-poor growth has increased rapidly over the years. Various definitions of pro-poor growth exist in the literature (e.g. Kakwani and Pernia, 2000; Ravallion and Chen, 2003). From a policy perspective, Klasen (2009) defines pro-poor growth as growth that maximizes the income gains of the poor and thus accelerates progress towards meeting the first MDG of halving

poverty and reducing hunger by 2015. Pro-poor growth therefore requires growth that focuses on the sectors where the poor are active, regions where the poor live, and sectors that use the productive factors that the poor possess. Agriculture has been identified as a vital development tool for achieving the first MDG (World Bank, 2008). In Uganda, for example, pro-poor growth in the 1990s, where economic growth was significantly associated with poverty reduction, was as a result of good agricultural performance (Kappel *et al.*, 2005). Improving the asset base of the poor has also been identified as an important element in promoting pro-poor growth (Klasen, 2009; World Bank, 2001). In Kenya, this suggests growth that focuses on the agricultural sector, rural areas, and sectors that are labour intensive. Economic growth and its effectiveness in reducing poverty also depend on other factors such as sound institutions and stable governance. Therefore, Kenya needs to pay attention to governance issues as well.

The pro-poor programs that have been initiated by the Kenya government include free primary education (FPE) and the constituency development fund (CDF). The CDF was established in 2003. The CDF redistributes national resources at the local-level and aims to control imbalances in regional development. Funds under CDF go directly to the local level (constituencies) and takes into account poverty levels, such that constituencies with high poverty receive slightly more resources. Pro-poor growth policies should also include specific "safety net" policies aimed at preventing households from declining into poverty, and "cargo net" policies aimed at aiding households out of poverty.

Regional differences in poverty levels and poverty dynamics in Chapters 2 and 3 provide a justification for geographical targeting of anti-poverty programs and interventions. Moreover, the findings from Chapter 5 suggest that for Kenya, domestic inequality and region-specific poverty can be reduced by tackling geographical challenges. These results are also consistent with findings from Chapter 4 that different kinds of shocks are prevalent in particular regions, implying a central role for effective targeting of programs that are aimed at reducing vulnerability to shocks.

Because poverty and income disparities between regions can also arise from differences in the geographical distribution of government spending especially on infrastructure, targeted public spending in rural infrastructure such as roads and electricity are options for stimulating growth in agriculture and rural areas. Infrastructure (especially rural transportation and communication) has been shown to have multiple links to rural poverty reduction and can enhance the returns to resources commanded by rural households in a number of ways. First, by lowering the transactions costs of market exchange, improved

infrastructure can boost net returns to agricultural production. Second, improved infrastructure can lead to greater availability, and probably at a lower cost of the necessary agricultural inputs such as fertilizer and thus improve welfare by increasing agricultural productivity. Third, improved infrastructure facilitates spatial integration of product and factor markets both in the agricultural and non-agricultural sectors. Renkow *et al.* (2004) estimate that high transaction costs are equivalent to a value added tax of 15% for Kenyan farmers. Investment in public infrastructure facilitates market integration and therefore represents a potential channel for improving the welfare of relatively poor geographical areas in Kenya.

The findings from Chapter 3 on the factors underlying poverty transitions underscore the importance of "safety net" and "cargo net" policies and interventions. The significance of ill-health and health expenses shocks among rural households in Chapters 3 and 4 suggest that "safety net" health policies aimed at strengthening public health programs and preventative health care, and improving access to curative health care are actions that would reduce poverty. Specific public health and preventative health care policies and programs would include immunization programs, malaria prevention programs, public education on risks associated with smoking, risky sexual behavior, better sanitation and hygiene, and safe drinking water. Curative health care policies and programs would include expansion of the coverage of public health insurance schemes to include people in the informal sector as well. These health "safety net" policies would also reduce vulnerability of rural households to health shocks. Improved access to HIV/AIDS screening and anti-retroviral drugs are also actions that would prevent households from losing a prime income earner especially in areas with high prevalence of HIV/AIDS and also increase the productivity of the HIV/AIDS infected individuals.

The Kenyan government revised deduction and contribution rates for the National Hospital Insurance Fund (NHIF) since October 2010 that takes into account income levels of the formally employed contributors. The revised rates are aimed at improving the quality of health care provision for the poor, the sick and the old. However, the NHIF should be anchored within a strong or solid regulatory framework to prevent misuse and to ensure access to quality health care. In addition, the rapid growth of private health care providers in Kenya suggest that strengthening the regulatory framework governing the operations of private health care providers is also necessary to ensure quality in health care provision. Muthaka *et al*. (2004), for example, found that the legal and regulatory requirements for the practice and provision of private healthcare in Kenya had serious weaknesses that should be

addressed by the regulatory agencies. Gertler *et al*. (2000) outline various ways of strengthening the regulatory framework of private health care: implementing a system of training and licensing health care providers, monitoring the quality of health care facilities and the process of health care, and the regulation of pharmaceuticals (i.e. which drugs should be banned, which ones should be available only by prescription, and which ones can be sold over the counter).

In addition to health "safety net" policies, the findings from Chapter 4 suggest that other "safety net" policies are also necessary. These would include provisions for widow or widower and children in the event of death of an income earner, funeral micro-insurance, and livestock micro-insurance in drought-prone areas. Funeral micro-insurance is currently a new product in Kenya offered by some funeral homes and a few insurance companies (e.g. Microensure Company). The challenge for funeral micro-insurance is how to scale it up to poor households in the rural areas where funeral expenses can lead to asset depletion and chronic poverty. The Index-Based Livestock Insurance (IBLI)[52] that is currently being piloted in the arid areas of Northern Kenya by the International Livestock Research Institute (ILRI) in collaboration with other partners should be scaled up to other marginal areas where rural livelihoods largely depend on livestock (e.g. Eastern lowland).

The "cargo net" policies that are likely to help poor households out of poverty include targeted microfinance, investment in human capital including adult education, agricultural input subsidies and improved marketing of agricultural produce. The significance of high-value cash crops (tea, coffee and sugarcane) and dairy farming among the structurally non-poor suggest that increasing market participation through diversification into high-value food crops such as horticultural crops (fruits and vegetables), and livestock diversification have the potential to reduce rural poverty.

6.4 Limitations and future research

Some key insights and limitations emerged from the study generating further research questions. We faced some challenges in deriving income or consumption poverty lines for poverty comparisons overtime. While one would expect the poverty lines to reflect trends in consumer price index (CPI) or inflation, Kenya's official poverty line increased less in

[52] Index insurance is based on cumulative rainfall, cumulative temperature, area average yield, area livestock mortality, and related indices and has recently been developed to try to address otherwise-uninsured losses caused by various natural perils in low income countries such as drought. Unlike traditional insurance, index insurance makes payments based on realizations of an underlying – transparent and objectively measured – index (e.g. amount of rainfall or cumulative temperature over a season, or area-average livestock mortality) that is strongly associated with the insurable loss.

nominal terms than the increase in price level. The official nominal overall poverty line rose by 26% between 1997 and 2005/06, whereas the general price level as measured by the CPI increased by over 100%. The food CPI alone increased by 118% over the same period. There are two possible explanations. First, how much the nominal poverty line grows over time depends on the prices of the components of the poverty line. It may be the case that the cost of a poverty basket does not have to follow changes in CPI. Secondly, other studies suggest that consumer price indices are often suspect in Africa due to weaknesses in data collection and related analytical procedures (Sahn and Stifel, 2000). This suggests that further research is needed on how the CPI and poverty lines are calculated, and also whether this pattern of poverty lines rising more slowly than inflation is also found in other countries.

In Chapter 2, we only compared two measures of poverty — income and Stages-of-Progress. The Stages-of-Progress approach captures broad and more stable welfare indicators that include a combination of expenditures of meeting household basic needs, assets such as livestock, and livelihood strategies. It would be interesting to compare the Stages-of-Progress approach to other stable indicators of welfare such as the asset-based approaches to poverty measurement (Carter and May, 1999; 2001; Carter and Barrett, 2006; Filmer and Pritchett, 2001; Moser, 2006; Sahn and Stifel, 2003).

Our analysis in Chapter 3 is based on static asset-based poverty measures. Static asset-based poverty measures are useful for distinguishing *structural* from *stochastic* poverty. However, static asset-based poverty measures do not identify whether the structurally poor are likely to remain poor over the longer term (i.e. trapped in poverty). A further research area would be to decompose further the structural poverty groups based on an understanding of the underlying patterns of asset dynamics in order to distinguish those households that will be able to move out of poverty with time and those that are likely to be trapped in poverty unless other external interventions are put in place — that is to test the poverty traps hypothesis (Carter and Barrett, 2006).

Analysis of poverty dynamics based on longer periods of time can mask significant movements into and out of poverty in intermediate periods. A further research area would be to undertake a more ‘dynamic’ analysis based on the trajectories of individual households. In Chapter 4, we focus on shocks affecting individual households as reported by the households themselves. It would be interesting to also quantify the magnitude or financial cost of the various shocks. In addition, given that we find limited evidence that welfare level affects exposure to specific shocks, a further research area would be to examine the effect of shocks on welfare change. Lastly, Chapter 5 highlights some of the challenges in measuring

institutions, perhaps the lesson is that we need to be careful about how we define and exactly measure institutional variables at different scales (macro-meso-micro levels).

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Summary

Global trends indicate that poverty rates in developing countries are declining. Across regions or continents, trends in poverty reduction have been mixed. Much of the progress in poverty reduction has been confined to East Asia and the Pacific. In Sub-Saharan Africa, progress in poverty reduction has been much slower and poverty rates remain high in many countries in the region. In Kenya, official statistics indicate that the incidence of rural poverty was 49% in 2005/2006. These national data, however, mask a wide variation in poverty incidence across regions with some regions having very high rural poverty rates of up to 70%. The persistently high poverty incidence in Kenya has created a desire for empirical studies to inform poverty reduction policies and strategies. While the poverty literature for Kenya has been increasing over the years, studies of poverty dynamics are still limited because of lack of panel data. Moreover, individual poverty studies in Kenya remain confined to single disciplines and methodologies.

This study explores rural welfare and welfare dynamics within the sustainable livelihoods conceptual framework (SLF). The study seeks to identify and understand the linkages between welfare, livelihood assets, livelihood strategies, local-level institutions, and exposure to shocks in Kenya. We address four specific research aims: (1) we compare participatory and income approaches to studying poverty and poverty dynamics and identify the extent to which these measures give similar versus different results and lead to similar or different policy implications, (2) we explore the nature of rural poverty dynamics using asset-based approaches and examine the livelihood strategies, shocks and other factors (positive and negative) associated with structural poverty transitions, (3) we characterize shocks facing rural households and examine whether poor households are vulnerable to certain shocks, and (4) we explore spatial dimensions of poverty by examining the relative contributions of geography and local-level institutions in explaining variations in income across households in diverse communities.

We use household-level panel and cross-section survey data, secondary data, and information from community-level focus group discussions. The study sites spread across four diverse agro-regional zones. The zones represent high and low agricultural potential areas, and are located in the eastern, central and western parts of Kenya. The study sites also reflect diversity in market access, population densities,

poverty levels and culture. The zones were part of a 10–year panel dataset collected by Tegemeo Institute of Agricultural Policy and Development in 1997, 2000, 2004 and 2007. Chapter 1 presents an overview of global poverty trends, poverty and economic growth in Kenya, a detailed description of the study sites and the various data sources we use.

Chapter 2 compares a participatory community-based method (Stages-of-Progress) and income approach to studying poverty and poverty dynamics over the period 1997–2009. We examine the extent to which these measures give similar versus different results. The findings show a significant positive correlation between the results obtained using the two approaches. Nevertheless, we find discrepancies in poverty levels and poverty dynamics as well. Poverty rates (or incidence) were much lower, and with fewer transitions using the Stages-of-Progress approach compared with the income approach. Moreover, the Stages-of-Progress approach showed a steady increase in poverty incidence, whereas the income approach showed an initial decline between 1997 and 2000, followed by a variable but rising trend in subsequent years. We attribute the differences to a number of factors. The Stages-of-Progress approach captures broad and more stable welfare indicators compared with the income approach. In addition to expenditures for meeting household basic needs of food, clothing and shelter, the Stages-of-Progress captures a household's underlying circumstances that include assets such as livestock, and livelihood strategies. Participatory approaches are unlikely to explicitly take into account household size in welfare ranking. Participatory poverty measures might also be influenced by people's values and attitudes and relative welfare within the communities. Other factors such as health, education, livelihood strategy, marital status and other culturally acceptable or unacceptable behavioural norms (e.g. domestic conflicts, alcohol dependency) may matter independently of income. While the Stages-of-Progress method is retrospective recovering information on past events over long recall periods, the income measure is based on a series of surveys collecting data on the past year, thus differences in recall periods for the two welfare measures might contribute to the discrepancies.

Chapter 3 explores the nature of rural poverty dynamics in Kenya using panel survey data and qualitative methods. We use asset-based approaches to analyzing poverty and poverty dynamics to examine the extent to which economic mobility is *stochastic* or *structural* (due to successful asset accumulation or de-accumulation) over multiple periods — 2000–2004, 2004–2007, and 2007–2009. We use household

event-histories to understand the processes underlying poverty transitions. The findings show that the majority of the households that were poor in two consecutive survey years were structurally poor. Of the households rising from poverty, a large proportion (between 65% and 82%) was characterized by stochastic transitions. Few households successfully escaped poverty through asset accumulation. In contrast, a large proportion of the households declining into poverty experienced structural movements. These findings suggest limited asset accumulation among rural households in Kenya over the period 2000–2009, although the Kenyan economy experienced macro-economic growth over the period 2003–2007. Findings from the event-histories show that in most cases, a combination of livelihood strategies, shocks and other factors (negative and positive) interact to influence household structural mobility. Health shocks were more common than other shocks, thus pointing to the need to invest in preventive health care and to expand the coverage health insurance.

Chapter 4 examines shocks rural households in Kenya face and explores whether welfare level and geographical location affect exposure to *specific* shocks and the *number* of shocks reported. In doing so, we also test for reverse causality that confronts studies that examine the impact of shocks on household welfare. Health expenses, ill-health, funeral expenses, livestock losses, land sub-division, and death of major income earner were the most frequently reported shocks. The results show significant differences in the distribution of shocks across geographical locations, but no differences across welfare levels. To separate out the impact of geographical location and welfare level on exposure to specific shocks and on the number of shocks reported, we estimate probit and poisson regression models. Once we control for household characteristics, we find limited evidence that welfare level affects exposure to shocks. Geographical location significantly affects exposure to certain shocks — ill-health, funeral expenses, livestock losses, and death of income earner shocks. These findings contradict the perception that poor households are more vulnerable to shocks.

Chapter 5 revisits the geography-versus-institutions debate at the local level. We adopt a micro-focus to explain within-Kenya income differences and unbundle the institutional framework at the local-level distinguishing between a number of institutional proxies — quality of local governance, social capital, political participation and trust in local government institutions. The main findings provide very little evidence for the view that "institutions rule." Instead, a number of

geographical factors that are related to infrastructure, malaria prevalence, and land type seem to contribute to income differences across households. The findings provide support for the geography-based perspective on underdevelopment within Kenya, and are consistent with the evidence provided by Bhattacharyya (2009b) that geographical factors (notably malaria prevalence) best explain income differences for a sample of African countries only. The findings, however, contradict evidence from cross-country studies that typically identify institutions as the main driver of long-term economic growth. The findings can be attributed to two reasons. First, it may be possible that in early stages of development geography simply matters more than institutions. Second, it could be that there is relatively little variation across space for the institutional variables of interest. Our data shows limited variation in some of our institutional quality indicators such as cooperation, political participation, or the quality of local government institutions. In contrast, geographical conditions vary widely as our sample spreads across four agro-ecological zones with significant variation in climatic and soil conditions. We conclude that while the subject of study — geography-versus-institutions — is the same across studies, the object of study varies. The determinants of income differences in Kenya may be quite different from the factors explaining why Kenya is poor relative to other countries. The findings suggest that the geography-versus-institutions debate is likely to be scale and context specific.

Chapter 6 summarizes and discusses the main findings of the study. We review the objectives and discuss the findings in the context of the broader macro-literature on poverty, economic growth, and vulnerability to shocks. The study makes four main contributions. First, we add micro-level empirical evidence to the debate on methods for analysing poverty and poverty dynamics. Second, the combined approach that we adopt to analyse poverty dynamics contributes to a better understanding of poverty and the processes underlying poverty transitions and to the increasing need to combine quantitative and qualitative research methods in poverty analysis — referred to as ‘Q-Squared’ (Carvalho and White, 1997; Kanbur, 2003). Third, by adopting a micro focus to the geography-versus-institutions debate on the root cause of underdevelopment, this study enhances our understanding of the relative importance of geography and institutions at different scales and contexts. Fourth, we add micro-level empirical evidence to the body of literature on vulnerability to shocks among

rural households in developing countries. Chapter 6 also discusses the policy implications of the findings, limitations of the research and future research areas.

Samenvatting

Mondiale trends laten zien dat het percentage armen afneemt in ontwikkelingslanden. Tussen regio's of continenten zijn de trends in armoedereductie wisselend. Veel van de vooruitgang in armoedebestrijding heeft zich beperkt tot Oost Azië en het gebied van de Stille Oceaan. In Sub-Sahara Afrika gaat de voortgang in armoedebestrijding veel langzamer en in veel landen van deze regio blijft het aandeel armen groot. De officiële statistieken van Kenia laten zien dat 49% van de mensen op het platteland arm was in 2005/2006. Deze nationale data verbergt echten een grote variatie in armoedepercentages tussen regio's, waarbij in sommige plattelandsregio's zelfs 70% van de bevolking arm is. De aanhoudend hoge armoedepercentages in Kenia hebben geleid tot een behoefte aan empirische studies om beleid en strategieën voor armoedebestrijding te ondersteunen. Hoewel er steeds meer armoedestudies over Kenia verschijnen, is het aantal onderzoeken naar de dynamiek van armoede nog beperkt vanwege het gebrek aan paneldata. Bovendien beperken individuele armoedestudies zich vaak tot één discipline en methode.

Deze studie verkent het plattelandswelvaart en de dynamiek van welvaart binnen het conceptuele kader van duurzaam levensonderhoud (*Sustainable Livelihoods*). De studie heeft tot doel de verbanden tussen welzijn, hulpbronnen, strategieën van levensonderhoud, lokale instituties en blootstelling aan schokken te identificeren en te begrijpen. We behandelen vier specifieke onderzoeksdoelen: (1) we vergelijken participatieve en inkomensgerichte benaderingen om armoede en de dynamiek van armoede te bestuderen en we identificeren in welke mate deze maatstaven leiden tot vergelijkbare of verschillende resultaten en beleidsaanbevelingen, (2) we verkennen de aard van armoededynamiek op het platteland met behulp van benaderingen die uitgaan van bezittingen en we onderzoeken de strategieën van levensonderhoud, schokken en andere factoren (positief en negatief) die verband houden met structurele veranderingen in de relatieve armoede positie (armoedetransities), (3) we karakteriseren de schokken waaraan plattelandshuishoudens blootstaan en onderzoeken of arme huishoudens kwetsbaar zijn voor bepaalde schokken, en (4) we verkennen de ruimtelijke dimensies van armoede door de relatieve bijdrages van geografie en instituties aan het verklaren van variaties in inkomen tussen huishoudens in verschillende gemeenschappen te onderzoeken.

We gebruiken panel en cross-sectie enquête data op huishoudniveau, secundaire data, en informatie van focusgroep discussies op gemeenschapsniveau. De studielocaties zijn verdeeld over vier contrasterende agroregionale zones. De zones zijn representatief voor

gebieden met een hoog en laag landbouwpotentieel en liggen in de oostelijke, centrale, en westelijke delen van Kenia. De studielocaties zijn ook divers in toegang tot markten, bevolkingsdichtheid, armoedeniveaus en cultuur. De zones waren onderdeel van een tienjarige paneldataset die verzameld is door het Tegemeo Institute of Agricultural Policy and Development in 1997, 2000, 2004 en 2007. Hoofdstuk 1 geeft een overzicht van mondiale armoedetrends, armoede en economische groei in Kenia, een gedetailleerd overzicht van de studielocaties en de verschillende datasets die we gebruiken.

Hoofdstuk 2 vergelijkt een participatieve, gemeenschapsgerichte methode (Stadia-van-Vooruitgang/*Stages-of-Progress*) en een inkomensbenadering voor het bestuderen van armoede en armoededynamiek in de periode 1997-2009. We onderzoeken de mate waarin deze maatstaven vergelijkbare of verschillende resultaten geven. De correlatie tussen de resultaten van de twee methodes is positief en significant. Toch vinden we ook discrepanties in armoedeniveaus en armoededynamieken. De armoedepercentages waren veel lager en er waren minder transities bij gebruik van de Stadia-van-Vooruitgang benadering vergeleken met de inkomensbenadering. Bovendien laat de Stadia-van-Vooruitgang benadering een gestage toename van het armoedepercentage zien, terwijl de inkomensbenadering een daling laat zien tussen 1997 en 2000, gevolgd door een wisselende maar stijgende trend in de latere jaren. We wijten de verschillen aan een aantal factoren. De Stadia-van-Vooruitgang benadering representeert brede en meer stabiele welvaartsindicatoren dan de inkomensbenadering. Behalve uitgaven voor basisbehoeften aan voedsel, kleding en onderdak, omvat de Stadia-van-Vooruitgang methode ook de onderliggende condities van een huishouden, met onder andere eigendom, zoals vee, en strategieën van levensonderhoud. Participatieve benaderingen nemen de grootte van het huishouden niet expliciet mee in hun ordening van welvaart. Bovendien zouden participatieve maatstaven van armoede beïnvloed kunnen zijn door waarden en levenshouding en door de relatieve welvaart binnen een gemeenschap. Andere factoren zoals gezondheid, opleiding, strategie van levensonderhoud, burgerlijke staat en andere cultureel geaccepteerde of niet geaccepteerde gedragsnormen (zoals huiselijke twisten, alcoholisme) zouden een rol kunnen spelen onafhankelijk van inkomen. Terwijl de Stadia-van-Vooruitgang methode retrospectief is en informatie over gebeurtenissen gedurende een lange periode bovenbrengt, is de inkomensmaat gebaseerd op een serie van enquêtes waarbij gegevens zijn verzameld over het afgelopen haar. Verschillen tussen de twee methodes in de periode waarover respondenten rapporteren zouden bijgedragen kunnen hebben aan de discrepanties.

Hoofdstuk 3 gebruikt panel survey data en kwalitatieve methodes om de aard van de dynamiek van plattelandsarmoede in Kenia te verkennen. We gebruiken bezitsgerichte methodes voor het analyseren van armoede en de dynamiek van armoede. Met bezit wordt hier gedoeld op bezit van huishoudens van verschillende vormen van kapitaal of *assets*; hierbij worden vijf vormen van kapitaal onderscheiden: natuurlijk, fysiek, financieel, menselijk en sociaal kapitaal. Het doel van deze methode is om te bepalen in hoeverre economische mobiliteit stochastisch is of structureel (het gevolg van succesvolle accumulatie of de-accumulatie van bezit) gedurende verschillende periodes — 2000–2004, 2004–2007, en 2007–2009. We gebruiken overzichten van belangrijke gebeurtenissen voor huishoudens (*event histories*) om de processen te begrijpen die ten grondslag liggen aan armoedetransities. De bevindingen laten zien dat de meerderheid van de huishoudens die in twee opeenvolgende surveyjaren arm waren, structureel arm waren. Van de huishoudens die uit de armoede gekomen zijn was dat voor een groot deel (tussen 65% en 82%) een stochastische transitie. Slecht een klein aantal huishoudens is succesvol uit de armoede ontsnapt door accumulatie van bezit. Daarentegen was en groot deel van de transities naar armoede structureel. Deze bevindingen suggereren dat plattelandshuishoudens in Kenia weinig bezit opbouwden in de periode 2000-2009, hoewel de Keniaanse economie als geheel groeide tussen 2003 en 2007. De bevindingen van de overzichten van gebeurtenissen laten zien dat in de meeste gevallen structurele mobiliteit het gevolg is van een combinatie van strategieën van levensonderhoud, schokken en andere (positieve en negatieve) factoren. Gezondheidsschokken kwamen vaker voor dan andere schokken, wat wijst op de noodzaak om te investeren in preventieve gezondheidszorg en om de dekkingsgraad van ziektekostenverzekeringen te vergroten.

Hoofdstuk 4 onderzoekt de schokken waaraan plattelandshuishoudens in Kenia blootstaan en verkent of het welvaartsniveau in een voorafgaande periode en de geografische ligging invloed hebben op de blootstelling aan *specifieke* schokken en het *aantal* schokken dat gerapporteerd wordt. Hierdoor testen we ook voor problemen met omgekeerde causaliteit (*reverse causality)*; deze problemen doen zich vaak voor in studies die het effect van schokken op welvaart onderzoeken. Uitgaven voor gezondheid, slechte gezondheid, begrafeniskosten, verlies van vee, herverdeling van land, en het overlijden van een belangrijke kostwinner waren de meest gerapporteerde schokken. De verdeling van schokken was significant verschillend tussen geografische locaties, maar er waren geen verschillen tussen welvaartsniveaus. Om de effecten te isoleren van geografische locatie en welvaartsniveau op blootstelling aan *specifieke* schokken en op het *aantal* gerapporteerde schokken, hebben we probit en poisson regressiemodellen geschat. Als we controleren voor

huishoudkarakteristieken vinden we slechts een beperkt effect van welvaartsniveau op blootstelling aan schokken. Geografische ligging heeft een significant effect op blootstelling aan bepaalde schokken — slechte gezondheid, begrafeniskosten, verlies van vee, en het overlijden van een kostwinner. Deze bevindingen zijn strijdig met de vaak veronderstelde perceptie dat arme huishoudens kwetsbaarder zijn voor schokken.

Hoofdstuk 5 heronderzoekt het geografie-versus-instituties debat op lokaal niveau. We nemen een micro-perspectief om inkomensverschillen binnen Kenia te verklaren en we specificeren het institutionele kader op lokaal niveau door een aantal institutionele indicatoren te onderscheiden — kwaliteit van lokaal bestuur, sociaal kapitaal, politieke participatie en vertrouwen in lokale overheidsinstituties. De belangrijkste bevindingen bieden weinig bewijs voor de visie dat "instituties bepalend zijn". Het zijn juist een aantal geografische factoren gerelateerd aan infrastructuur, malariaprevalentie en land type die lijken bij te dragen aan inkomensverschillen tussen huishoudens. Deze bevindingen ondersteunen het geografie-gebaseerde perspectief op onderontwikkeling binnen Kenia en zijn in overeenstemming met het door Bhattacharyya (2009b) geleverde bewijs dat geografische factoren (met name malariaprevalentie) het beste inkomensverschillen verklaren voor een steekproef van uitsluitend Afrikaanse landen. Deze bevindingen zijn echter strijdig met resultaten uit studies tussen landen die juist instituties aanwijzen als de belangrijkste stimulans van lange termijn groei. De bevindingen kunnen op twee manieren verklaard worden. Ten eerste is het mogelijk dat in vroege ontwikkelingsstadia geografie nu eenmaal belangrijker is dan instituties. Ten tweede zou het kunnen dat er binnen een land weinig ruimtelijke variatie is in de relevante institutionele variabelen. Sommige variabelen voor institutionele kwaliteit, zoals samenwerking, politieke participatie en de kwaliteit van lokale overheidsinstituties, vertonen weinig variatie in onze data. Daarentegen is er grote variatie in geografische condities, omdat onze steekproef verspreid is over vier agro-ecologische zones met substantiële variatie in klimaat en bodemcondities. We concluderen dat hoewel het onderwerp van studie, geografie-versus-instituties, voor de verschillende studies hetzelfde is, de doelstelling varieert. De bepalende factoren van inkomensverschillen in Kenia kunnen heel anders zijn dan de factoren die verklaren waarom Kenia arm is ten opzichte van andere landen. De bevindingen suggereren dat het geografie-versus-instituties debat schaal en context specifiek is.

De belangrijkste bevindingen van de studie worden samengevat en bediscussieerd in hoofdstuk 6. We nemen de doelstellingen in ogenschouw en bespreken de bevindingen in de context van de bredere macro-literatuur over armoede, economische groei en kwetsbaarheid

voor schokken. De studie levert vier belangrijke bijdragen. Ten eerste geven we empirisch bewijs op microniveau voor het debat over methodes om armoede en armoededynamiek te analyseren. Ten tweede draagt de gecombineerde benadering die we gebruiken om armoededynamiek te analyseren bij aan een beter begrip van armoede en de processen die ten grondslag liggen aan armoedetransities en aan de toenemende noodzaak om kwantitatieve en kwalitatieve onderzoeksmethoden te combineren in armoedenanalyses –'Q kwadraat' (Carvalho and White, 1997; Kanbur, 2003) . Ten derde, door een micro-focus te nemen op het geografie-versus-instituties debat over de kernoorzaak van onderontwikkeling vergroot deze studie ons begrip van het relatieve belang van geografie en instituties op verschillende schaalniveaus en in verschillende contexten. Ten vierde voegen we empirisch bewijs op microniveau toe aan de literatuur over kwetsbaarheid voor schokken van rurale huishoudens in ontwikkelingslanden. Hoofdstuk 6 bediscussieert bovendien de beleidsimplicaties van de bevindingen, de beperkingen van het onderzoek en toekomstige onderzoeksterreinen.

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Finally, thanks to all the others who have contributed to the successful completion of this work in one way or the other.

To the almighty God, thanks for keeping me in good health and giving me strength. Glory and honour be unto you.

Maren A. Ochere Radeny, Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan

Name of the activity	Department/Institute	Year	ECTS*
A) Project related competences			
Econometrics	AEP 21306 (WUR)	2007	6
Advanced Econometrics	AEP 50806 (WUR)	2007	6
Economic Models	AEP 30806 (WUR)	2007	6
Advanced Microeconomics	ECH 32306 (Tilburg)	2007	6
Proposal Development	WASS	2007	3
B) General research related competences			
WASS Introduction Course	WASS	2007	1.5
Research Methodology	WASS	2007	4
C) Career related competences/personal development			
Information Literacy	WGS	2007	0.6
Scientific Writing	WGS	2010	1
Techniques for Writing and Presenting a Scientific Paper	WGS	2010	1.2
Teaching Activities:			
Teaching assistance	RDS 33306 (WUR)	2007	1
Teaching assistance	RDS 33306 (WUR)	2010	1
D) Presentation at conferences and workshops			
Participatory and Income Poverty Measures Poverty	WASS PhD Day	2010	1
Stages-of-Progress and Income Measures: Analysis of Poverty Levels and Dynamics in rural Kenya	Chronic Poverty Research Centre (CPRC) International Conference	2010	1
Poverty Measures	WASS Cluster Economics Seminar	2010	1
Total (minimum 30 ECTS)			**40.3**

*One ECTS on average is equivalent to 28 hours of course work

Curriculum Vitae

Maren Radeny was born on 3rd October, 1970 in Kenya. After completing high school, she joined the University of Nairobi to study agricultural sciences, obtaining a Bachelor of Science Degree in Agriculture in 1994. With a scholarship from the University of Nairobi, she obtained a Master of Science Degree in Agricultural Economics in 1999. Her thesis focused on "Policy Incentives and Competitiveness of Maize Production in Kenya." In 1997, she worked as an intern with the Institute of Policy Analysis and Research (IPAR) in Kenya. In1998–1999, she worked as an Assistant Researcher with the International Crops Research Institute for the Arid and Semi-arid Tropics (ICRISAT) in Kenya, where her research focused on the pigeonpea sub-sector in Eastern and Southern Africa.

In 2000, Maren joined the International Livestock Research Institute (ILRI) as a Research Associate in Kenya, under the Systems Analysis and Impact Assessment Program, and later on the Poverty and Gender unit. She has been conducting research on livelihood options, poverty and livestock marketing in diverse settings. In August 2006, she obtained initial funding from the Wageningen Sandwich fellowship Program to pursue a PhD degree. She joined the Development Economics Group of Wageningen University in February 2007.