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**EMPLOYMENT AND INCOME DIVERSIFICATION IN
RURAL UGANDA: EVIDENCE FROM THE 1999/2000
NATIONAL HOUSEHOLD SURVEY**

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Thesis Presented for the Award of the Degree of

DOCTOR OF PHILOSOPHY

in the School of Economics

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DECLARATION

I, Darlison Kaija, do hereby declare that the work presented in this thesis, is my own, except where acknowledged and that this thesis or any part of it, has not been submitted in the past, for the award of a degree at any university. The errors that may appear in this thesis are entirely my responsibility.

University of Cape Town

DEDICATION

To my beloved children Ambrose, Trina and Timothy

University of Cape Town

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Cape Town, 2008
Darlison Kaija

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ABSTRACT

The motivation for this thesis was to interrogate the common view on rural development in Uganda, which assumes that the rural sector is driven almost entirely by agriculture, suggesting that rural households depend on production of food and export crops for their livelihood. However, there is growing evidence that rural households in Uganda and in many developing countries are involved in non-farm employment as a way of supplementing income from agriculture hence diversifying their income sources and improving their income levels. Rural development policies in Uganda need to be based on a good understanding of the determinants of participation in farm employment, wage employment and non-farm self-employment, and on the levels of income from these activities. Such an exploration requires an understanding of the factors determining rural individuals' participation in the different activities. It also requires an analysis of the contribution of income from these activities to total household income, and the determination of whether an activity increases or reduces income inequality. This is the contribution of this thesis. This analysis is done using the 1999/2000 National Household Survey data for Uganda collected by the Uganda Bureau of Statistics. The data are based on a two-stage and in some cases, three-stage sampling procedure. With an exception of the Tobit and the censored least absolute deviation that do not work with sample survey commands, the rest of the empirical analysis and descriptive results take into account the design effects of the survey. Specifically, they consider weights and all standard errors are adjusted for clustering and stratification.

A non-separable (non-recursive) model was developed to test the participation of individuals in farm employment, wage employment and non-farm self-employment as a function of individual characteristics, household characteristics, community characteristics and location dummies. This analysis is done at individual level. The findings indicate that age, gender, education, shadow wages, access to electricity, distance to the nearest headquarters and regional location are key in determining individual participation in different employment activities. Individuals in rural Uganda are more likely to participate in wage and self-employment in the early stages of life and resort to farming, as they grow old. From the gender perspective, men are more likely to participate in both wage employment and self-employment than women. This is consistent with the patriarchal nature of Ugandan society, which tends to confine women to farming and household chores. The results suggest that individual family members respond significantly to changes in the household's economic opportunities. A higher shadow wage for males reduces participation in non-farm wage employment and self-employment implying that more male labour is supplied to farming activities as the opportunity cost of farming increases. Higher shadow wages for females increase participation in non-farm wage employment and self-employment activities leading to a backward bending female labour supply in farming. Education is a pathway out of the low-paying farm activities to better paying wage and self-employment activities. Access to electricity encourages participation in both wage employment and self-employment. The results further show that the further away the individual is from the district headquarters (town), the less the likelihood of participating in wage employment.

The inverse of the Herfindahl index is used to measure overall income diversification. The ordinary least squares estimation was used to find the determinants of overall income diversification. Tobit estimation in comparison with the censored least absolute deviation (CLAD) was used to estimate the determinants of the shares of different income sources. The shares of four income sources namely farm, wage, self-employment and non-labour income in total income were considered in the Tobit and the censored least absolute deviation (CLAD) estimations against household, community and location variables. Estimation of the models using the two approaches reveals that CLAD approach performs better against the Tobit model for two income sources, farm share and non-labour income. The results show that despite the fact that farming is the major income source for rural households, non-farm activities play a significant role in rural Uganda. Age, sex, marital status of the household head, household size, education level of adult household members, ownership of assets, access to public services (electricity and markets) and geographical location influence income diversification and the income shares from different sources.

The Gini index and coefficient of variation descriptive approaches to income inequality are used to determine the contribution of different income sources to income inequality and whether an income source is associated with an increase or a reduction in income inequality in rural Uganda. The use of the two decomposition methods was to compare results given that sometimes, different income inequality decomposition approaches give different results. The relative concentration coefficients using both approaches show that in rural Uganda, wage employment income and self-employment income are positively associated with income inequality. This however does not mean causality. By contrast, both decompositions agree that farm income and non-labour income are negatively associated with income inequality in rural Uganda.

From a policy perspective, strategies aimed at increasing incomes of the rural households in Uganda should consider that income generated from wage employment and self-employment is more unequally distributed in favour of the richer households given that they are the ones already participating. This could explain the worsening income distribution reported in rural Uganda over time in spite of increasing income levels. In addition, a rural development policy that seeks to promote not only formal education, but also sensitize people to the benefits of non-farm employment activities and develop institutional resources should be emphasized. To address issues of participation in various activities, policies which promote both public and private investment in infrastructure especially roads, telecommunications and rural electrification are required. Programs to support rural women must give greater attention to facilitating their access to wage-earning job markets in agro-industry, trade and other enterprises. In terms of income diversification, the government should aim at improving the asset endowments of the poor. Government should create an environment with relatively equitable distribution of income, well functioning factor markets and a strong emphasis on educational expansion and improvement.

CHAPTER ONE

BACKGROUND AND INTRODUCTION

1.1 Introduction

Rural development policy in Uganda needs to be based on a good understanding of the determinants of participation in farm and non-farm activities and on the levels of income from these activities. However, little is known about rural employment especially in non-farm activities; why households diversify their income sources; and the shares of different income sources in total household incomes in rural areas. In Uganda, 87 percent of the population lives in rural areas, 85 percent is engaged in subsistence agriculture and 31 percent lives in poverty (UBOS, 2006a). Rural development policies in Uganda, in particular those aiming at rural poverty alleviation such as the Plan for Modernisation of Agriculture (PMA) and the Poverty Eradication Action Plan (PEAP), generally concentrate on agricultural development. This is because low productivity in agriculture and supply side constraints such as knowledge, access and information to improved varieties, new technologies and other agricultural inputs are considered key causes of rural poverty (Government of Uganda (GOU), 2003d).

Over the last decade, the importance of the non-farm sector to rural development has been emphasised in developing countries (Ranis and Stewart, 1993; Lanjouw and Lanjouw, 1995; Reardon, 1997; Lanjouw, 1998; Marter, 2002; Jonasson, 2005; Lanjouw, 2007). These authors conclude that non-farm activities can be a pathway out of poverty, and assert that the impact of the non-farm sector on household welfare depends on the type of non-farm activity, land tenure patterns, and physical and human capital. Reardon (1997) shows that rural people's livelihoods are derived from diverse sources and are not as overwhelmingly dependent on agriculture as previously assumed. In this respect, the behaviour of rural households in diversifying their sources of income and employment is considered important in determining the role of the non-farm sector in rural development.

Governments throughout the developing world are increasingly recognizing the importance of developing rural areas. Several authors (Islam, 1997; Gordon and Craig, 2001; Davis and Gaburici, 2001) have argued in favour of promotion of the rural non-farm sector. First, non-farm activities provide employment for a growing labour force especially in developing countries. This is especially the case where agriculture cannot absorb all the expanding labour force due to land limitations. Often, the rural non-farm sector in developing countries is typically organised on a small scale and provides employment opportunities, many of which are labour intensive. Second, it contributes to growth in a particularly efficient way since the rural non-farm sector faces prices for labour and capital that more closely reflect their social opportunity costs than urban development incentives. Third, it slows down rural-urban migration. Lastly, it can promote a more equitable distribution of income and contribute to the alleviation of poverty.

Non-farm activities can help reduce poverty and inequality in three ways (Islam, 1997). First, they can provide employment and income for the marginal farmers and landless labourers who cannot obtain enough income and sustenance from agriculture. During slack seasons, non-farm employment, however low the wages or the returns may be, supplements the income of farmers and is especially important to the poorer farmers and landless labourers. However, to the extent that non-farm employment contributes a higher proportion of income to rich farmers, it may aggravate inequality. Bagachwa and Stewart (1992), in their study of rural industries and rural linkages in developing countries, indicate that in many cases the share of non-farm income in farm households' income is higher for the small-scale farmers than for the large-scale farmers, hence reducing inequality. The findings by Mwabu and Thorbecke (2004) and White (1991) indicate that if the poor engage in low paid employment, often as wage labourers or are self-employed at home and the rich engage in industry, commerce, and trade as entrepreneurs and employers, then non-farm employment will aggravate poverty and inequality.

The second way that the non-farm rural sector may alleviate poverty is to enable the poor to offset fluctuations in agricultural income that occur from one year or season to another through facilitating diversification of sources of household income. This is true where there are not enough, or any institutions or mechanisms for the rural poor

to offset such fluctuations through savings, credit, or insurance (as is the case in Uganda). The non-farm sector provides a way of offsetting the risks and uncertainties associated with fluctuations in agricultural income when there are weather-induced variations in output, pests and diseases, or variations in external trade in agricultural commodities. However, when demand for the output of the non-farm sector is dependent on income in the farm sector in an agricultural economy, the level of non-farm activities will be low when agricultural income is low. In such a case, the role of non-farm employment in offsetting the fluctuations in agricultural income is circumscribed. The effectiveness of the non-farm sector in stabilizing income over the different seasons or consecutive years depends on the strength and nature of the linkage and the types of non-farm activities that households have.

The third way that rural non-farm activities can assist in reducing poverty is by producing cheaper and more appropriate goods for rural consumers than those produced by urban industries. This can help the poor maintain their real income.

Lanjouw (2007) looks at the contribution of non-farm activities by distinguishing between direct participation in non-farm activity, the role of non-farm income in providing a safety net and, finally, the indirect (labour market) effects of rural non-farm employment growth.

The discussion analysis of rural non-farm employment can be an important guide to policy since it provides information regarding whether the rural poor are able to make optimum use of the opportunities provided by non-farm employment or whether specific policy measures are needed to assist them. It is likely that the importance of rural non-farm employment will grow as the agricultural sector becomes increasingly more integrated into global markets and as the links between rural and urban areas intensify (Deininger and Olinto, 2001).

Since 1996, the government of Uganda has built its development planning around rural development and poverty reduction. The Plan for the Modernisation of Agriculture (GOU, 1996) and the Poverty Eradication Action Plan (PEAP) (GOU, 1997 and 2004) serve as Uganda's master development policy and the basis for its relationships with development partners and donors. The PEAP has been accepted by

donors as the Ugandan equivalent of the Poverty Reduction Strategy Paper (PRSP). Despite the increasing focus on poverty reduction, little attention has been paid to rural non-farm employment (RNFE) as a potential route for livelihood enhancement. Several studies conducted over the past decade have provided considerable evidence of an active, albeit isolated and small-scale non-farm economy in rural Uganda (Bigsten and Kayizzi-Mugerwa, 1995; Government of Uganda, 2000b; Deininger and Okidi, 2001; Newman and Canagajarah, 2000; Smith *et al.*, 2001; Zwick, 2001 and Smith, 2001). The importance of non-farm income to rural livelihoods and the potential sectoral growth are beginning to be recognised. However, little research has been conducted into the specific nature of this sector. Some recent studies (Deininger and Okidi, 2001; Newman and Canagajarah, 2000) found that about one third of rural households started a non-farm enterprise during the period 1988-1992, and that 32 percent were engaged in both agriculture and rural non-farm activities in 1996. In Africa as a whole, the average non-farm income share in total rural income was estimated at about 42 percent (Reardon *et al.*, 1998).

Studies carried out in Latin America, Chile and Peru by Reardon *et al.* (2001), Berdegue *et al.* (2001) and Escobal (2001), respectively, clearly spell out the importance of non-farm employment to the incomes of rural households. Previous studies in Uganda do not analyse the contribution of rural non-farm employment towards total household income and the determinants of individual's participation in non-farm activities. This study fills this gap by analysing in more detail, the determinants of rural employment and incomes than prior studies using the 1999/2000 Uganda National Household Survey (UNHS). The data and data collection procedures are discussed in Chapter Three.

1.2 Definition and Conceptual Issues

It is important to note at the outset that the literature on farm, non-farm and income diversification issues is plagued by definitional problems and inconsistencies, thereby making comparative analysis difficult (Gordon and Craig, 2001; Barrett, Reardon and Webb, 2001). Ideally, there should be a single standard national accounting sectoral classification but in practice, analysts are constrained by the design of the survey data

they have to work with. Researchers analysing diversification behaviours must be clear on the definitions of the different terms used (Barrett, Reardon and Webb, 2001: 8). This section is meant to explain the different terms and concepts used in this study.

In this thesis, the basic distinctions between activities and incomes are made along locational (farm versus non-farm) and functional (wage employment and self-employment) lines. This is different from the pure sectoral basis of farm versus non-farm categories suggested by a number of authors including; Barrett, Reardon and Webb (2001), Reardon (1997), Barrett and Reardon (2000), Barrett *et al.* (2005) and Stifel (2007). The sectoral farm/non-farm classification concerns only the nature of the product and the types of factors used in the production process. It does not matter where the activity takes place, at what scale, with what technology or whether the participant earns profit or labour income from the activity. The use of the locational classification in this thesis is due to analytical consistence and limitations of the design of the survey data.

The major difference between the sectoral and location classification of farm and non-farm is in the individuals involved in farm activities for a wage. Under sectoral classification, wage from farming is categorised as a farm activity where as under locational classification it is categorised as non-farm activity. In this study, the wage from working on other households' farms has been classified as non-farm (together with the non-farm wage category) for two reasons. First, analytically if farm wage is merged with farming, then it means that the derived shadow wage for females and males also applies to farm wage employment. This will imply that there is no difference between the shadow wage and hired wage. This is not the case in Uganda where family labour and hired labour are not perfect substitutes. Second and purely expediently, farm wage employment does not have enough observations to stand on its own in the sample used for analysis in chapter five (only 23 individuals - 0.16 percent). Even then, before dropping any observations, it was accounting for only 2 percent of those who were interviewed. Third, when it comes to income data, farm wage income and non-farm wage income data were collected as employment income and therefore it is not possible to differentiate them. This is further explained in the subsequent chapters.

In the context of this study, *farm employment* is the involvement in activities that produce raw agro-food products with one of the production factors being natural resources (land, rivers/lakes/ocean, air), the process can involve “growing” (cropping, aquaculture, livestock husbandry, woodlot production) or “gathering” (hunting, fishing and forestry) (Stifel, 2007:4 and Reardon *et al.*, 2001:396). The farm products gathered or produced can be for household consumption or for sale.

Non-farm employment is any activity done either on own enterprise or employed for a wage. Employment for a wage can be in either farm activities or non-farm activities. Non-farm activities include: manufacturing, electricity services, gas welding, plumbing, conservation, sale, maintenance and repair of motor vehicles and motorcycles, wholesale and retail trade, mechanical and electrical workshops, hotels and lodging, bars, restaurants and canteens. It also includes transport and communication, finance, legal accounting and architecture, photographic activities, public service, defence, education, health, hairdressing, working on other household’s farms for a wage, processing, transport or trading in unprocessed agricultural, forest and fish products produced by other households¹. Although agro-processing is closely linked to agriculture, it is considered non-farm even if it takes place on the farm. This brings in the component of sectoral classification of farm and non-farm activities. This means that once either the producer or a business entrepreneur processes agricultural products, they become non-farm activities. For example, the production of maize flour, cheese, pails, furniture and fertilizers from maize, milk, iron, wood or elements of fertilizer is a non-farm activity even if the producer processes the inputs. If these products are sold unprocessed by a business entrepreneur, as opposed to the farmer who produced them, they are considered non-farm in the case of the businessperson. Non-farm employment is further categorised as wage employment and self-employment. The analysis of the determinants of employment in rural Uganda considers three employment categories: farm employment, wage employment and non-farm self-employment.

Household income is defined as all receipts (cash and in-kind) in exchange for employment, or in return for capital investment, or receipts obtained by other sources

¹ If households are selling their own produced or gathered agricultural products, then this is counted under farm income.

such as pension (UBOS, 2003a). In this thesis, household income is categorised into four: farm income, wage employment income, non-farm self-employment income and non-labour income. The full income (actual earnings plus potential earnings of home consumption) from farm goods is what comprises of farm income in the income diversification and inequality analysis of this thesis. *Farm income* is obtained from the sale of farm products gathered or produced or the value of the farm products consumed by the household. *Wage employment income* is from both farm wage employment and non-farm wage employment. It includes government employees and private employees in farm employment and non-farm employment. *Non-farm self-employment income* comes from non-farm enterprises or where household members are engaged independently in a profession or trade on own account or with one or a few partners. Non-farm self-employment comprises of employers² and own account workers³ in non-farm activities. *Non-labour income* is the unearned income from remittances, property and pension.

Inconsistent terminology is one of the sources of confusion in the rural employment and income diversification literature. In some cases, the terms off-farm, non-farm, non-agricultural and non-traditional appear in seemingly synonymous ways. This study uses the terms “non-farm” and “non-agricultural” synonymously, as well as the terms “farm” and “agricultural”. The term ‘off-farm’ which some authors use to refer to activities (sometimes restricted exclusively to agricultural wage labour) on someone else’s land (e.g. Ellis, 1998) and others (Jonasson, 2005) is considered to be all work (farm or non-farm) located outside one’s own farm. This difference is because Ellis (1998) uses a sectoral classification of farm versus non-farm, and Jonasson (2005) uses a locational classification. Given that this study adopts a location classification, off-farm can synonymously be used with non-farm and non-agricultural. However, the use of the term off-farm is avoided in this thesis.

According to Gordon and Craig (2001), *rural* is another term that is subject to a lot of debate that hinges on three aspects namely: whether towns in predominantly rural areas are classified as rural or urban; at what size a rural settlement becomes urban;

² These are people who operate their own economic enterprise or engage independently in an economic activity, and hires one or more employees (UBOS, 2003a).

³ These are persons who operate their own economic enterprises without employing other people as helpers and work for their own or household’s consumption or profit (UBOS, 2003a).

and the treatment of migration and commuting between rural areas and towns. They point out that the definition of rural in Asia is often any settlement with 5,000 or fewer inhabitants. In Latin America, the cut off point is often 2,000 to 2,500 inhabitants. There is no firm rule that resolves these issues but researchers should always ensure that the definition adopted is clearly stated. In the case of this study, the definition of rural was adopted from the Uganda Bureau of Statistics (UBOS). Rural areas are defined to include areas that do not fall under the jurisdiction of a city, municipality, town or urban boards. This kind of definition eliminates the urban rather than narrating what comprises a rural area.

There is ambiguity in the literature on the use of the term *rural non-farm income*. One needs to be clear about the definition of the term “rural non-farm income” in any study of diversification behaviour in rural areas (Barret, Reardon and Webb, 2001). Rural non-farm income is sometimes used to mean the non-farm income (earned anywhere) by rural households, and other times only in rural areas by rural households (Barrett, Reardon and Webb, 2001: 8). This study looks at rural non-farm income as income received or earned from anywhere by rural households. This is because national household surveys often use only the location of residence of the income earner and do not distinguish the location of the activity (Barrett and Reardon, 2000). This kind of definition also includes non-labour income.

There is a tendency in the literature to regard *income diversification* as synonymous with *livelihood diversification*⁴. This is not the case in this study. *Income diversification* is the adoption of a range of farm and non-farm income-generating activities by rural households. On the other hand, *livelihood diversification* is a process by which households construct a diverse portfolio of activities and social support capabilities in order to improve their living standards and manage risk. A livelihood is more than income. Income refers to the cash earnings of the household plus payment in kind that can be valued at market prices. The in-kind component of income refers to consumption of own farm produce, payment in kind (for example, in food), and transfers or exchanges of consumption items that occur between households in rural communities. Income generation is one of the components of

⁴ The literature is well reviewed by Ellis (1998, 2000b), Bryceson (1999) and Davies (1993).

livelihood strategies (Ellis, 1998; Ersado, 2006). A livelihood encompasses income, both cash and in-kind, as well as the social institutions, for example, kin, family, village and compound, gender relations and property rights required to support and sustain a living. Income diversification is therefore not synonymous with livelihood diversification. Nevertheless, many, but not all, economic studies of diversification focus on different income sources and their relationship to income levels, income distribution, assets, farm output and other variables (For example, Reardon *et al.*, 1992; Adams and He, 1995). This thesis looks at diversification of income sources and their relationship to income levels and distribution.

1.3 The Problem Statement

A large share of the labour force in developing countries is found in rural areas and this accounts for about 90 percent of the poor (Hanmer *et al.*, 1999). Many statements have been made, particularly by the World Bank, to the effect that labour is one asset the poor possess (The 1990 World Development Report). The functioning of rural labour markets is thus critical to the success of policies intended to promote pro-poor growth.⁵

The common view in the international literature on rural development has been that of a sector driven almost entirely by agriculture, suggesting that rural households depend on the production of food and export crops for their livelihood. However, very few households collect all their income from one source and use their assets in just one activity. Multiple motives prompt households to diversify incomes and activities (Barrett, Reardon and Webb, 2001). The literature shows that wage income and non-farm self-employment income account for a considerable share of household income for richer households. Thus, for growth to be inclusive, the poor must be able to participate in growth through more remunerative uses for their labour.

⁵ See White (1999) for a discussion of the meaning of pro-poor growth. For pro-poor growth, participation in farm employment, wage employment and non-farm self-employment plus the incomes earned from these activities are important. However, this study includes unearned income just to know their effect on income diversification.

Despite the growing evidence that rural households in many developing countries are involved in non-farm employment as a way of supplementing income from agriculture, rural development policies in Uganda that aim at rural poverty alleviation generally concentrate on agricultural development. Much as these policies have reduced the poverty levels in Uganda, these levels are still high. To reduce the poverty that affects a large share of the rural households in Uganda to much less levels, there is need to explore other possible ways rather than focus only on small-scale agricultural production. Such an exploration requires an understanding of the factors that determine rural individuals' participation in the different activities and the contribution of incomes from these activities to total household incomes. It also requires an explanation of whether an activity is income inequality increasing or decreasing. This is thus one of the topics addressed in this thesis.

1.4 Objectives of the Study

In line with the above, this study examines the determinants of employment and income diversification in rural Uganda. These activities are important determinants of the quality of life of individuals or households. Therefore, an understanding of participation in such activities, coupled with knowledge of how individual, household-specific and broader sub-national factors affect household welfare, could help the formulation of policies and programmes that enable people in rural areas of Uganda improve their own quality of life.

This study has three specific objectives:

- To analyse the determinants of individuals' participation in different employment activities;
- To analyse the determinants of household income diversification and the share of income sources to total household income; and
- To examine the contributions of income sources to overall income inequality and to find out whether an increase in a particular income source increases or reduces income inequality.

1.5 Scope and Overview of the Analysis

This study uses the 1999/2000 Uganda National Household Survey (UNHS) data. These data were collected by the Uganda Bureau of Statistics (UBOS) and covered 10,696 households, out of which 8,344 (78 percent) were rural.

The Uganda Bureau of Statistics has conducted large-scale surveys since 1989. The surveys have a nationwide coverage with different modules and objectives. These include the Household Budget Survey (HBS) of 1989/90; the Integrated Household Survey (IHS) of 1992/93 and 1997; three Monitoring Surveys (MS) of 1993/94, 1994/95 and 1995/96 respectively, and three Uganda National Household Surveys (UNHS) of 1999/2000, 2002/03 and 2005/06 respectively. The major surveys were the IHS and the UNHS. The monitoring surveys were conducted with the main objective of providing data to measure changes over time in the relationship between economic growth and social development. The 1992/93, 1997, 1999/2000, 2002/03 and 2005/06 survey rounds covered 9,925, 6,564, 10,696, 9,711 and 7,400 households, respectively.

All these surveys are nationally representative and can be disaggregated to regional and rural/urban levels. The sampling frame for the surveys between 1992 and 2000 was drawn from the 1991 Population and Housing census. The 2002 census was used as a sampling frame for 2002/2003 and 2005/06 UNHS. The use of the 1991 census as a sampling frame for the 1997 and 1999/2000 could be problematic because, as Deaton (1997) has shown, the use of outdated frames is an important source of error in survey estimates. For the case of Uganda, the problem could be that since the 1990s, the country has been experiencing significant migration from neighbouring countries such as Sudan, Rwanda and the Democratic Republic of Congo. These migrants live in their own households located in camps. Using the 1991 Census as a sampling frame could have left out such in-migrants. However, this was the nearest census to this survey and therefore the best option available for obtaining a sampling frame. Uganda carries out population census every after 10 years and the sequence is 1948, 1959, 1969, 1980, 1991 and 2002.

With the exception of the survey carried out in 1997, the remaining survey rounds collected data on all socioeconomic aspects of the household and community characteristics. However, the 2002/03 UNHS did not collect information on household income (one of the areas of emphasis in this thesis). Data for the 2005/06 were collected from May 2005 to April 2006. Preliminary findings from the survey were released in December 2006 and as of February 2007, the data were not available to the public for further analysis. This study could therefore not use the 2005/06 survey data. For purposes of this study, the 1999/2000 survey is considered to be the most appropriate and available. Income data from this survey (drawn from the socio-economic survey, the community survey and the crop survey) can be categorised successfully into different income sources namely: farm income, non-farm self-employment income, wage employment income and non-labour income.

The models that this study uses to assess the determinants of rural employment, income diversification and income shares in total household income, are drawn from the literature on household decision models. Such models have a long history in development economics (Becker, 1965, 1981; Gronau, 1973, 1977; Huffman, 1980; Low, 1986). The analysis of employment is built on the theory of non-separability of household production and consumption. The resultant empirical estimations make use of a multinomial logit model. The Gini inequality measure along with the coefficient of variation are used in this study. These are based on a series of decomposition exercises that examine the contribution of different income sources to the inequality of total household income. The inverse of the Herfindahl index is used to measure income diversification and the ordinary least squares (OLS) approach is used to find the determinants of income diversification. This is complemented with a set of Tobit and censored least absolute deviation (CLAD) estimations of income shares. These estimations were done against individual, household, community and location variables. Descriptive analysis is also provided to complement the empirical results.

1.6 Organisation of the Thesis

This thesis is organised into seven chapters. Chapter Two provides an overview of the socio-economic aspects of Uganda's rural economy. It describes the Ugandan

economy and looks at the different activities and sources of rural income, trends in poverty, inequality and employment. It also highlights Uganda's rural development policies. This is not path-breaking material but is necessary in order to provide the reader with important contextual information about the Ugandan economy. Subsequent chapters are concerned with the conditions that exist in rural areas of Uganda regarding land, employment, agriculture, income sources and institutions.

Chapter Three describes in detail the data used in the study: the data types, sampling frame and design, and selection of households. As empirical studies crucially depend on the data quality, this chapter describes the data collection processes and cleaning. It explains the use of sampling weights and the methods used to measure statistical inference. The chapter also presents descriptive statistics on the demographic and socio-economic characteristics of households in Uganda. This is useful in showing that this particular survey matches the empirical review of Uganda as discussed in Chapter Two. It also presents a description of the independent variables used in the analysis. These are categorised as individual, household, community and location variables.

Chapter Four reviews the body of work on income inequality by income source. It presents the empirical strategy of the Gini and coefficient of variation decomposition approaches and discusses the results from these two approaches. The use of the two decomposition approaches (Gini and coefficient of variation) is for comparison purposes given that different decomposition methods sometimes give different results when used on the same data. This study however shows that these decomposition approaches lead to similar conclusions when used on the same data. The chapter discusses whether an income source increases or reduces income inequality in rural Uganda. As such, this chapter provides a basis for the analysis in chapter six.

Chapter Five reviews the theoretical and empirical literature on the evolution and application of household models to analyze rural employment in developing countries. The chapter further reviews available empirical studies on participation in employment mainly in developing countries. It discusses the influence of various

socio-economic factors on the activity choices of household members and hypothesizes their outcome for analysis. This review develops the theoretical understanding that motivates the analysis.

Thus, the chapter first provides a useful framework for understanding how households choose between farm and non-farm activities. It later presents the analytical framework of individual choice models and discusses the results of the factors that determine participation in employment in rural Uganda. A multinomial logit model is used to derive the determinants of participation in employment. The analysis of participation in employment is done at an individual level with different activities forming the dependent variables. Three forms of employment are analysed: farm employment, wage employment and non-farm self-employment. The independent variables include individual, household, community and location characteristics. It is assumed that participation in farm employment, wage employment and non-farm self-employment depend on labour allocation according to household preferences and prevailing constraints. A household allocates labour depending on the circumstances where they are located, and on each individual's comparative advantage, which is determined by characteristics such as education level, age and sex.

Chapter Six discusses the determinants of income diversification, where diversification is measured by the inverse of the Herfindahl index which uses the shares of different income sources to total household income. Following the household model presented in Chapter Five, this chapter presents the analytical model of the determinants of income diversification and income shares. The four income shares considered are: farm income, wage employment income, non-farm self-employment income and non-labour income. Wage employment income includes wage employment in both farm activities and non-farm activities. This is so because the income data did not differentiate the two. Non-labour income includes earnings from property, remittances and pensions. A reduced form approach is used to find the determinants of the different income shares. The ordinary least squares (OLS) estimation approach is used to find the determinants of income diversification. The Tobit estimation in comparison with the censored least absolute deviations (CLAD) was used to find the determinants of the income shares. A Tobit estimation is

preferred to the OLS because of zero income shares for households that do not earn any income from a particular source. However, the Tobit estimates are generally inconsistent if the error terms are heteroskedastic or not normally distributed (Greene, 2003; Wooldridge, 2003). In light of this potential problem, Kennedy (2003) suggests the use of robust estimators such as censored least absolute deviations (CLAD) to control for heteroskedasticity. For this reason, this study uses both the Tobit and CLAD estimation approaches.

The final chapter presents conclusions and derives policy implications based on the findings. Necessary extensions to the analyses that could not be done in this study are also considered.

University of Cape Town

CHAPTER TWO

THE UGANDAN ECONOMY

2.1 Introduction

This chapter briefly outlines the main features of Uganda's economy and recent changes in the agricultural and overall policy environment. The main part of this chapter describes the features of the rural sector with emphasis on sources of income, activities, poverty, inequality, employment and Uganda's rural development policies. It then describes the characteristics of typical rural areas in terms of farm size and household labour allocation.

2.2 Geographical Characteristics of Uganda

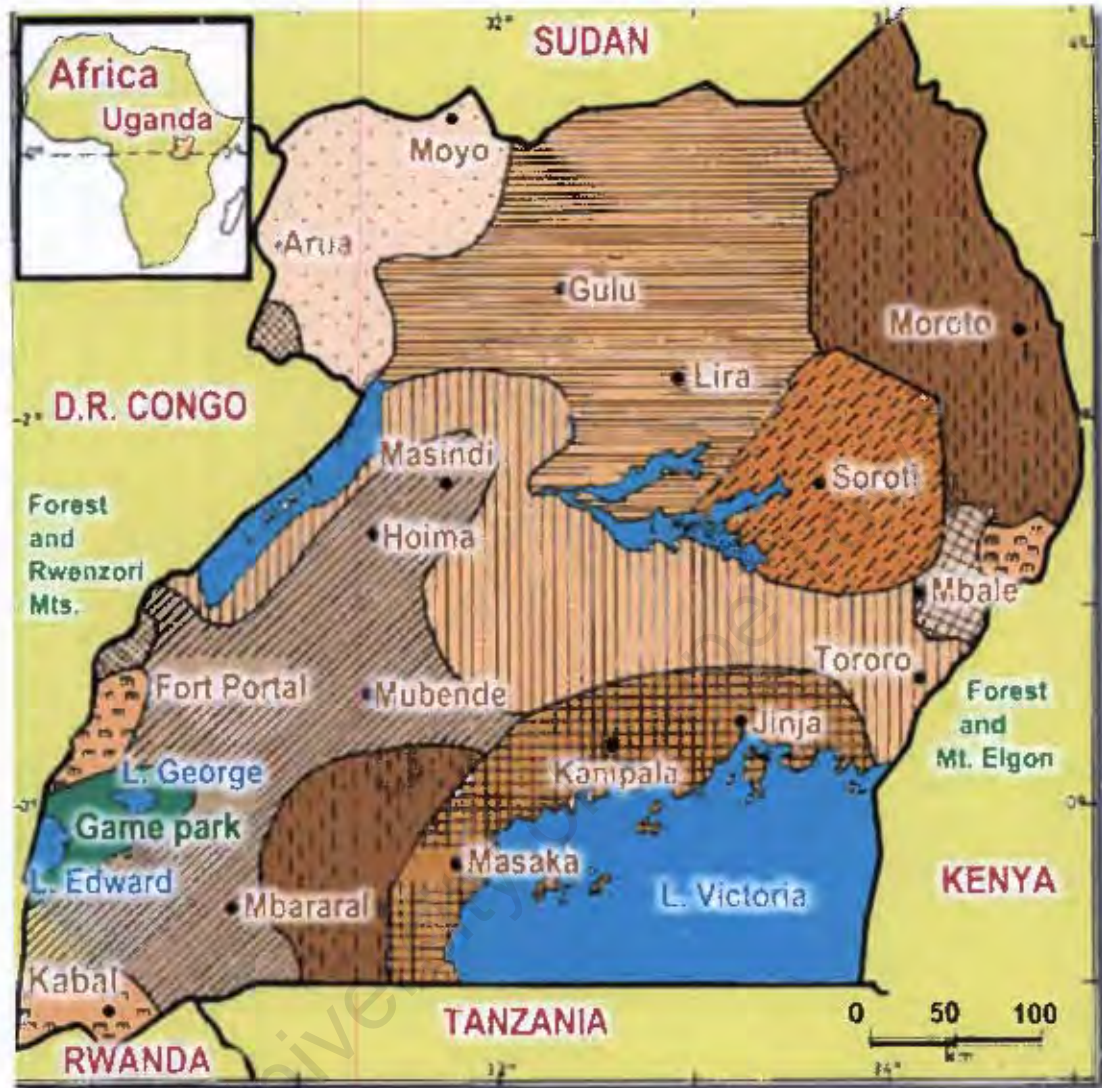
Uganda lies astride the Equator, between latitudes 4° 12' N and 1° 29' S and longitudes 29° 34' W, and 35° 0' E. It has an altitude of between 620- 5110 metres above sea level. More than two-thirds of the country is a plateau, lying between 1000 - 2500 metres above sea level. Uganda is located within the Great Lakes Region of Africa, and shares Lake Victoria with Kenya and Tanzania, and lakes Albert and Edward with the Democratic Republic of Congo (DRC). Within its boundaries, there are lakes Kyoga, George and Bisina. River Kagera and Nile are the two major rivers in Uganda. There are many other small streams, which drain into wetlands, lakes, or form tributaries and sub-tributaries to the major rivers. The vegetation is mainly composed of savannah grassland, woodland, bush land and tropical high forest. Temperatures are in the range of 15° - 30° C. Precipitation is reliable, varying from 750 mm in Karamoja in the Northeast to 1500 mm in the high rainfall areas along the shores of Lake Victoria, in the highlands around Mt. Elgon in the east, the Rwenzori Mountains in the south-west and some parts of Masindi in the West and Gulu in the North (UBOS, 2004).

The total geographical area of the country is 241,038 square kilometres, 75 percent of which is available for cultivation and pasture. The remaining 25 percent constitute lakes,

swamps and forestry zones. Of the 18 million hectares available as arable land, only about 5 million hectares are currently under cultivation, which constitutes less than 30 percent of total arable land (UBOS, 2003b). The average household land holding is 2.2 hectares. This land resource, together with the bodies of water, are the base upon which most of the 24.4 million Ugandans (2002 Census estimates) and their livestock depend for their livelihood. Although the above indicates very good scope for expansion of acreage under cultivation, land is increasingly becoming a constraint in some parts of the country, particularly in the Kigezi area and southern and eastern regions, where population densities are high (GOU, 2000a).

The influence of soils, topography and climate on the farming systems in Uganda has led to the dividing of the country into seven broad agro-ecological zones. An agro-ecological zone is a broad area with similar socio-economic background and in which ecological conditions, farming systems and practices are homogeneous. It is a zone where more or less the same crops can be grown and same livestock can be reared. Zones may cut across districts and may be sub-divided into sub-zones to cater for specific development requirements. Figure 2.1 shows Uganda's agro-ecological zones (farming systems).

Figure 2.1 Uganda's Agro-ecological Zones



- Intensive Banana Coffee Lake shore system
- Banana Millet Cotton system
- Annual cropping and Cattle West Nile system
- Medium altitude intensive Banana Coffee system
- Annual Cropping and Cattle Teso System
- Pastoral and some annual crop system
- Western Banana Coffee Cattle system
- Montane system
- Annual cropping and Cattle Northern system

Source: Government of Uganda (1995), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)

2.3 The Ugandan Economy: Overview

As of 2007, the Ugandan economy is in its second phase of economic expansion, combining strong economic growth (one of the fastest in Africa) and significant declines in inflation, which is closer to the government's target of 5 percent. This period of sustained economic growth has allowed Uganda to recover from the years of economic decline in the 1970s and early 1980s. It has also been marked by persistent but declining poverty as discussed in section 2.4.

2.3.1 The Dualistic Structure of the Economy

The agricultural sector dominates the Ugandan economy and it accounts for 77 percent of total employment. The country remains one of the least urbanised countries in the world, with 87 percent of the population living in rural areas and 85 percent of the rural population depending on agriculture for a livelihood (UBOS, 2001). About 71 percent of the working population are engaged in agriculture as their main occupation. However, the growth of the agricultural sector in Uganda remains low compared to other sectors and its contribution to Gross Domestic Product (GDP) is on the decline (see Table 2.1).

Table 2.1 Sector Contribution to GDP, 1999/2000-2005/06 in percentages

Sector	1999/00	2000/01	2001/02	2002/3	2003/04	2004/05	2005/06
Agriculture	40.9	40.7	39.8	38.7	37.6	36.3	34.0
Industry	18.6	18.7	19.0	19.5	19.7	20.4	20.5
Services	40.5	40.6	41.2	41.8	42.7	43.3	45.5

Source: GOU (2004a, 2005, 2006b)

Before 2002, agriculture was the leading contributor to GDP, followed by services and industry respectively. Agriculture is currently the second largest contributor to GDP (after services) and the largest contributor to rural employment and incomes. Food crop production dominates the agricultural sector, contributing 71 percent of agricultural GDP, while livestock products account for 17 percent, export crop production 5 percent, fisheries 4 percent and forestry 3 percent. Only one-third of the food crop produced is marketed compared to two-thirds of livestock produced. About 42 per cent of

agricultural GDP consists of subsistence crops for home consumption and is non-monetized. Agricultural output at present comes mainly from about 3 million smallholder farmers who constitute about 70 percent of the total farmers as indicated in Table 2.1

The Ugandan rural economy is characterised by the coexistence of estate and smallholder agriculture. Land cultivated by estates is privately owned (freehold) or leased from the state on long term-leases for 49 or 99 years (leasehold land). Customary laws that provide the farmer with user rights govern the land cultivated by smallholders. According to the Land Act of 1998, the customary rights can be passed on to children, and only in exceptional cases does the law deny traditional authorities the inheritance of user rights. The estate sector is characterised by relatively capital-intensive production that concentrates on lucrative export and local cash crops, such as tea and sugarcane. The share of land cultivated by estates has increased since independence in 1962. This trend is largely due to a policy framework that favoured the estate sector in the recent years. In contrast, the smallholder sector is to a large extent oriented toward subsistence production. It employs and feeds most of the rural population. The handhoe is the predominant technology for the small-holder farmers with the use of unpaid family labour. It is unusual to find a household member working on the same household farm for a wage. A wage or payment in-kind is earned when an individual works on other people's farms (UBOS, 2003c).

In this study we adopt the main criteria used to distinguish between large, medium and small-scale holdings for the Permanent Agricultural Statistics System (PASS) (UBOS, 2005b), that is, by physical size of production such as size of agricultural area and number of cattle. Some auxiliary socio-economic criteria are also considered. Table 2.2 shows the characteristics of the farmer category in rural Uganda. Small-scale holdings are characterized as "subsistence plus". Both small and medium-scale holdings are based on the household's own labour. On the other hand, the large-scale holdings are those characterized by mainly hired labour as well as market and sales orientation of the production.

Table 2.2 Farmer Categories and Characteristics in Rural Uganda

Farmer Category	Characteristics
A. Commercial Farmers (5)	<ol style="list-style-type: none">1. Possess or have access to critical skills and knowledge.2. Produce for the market with a profit motive.3. Engage in specialised production, marketing and processing agro-enterprises.4. Use skilled and non-skilled hired labour.5. Use high input / high output technologies.6. Have access to local and international market information.7. Have access to and use risk management instruments.
B. Semi-Commercial Farmers (25)	<ol style="list-style-type: none">1. Produce both for home consumption and the market.2. Use relatively improved methods of production.3. Use both family and hired labour.4. Maintain several enterprises.5. Are partial risk takers.
C. Subsistence Farmers (70)	<ol style="list-style-type: none">1. Produce mainly for domestic consumption.2. Engage in a multiplicity of enterprises3. Rely on low input /low output technologies4. Depend on family labour.5. Use small land holdings.6. Often forced to sale produce to meet basic domestic needs such as education, and health.7. Highly exposed to risks such as price, weather and yields.8. Have low literacy, skills and knowledge levels.

Source: GOU (2000a) and UBOS (2005b)

2.3.2 Growth, per Capita Income and other Key Indicators

The performance of the agricultural sector during the financial year 2005/06 was the weakest since 1999/2000. The agricultural real GDP growth rate was 0.4 percent as compared to 4.5 percent for industry and 9.2 for services (Background to the Budget, 2006/07). Given the contribution of the agricultural sector to GDP of 34 percent as of 2005/06, this rate of growth of GDP (0.4 percent) slows down the overall real GDP growth rate, per capita income growth and poverty reduction as indicated in Figure 2.3. The trend for the different sub-sectors is indicated in Table 2.3.

The slow growth in agriculture can be attributed to the prolonged drought conditions experienced in most parts of the country, which affected both food and cash crop

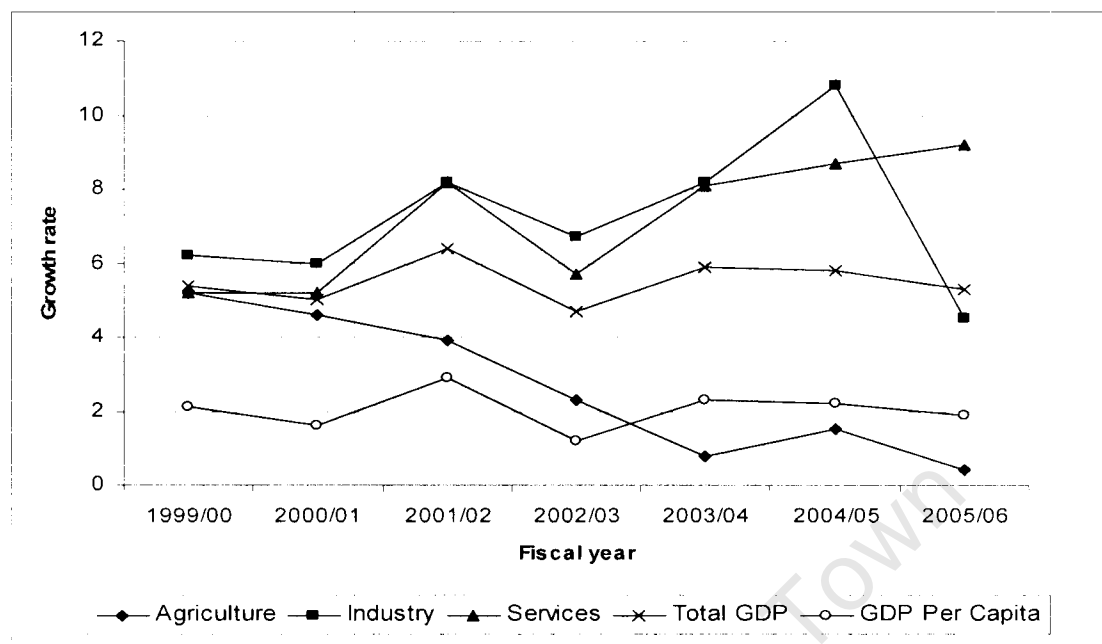
production. In addition, cotton production, which is one of the major cash crops in Uganda, was affected by a reduction in cotton growing because of low farm gate prices in the previous years. Similarly, tobacco production declined significantly because of difficulties in contract negotiations between buyers and growers. However, these effects were partially offset by increased growth in value added output in the coffee sub-sector, which rose to 1.7 percent from 0.2 percent in 2004/05 (GOU, 2006b).

Table 2.3 Annual real GDP growth rates by sector and major activity

Real GDP Growth (percentage)	1999/00	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6
Agriculture	5.2	4.6	3.9	2.3	0.8	1.5	0.4
Food crops (monetary)	5.9	8.2	5.7	3.7	1.7	1.7	0.9
Cash crops	7.0	-4.9	7.4	4.6	0.3	4.8	-7.4
Industry	6.2	6.0	8.2	6.7	8.2	10.8	4.5
Formal manufacturing	3.6	10.6	5.4	4.4	4.8	7.5	-3.5
Electricity & water	7.9	8.2	5.4	4.6	6.6	6.0	-1.2
Construction (monetary)	7.1	1.3	13.4	11.6	13.8	12.3	13.7
Services	5.2	5.2	8.2	5.7	8.1	8.7	9.2
Wholesale & retail trade	1.9	6.5	6.2	4.6	3.9	4.3	4.2
Hotels and restaurants	18.7	7.1	18.1	7.5	19.1	9.8	21.8
Transport & communication	8.5	9.6	12.4	16.8	19.9	17.9	20.7
Community services	8.6	2.4	7.0	2.7	5.5	4.7	6.2
Total GDP	5.4	5.0	6.4	4.7	5.9	5.8	5.3
GDP Per Capita	2.1	1.6	2.9	1.2	2.3	2.2	1.9

Source: GOU (2004a, 2005, 2006b); UBOS (2005a)

Figure 2.3 Annual real GDP growth rates by sector, Total GDP and GDP per capita



Source: GOU (2004a, 2005, 2006b) Background to the Budget (BTTB); UBOS (2005a)

The on-going energy crisis since February 2006 due to increased local demand and a fall in water levels at the Owen falls dam at Jinja, has severely affected industrial production, with growth in industrial output declining to 4.5 percent in 2005/06 (GOU, 2006b)⁷. This presents the lowest growth rate in the sector since financial year 1999/00 (see Table 2.3). This has had an adverse impact across a number of sub-sectors, particularly formal manufacturing leading to a decline in output of 3.5 percent. Formal manufacturing includes sugar processing, edible oil, soft drinks, cotton ginning, cement and roofing products. Agriculture provides most of the raw materials to the agro-based industrial sector. The decline in formal manufacturing has partially been offset by the continued strong performance in the construction sub-sector, with an estimated growth of 13.7 percent in 2005/06. The performance in construction is due to the private sector construction growth, which can partly be attributed to residential construction and preparations for the Commonwealth Heads of Government Meeting (CHOGM) scheduled for November 2007.

The service sector, being less severely affected by either drought or electricity shortages, has shown the strongest growth in 2005/06. Growth in the service sector is estimated at

⁷ The low water levels in Lake Victoria had a severe impact on the output of the electricity sub-sector, resulting in significant load-shedding throughout the first half of 2006.

9.2 percent. This performance is attributed to the continued strong growth in the transport and communications sub-sector and higher growth in the hotels and restaurants sub-sector. As a share in GDP, the service sector remains the largest. Transport and communication remains the fastest growing sub-sector of the economy, with an estimated growth of 20.7 percent in 2005/06. This is driven by the growth in telecommunications, which remains strong at 31.7 percent.

The overall Ugandan economy has been growing at an average annual rate of about 5.5 percent between 1999 and 2006 (GOU, 2006b). Previously, the country had experienced GDP growth rates of about 7.2 percent between 1991 and 1997. The fall in GDP growth started in the fiscal year 1999/2000 and was attributed to a number of problems (GOU, 2004b): First, a difficult international environment with deteriorating terms of trade specifically world coffee prices; second, civil wars and the war in the Democratic Republic of Congo (DRC). The third problem is the increase in pests, diseases and drought, and fourth is a rise in world prices of oil. These shocks affected the expansion of the productive sectors and the economy's position with the rest of the world.

Given Uganda's per capita income, standing at US\$ 346 in 2005/2006 (GOU, 2006b), the country is still placed among the ranks of the poorest nations in the World. Its small economy and poor social indicators (Table 2.4) show evidence of economic mismanagement and political turmoil over the period 1971-1986. In the 1970s, Uganda experienced negative GDP growth. Between 1972 and 1980, GDP fell at an average rate of 2.8 percent per year, but the virtual collapse of GDP occurred at the end of the seventies, when it fell by 5.5 percent in 1978, then by a further 11 percent in 1979. This seriously affected the growth of the economy and the provision of social services. Economic performance in the mid 1980s was much more favourable.

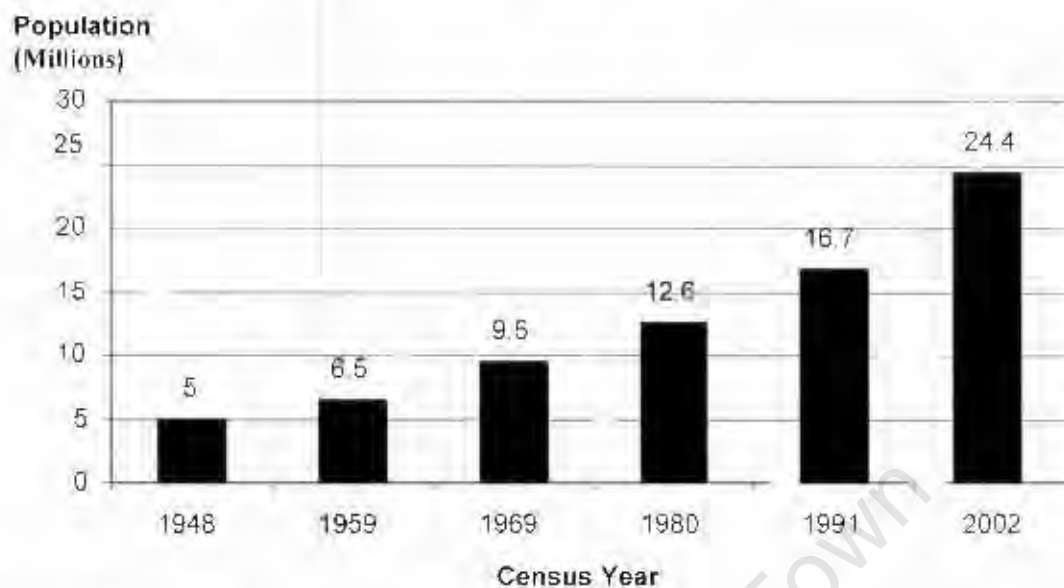
Table 2.4 Uganda's Key Economic and Social Indicators

Indicator	Year	Figure
Surface Area ('000 of km squared)	2002	241
Total Population (millions)	2002	24.4
Female (Millions)		12.5
Urban (Millions)		3.0
Population (annual growth rate)	1991-2002	3.3
GNP per capita (US \$)	2006	346
GDP annual growth rate (percent)	1999-2006	5.5
Labour force (millions)	1999, 2002	11, 9.8
Average annual growth of labour force (percent)	1990-99	2.6
Infant mortality (per 1,000 live births)	2002	83
Maternal mortality ratio (per 100,000 live births)	2002	504
Life expectancy (in years)	2002	
Male		48.1
Female		45.7
Total fertility rate	2002	6.7
HIV/AIDS prevalence (percent)	2002	6-7
Nutrition (stunting) (percent)	2002	39

Source: World Bank (2003 and UBOS (2003d, 2006a)

Uganda has a population of about 24.4 million people according to the census conducted in September 2002 (UBOS, 2005a). About 51 percent of Uganda's population are women. Uganda's population is growing rapidly, almost doubling in just 22 years from 12.6 million people in 1980 (Figure 2.4). Between 1991 and 2002, the population grew at 3.3 percent per year, recording an increase of 8 million people. This is the highest inter-censal increase ever recorded in Uganda. It is projected that if Uganda maintains the current population growth rate of 3.3 percent per annum, the population will increase to 54 million by 2025, doubling in less than 25 years.

Figure 2.4 Trends in Population of Uganda, 1948-2002



Source: UBOS (2003d)

The high increase in population may partially reflect population movements from neighbouring countries due to insecurity given the fact that the northern part of the country registered the highest population growth rate. Insecurity has increased the number of refugees in the northern part of Uganda. It could be attributed to a high household size of about 4.7 persons which is as a result of a high total fertility rate of 6.7 (the second highest in Sub-Saharan Africa and the third in the world) and high women child bearing age (15-49 years) of 22.4 percent of the total population. This rapid population growth has limited income gains in per capita terms to annual averages of about 3 percent during the period 1987 – 1999 and a meagre rate of about 2.2 percent in the period 2000-06.

Uganda, which holds about 0.4 of the world's population, is among the countries that have been worst hit by the AIDS epidemic in the world. Uganda accounts for 2.4 of the HIV/AIDS cases (GOU, 2003b). Recent data from the UNAIDS 2006 Report on the Global AIDS epidemic show that there are about 1,000,000 people and 6.7 percent of adults (aged 15-49) living with HIV/AIDS by the end of 2005. Specifically, about 520,000 women (aged 15-49) were living with HIV/AIDS and about 91,000 deaths were due to AIDS during 2005). AIDS affects severely all age groups⁸ both directly

⁸ Approximately 1,000,000 children have lost their mother or father or both parents to AIDS and (MOH, 2003)

and indirectly and has had major impact on their welfare and that of the country as a whole. For instance, it raised the infant mortality rate from 97 in 1988-1992 to 101 in 2000, and lowered life expectancy from 48 in 1990 to 42 in 2000. The number of cumulative AIDS cases has continued to rise because of a large pool of HIV infected people who fall sick as indicated in Table 2.5. However, surveillance activities have demonstrated a decline in the HIV/AIDS epidemic in Uganda in the last decade although the magnitude of the epidemic remains a daunting challenge (GOU, 2003b).

According to Table 2.5, there were 60,974 AIDS reported cases (cumulative) as of December 31, 2002. Out of these, 56,451 (92.6) were adults and 4,523 children aged 12 and below. The table further shows a sharp increase in the number of reported cases, reaching the peak in 1991 with about 10, 235 cases. These figures only represent the reported cases, yet the total number could be much more⁹. However, in 1992 the reported cases started declining at a consistent rate. The declining trend of the reported cases tallies with the decline in prevalence of HIV/AIDS based on surveillance studies.

⁹ According to MOH (2003) AIDS case reporting continues to suffer from underreporting

Table 2.5 Cumulative Reported AIDS Cases by Year

Year	No of cases reported in the year	Cumulative No. of cases
1983	17	17
1984	11	28
1985/86	882	910
1987	2,914	3,824
1988	3,425	7,249
1989	6,090	13,339
1990	6,616	19,955
1991	10,235	30,190
1992	6,362	36,552
1993	4,641	41,193
1994	4,927	46,120
1995	2,191	48,312
1996	3,032	51,344
1997	1,962	53,306
1998	1,406	54,712
1999	1,149	55,861
2000	2,303	58,165
2002	2,809	60,974

Source: GOU (2003b) - *STD/ACP (MOH) Surveillance Report 2003*

The estimates of HIV epidemic with regard to the number of people living with HIV/AIDS, new AIDS cases and AIDS death since the onset of the epidemic are presented in Table 2.6. Compared to the men, a higher figure is observed for women in all the three situations. There was a decline in both numbers of people living with HIV/AIDS and new AIDS cases between 1999 and 2000. This could have been due to sensitization, mobilization and government's commitment to fighting the AIDS pandemic. On the other hand, the cumulative AIDS death generally increased. This could be attributed to the high prevalence rate in the early 1990s given the period of 7 to 10 years between infection and death.

Table 2.6 Estimates of HIV/AIDS Epidemic in Uganda as, 1999 and 2000

Situation	Cases	Year	
		1999	2000
People living with HIV/AIDS	Total	1,438,000	1,107,644
	Adults	1,294,200	996,880
	Women	761,300	543,753
	Men	532,900	453,127
	Children<15 years	143,800	110,880
New AIDS cases in 1999 and 2000	Total	112,000	99,081
	Adults	100,800	89,173
	Women	54,982	48,640
	Men	45,818	40,533
	Children<15 years	11,200	9,908
Cumulative AIDS deaths since the beginning of the epidemic	Total	838,000	848,492
	Adults	754,200	763,600
	Women	411,382	416,510
	Men	342,818	347,090
	Children<15 years	83,800	84,892

Source: GOU (2003b) - STD/ACP MOH Surveillance Report 2003

According to the AIDS Control Programme (ACP), a department in the Ministry of Health, it was estimated that by September 2001, a cumulative number of 2,276,000 people had been infected with HIV/AIDS since the epidemic was first reported in the country in 1982. Of these, over 838,000 people have already died. An estimated number of 83,800 children below 15 years are affected. The STD/ACP surveillance projections for 2002 show that there were 70,170 new HIV infections as of December 2002. Adults constituted 78 percent and women were more exposed as they accounted for 53 percent of the adult infections. The projections further show that there were 73,830 new AIDS cases and 75,290 deaths as of December 2002. Consistently, female adults contributed the largest proportions of new AIDS cases (54 percent) and deaths (55 percent) (GOU, 2003b).

There were almost no intervention attempts and programs from Uganda Government and other agencies until 1986. Since then, a lot of interventions have been put in place by government, Non-Governmental Organizations (NGOs), Community Based

Organizations (CBOs), People Living with AIDS (PLWAs) networks and development partners. By 1997, over 1200 agencies were implementing HIV/AIDS related activities in the country. Due to these interventions, there has been a declining trend in adult prevalence since 1992. The average adult prevalence rate was estimated at 8.3 by the end of 1999 from about 24 in 1992 (GOU, 2003b).

Loss of skilled labour in the public and private sector is increasingly affecting productivity and increasing expenditure on the labour force. Findings of a survey conducted by the Uganda Ministry of Public Service in 2000 on trends and impacts of HIV/AIDS on public service show that 15.2 to 27.4 percent of the public officers are suspected to have died of AIDS between 1995 and 1999. The situation is worsened by the fact that over 80 percent of the reported cases occur among people aged 15-45. Of these, the majority are adults and parents (MOH, 1999). This age group constitutes the most productive category. A survey in Rakai district showed that 25 percent of the households cultivated less and less land. Of these, 35 percent attributed it to HIV/AIDS related sickness or death (Kirunga, 1997). This has threatened food security of the households, worsened nutritional status at the household level and led to a decline in cash crop production.

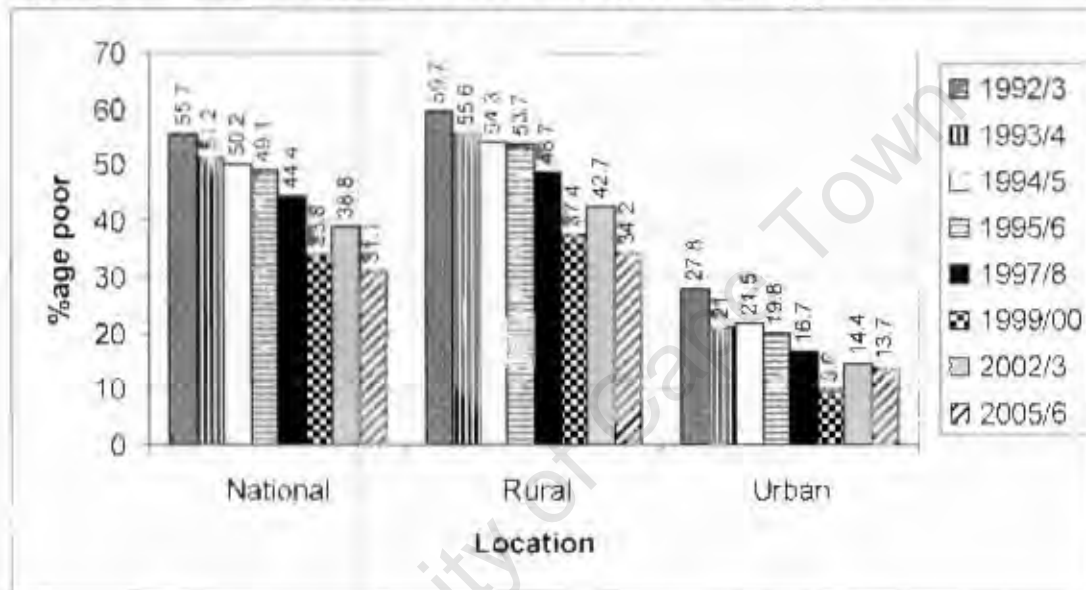
2.4 Poverty and Inequality

Using expenditure-based measures, poverty in Uganda has shown a consistent decline since 1992 (Figure 2.5). The proportion of Ugandans whose expenditures fell below the poverty line (the poverty headcount) decreased from 56 percent in 1992/93 to 44 percent in 1997/98 and even further to 34 percent in 1999/2000. However, between 1999/00 and 2002/03, poverty significantly increased from 34 percent to 39 percent (Appleton and Ssewanyana, 2003) and the increase was more remarkable in rural than urban areas. In terms of absolute numbers of people living in poverty, rural areas experienced an increase from 7.0 million in 1999/00 to 8.5 million in 2002/03, while the corresponding figures for the urban areas were from 0.3 million to 0.4 million respectively.

The results of the 2005/06 Uganda National Household Survey (UNHS) indicated that 8.4 million Ugandans lived in poverty (UBOS, 2006b). This represents 31 percent of

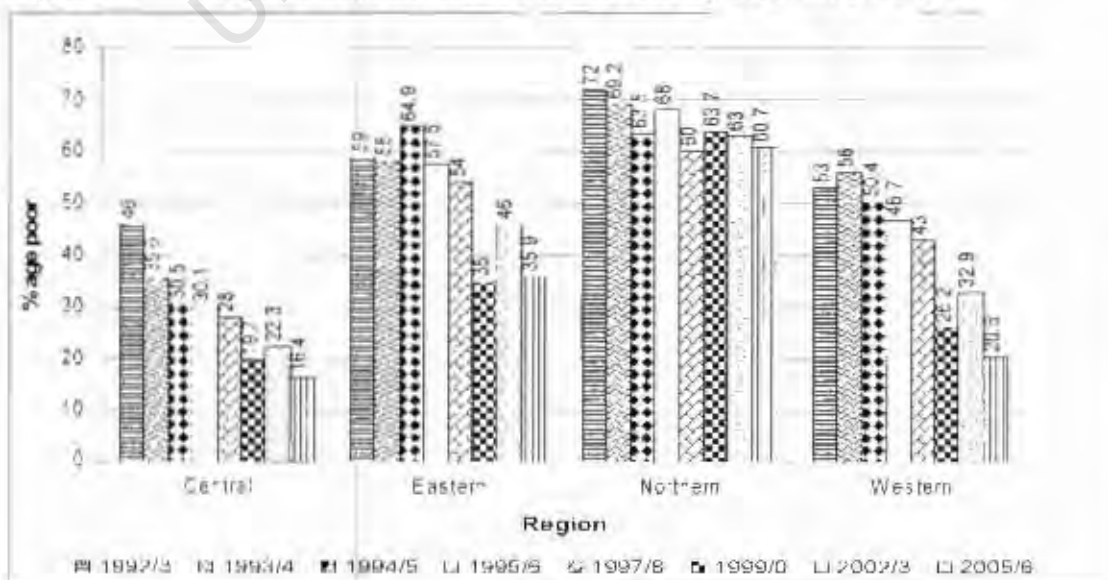
the total population. Compared to 2002/03 statistics, the percentage of people living in absolute poverty declined by 7.7 percentage points corresponding to a reduction of 1.4 million persons in absolute terms. The decline in income poverty was highest in rural areas (8.5 percentage points) compared to urban areas (0.7 percentage points). Details of the poverty distribution over time by rural/urban, region and the changes in poverty at sub-county level are presented in Figures 2.5, 2.6 and 2.7 respectively.

Figure 2.5 Decline in Poverty over Time by Location 1992-2006



Source: GOU (2004b); Appleton (2001); Ssewanyana et al. (2004) and UBOS, (2006b)

Figure 2.6 Proportion of Income Poor Persons by Region, 1992-2006



Source: GOU (2004b); Appleton (2001); Ssewanyana et al. (2004) and UBOS (2006b)

According to Figures 2.5 and 2.6, all areas experienced lower poverty levels between 1992 and 2006. However, the magnitude of the fall varied greatly between regions. The drop in income poverty estimates was statistically significant except for the Northern region. Income poverty in the Northern region remained higher than in other regions. The major reason for the increasing regional gap is the internal strife in certain parts of the country for the last 18 years (Appleton and Ssewanyana, 2003). Most parts of Northern region have been under civil war since 1986 and this has severely affected social and economic development in the region. Some parts of the Eastern region also faced insurgency between 1987 and 1991. The insurgency caused social and economic hardships for the people in this area and led to serious migration to other parts of the country. Households that are physically insecure cannot make economic investments and have the highest rates of poverty.

The sub-county level changes in poverty incidence between 1992 and 2002 are represented in Figure 2.7.¹⁰ The results of the analysis of changes in poverty levels from 1992–2002 by UBOS and International Livestock Research Institute (ILRI) (2007) are encouraging, showing widespread and large decreases in the incidence of poverty across Uganda. Gains in poverty reduction are well distributed in almost all the regions except for a few pockets in the Karamoja sub-region (Figure 2.7). The highest drops in rural poverty incidence are seen in sub-counties across the Western and Central regions. Poverty was estimated to have increased in a few sub-counties in Northern Region. In general, the absolute number of poor people declined almost equally (50) in both urban (35 counties out of 70) and rural counties (73 counties out of 148) across Uganda (UBOS and ILRI, 2007).

The poverty reduction in the 1990s was achieved by a very high rate of consumption growth of about 5.3 percent per annum. This can be mainly attributed to increased local and international transfers to households and an increase in international prices of coffee (from an average of 56 US cents per kilo in 2002/2003 to about US\$1.38 per kilo in 2005/06) (GOU, 2006b). This reflected very fast rates of GDP growth in the early and mid-1990s (1992 - 1997), which slowed from 1997 to 2000. This growth included all sectors of the economy. Between 1992 and 1997, a critical factor in

¹⁰ The statistics presented in this map represent per cent changes and not changes in absolute numbers of poor.

consumption growth was the increased prices that producers received for their crops. This was the time when agricultural marketing was liberalised and farmers were able to benefit from the increase in the world price of coffee. During this period, the most dramatic poverty reductions were found among cash crop farmers (GOU, 2004b).

Two factors are particularly important in explaining these patterns. First, agricultural growth was high during these years. International evidence shows that rural income has a particularly close relation to poverty reduction, and this is likely to be true in an economy as heavily rural as Uganda's (Fan *et al*, 2004). Moreover, in many cases, non-agricultural rural growth is dependent on agricultural income growth. Secondly, public expenditure was increasing sharply. The evidence is that the immediate effect of public expenditure is to increase incomes at the upper end of the distribution because government workers are generally better off than the average (GOU, 2004b). While the services delivered will probably increase incomes in other parts of the distribution, this takes time to be seen. Hence, the pattern that emerged was rapidly raising consumption but increasing inequality at the same time.

After 1997, GDP growth slowed down; the terms of trade deteriorated; inequality began to rise and poverty in the Northern region increased. The increase in poverty since 2000 and the marked increase in inequality since 1997 were of concern to policymakers (GOU, 2004b). This pattern is a result of a number of factors including; declines in farmers' prices, differences in asset base, cross border insecurity and low human development indicators. Several government interventions in form of policy and public expenditure reform have contributed to these patterns over time (Appleton, 2001; GOU, 2004b; UBOS, 2006b). These are highlighted in the last section of this chapter.

Between 2000 and 2003, the proportion of households whose head was mainly employed in agriculture fell from 71 percent to 58 percent, and there was a corresponding increase in the proportion of those who are self-employed outside agriculture from 12 percent to 25 percent (GOU, 2004b). Farmers' incomes fell during the period, leading to an increase in the proportion of farming households in poverty from 39 percent to 49 percent. This was accompanied by an increase in poverty among those in non-agricultural self-employment (17 percent to 21 percent)

because the market for non-agricultural products in rural Uganda depends on agricultural incomes. Nevertheless, for the individual household, non-agricultural self-employment is still a pathway out of poverty; poverty is much lower among those with non-agricultural self-employment (21 percent) than among those who depend entirely on agriculture (49 percent).

The results also show that poverty in Uganda has drastically modified its composition but has largely remained rural-based. The rural sector harbours the vast majority of the poor accounting for more than 90 percent of the total. The largest group of poor households in Uganda have solely been those in agriculture. The poorest occupation and the increase in poverty is particularly marked for households who specialise solely in crop production although other sectors such as trade, construction and manufacturing also show large increases (Table 2.7). By contrast, workers in government services experienced reductions in poverty.

Table 2.7 Proportion of People below the Poverty line by Occupation group

Occupation of Household Head	1992	1997	1999/00	2002/03	2005/06
Crop agriculture	56	40	39	50	37
Non-crop agriculture	55	40	42	34	28
Manufacturing	44	34	23	28	22
Construction & mining	37	35	20	23	27
Trade	26	21	13	17	15
Government services	37	32	15	13	9
Not working	59	60	43	38	37

Source: GOU (2004b) and UBOS (2006b)

Incomes have been rising fastest for those in formal manufacturing and service sectors while poverty is highest among food crop producers who are in the rural areas. About 12 percent of the rural households are primarily engaged in non-agricultural enterprises or employment as compared to 83 percent of urban households (UBOS, 2001). This implies that the growth realised has been mainly derived from the non-agricultural sector and hence the majority of the rural people have not benefited (Ssewanyana *et al.*, 2004; GOU, 2005).

Recent poverty trends in Uganda point to the critical need to focus on expanding rural incomes from smallholder agriculture for two reasons (GOU, 2006b): First, the incomes of the poor depend directly on agriculture; second, farmers spend part of their incomes generated from crop sales on non-agricultural goods and services. Most self-employed non-agricultural producers sell their products locally and therefore depend on the demand generated by the rural incomes raised from agriculture. Therefore, when agricultural incomes fall, people in non-agricultural self-employment experience difficulties (especially in rural areas). In a low-income agricultural economy such as Uganda, poverty reduction is likely to be achieved as a response to rural than urban growth. Therefore, to generate broader rural growth, both agricultural and non-agricultural growth is required.

It should be noted that changes in poverty levels in Uganda were driven mainly by increases in average income rather than by redistribution (Appleton, 2001; Ssewanyana *et al*, 2004; GOU, 2005). Inequality was steady from 1992 to 1997, but increased thereafter (Table 2.8); the Gini coefficient¹¹ was between 0.35 and 0.37 until 1997 but increased to 0.39 in 2000 and even further to 0.43 in 2003. There was a slight reduction in the national and urban inequality between 2002/03 and 2005/06. Rural income inequality remained the same. Figure 2.8 shows the spatial distribution of income inequality by sub-county in Uganda in 2002/03.

Table 2.8 Gini Income Inequality Indicators for Uganda 1992/93-2005/06

	1992/93	1993/94	1994/95	1995/96	1997/98	1999/00	2002/3	2005/6
National	0.36	0.35	0.36	0.37	0.35	0.39	0.43	0.41
Rural	0.33	0.29	0.32	0.33	0.31	0.33	0.36	0.36
Urban	0.39	0.39	0.40	0.37	0.35	0.43	0.48	0.43
Percentage change								
National		-2.7	3.1	0.3	-5.2	10.7	11.5	-2
Rural		-10.7	10.3	1.6	-4.6	3.5	12.5	0
Urban		-0.3	1.0	-5.8	-7.5	17	17.5	-5

Source: Ssewanyana et al. (2004) and UBOS (2006b)

¹¹ Generally, Gini coefficients are lower for expenditures than for incomes. Gini coefficients in African economies are mostly quite high by international standards, and a Gini coefficient of 0.39 for expenditures would put Uganda in the relatively high-inequality group even among African economies. It is worse with a Gini coefficient of 0.43 in 2003.

Recent studies show that most inequality is explained by differentials within regions and within groups, but it is likely that inequalities in physical and financial assets are an important proximate determinant of inequality in Uganda. For instance, using the UNHS 2002/03, Ssewanyana *et al.* (2004) find that the sex of the household head explains virtually none of the observed inequality; the rural-urban gap explains 20 percent of inequality; differences between regions explain 13 percent; the economic activity of the head of households explains 15 percent and education of the household head explains 25 percent. This shows that, if growth is to be pro-poor, then there is need to enable the poor to accumulate additional human and physical capital. The next section reviews the employment situation and sources of income in rural Uganda.

University of Cape Town

2.5 Employment and Sources of Income in Rural Uganda

Despite the fact that Uganda's labour force is expanding at a sustained rate of 2.6 percent per annum, the growth of employment opportunities in rural and urban areas is relatively slow. As earlier indicated, agriculture is traditionally the most important source of employment in rural Uganda. There are few large-scale farms that are completely dependent on hired labour, implying that most of those engaged in agriculture are self-employed. Their labour is sometimes supplemented by hired labour. Non-farm self-employment activities or non-farm enterprises are diverse, they include: carpentry, barbers, blacksmiths, general shops and transport service. Non-farm wage employment includes daily construction work, employment in those listed above under non-farm self-employment, office work and shop work in the nearby trading centres/towns (UBOS, 2003c).

According to the labour force survey of 2002/03 by UBOS, nearly 346,000 people in Uganda are unemployed, accounting for 3.2 percent of the total population, with more than half of them being in the Central region where the capital city is located, followed by the Eastern, Western and Northern respectively. Outright unemployment is higher in urban areas than in rural areas (12 percent compared to 2 percent). However, the visible underemployment rate is higher in rural than urban areas and particularly among the women. Underemployment rate is 65 percent and the majority are in agriculture. Uganda's labour force participation rate is estimated at 67 percent and has been increasing at 2.5 percent per annum during the period 1997-2003 (see Table 2.9). These unemployment figures are not different from the ones reported in the labour market status report for Uganda by the Ministry of Gender, Labour and Social Development (GOU, 2006b).

Table 2.9 Selected Key Labour Market Indicators

Indicator	Area/Region	Percentage
Unemployment rate	Total	3.2
	Rural	1.7
	Urban	11.6
	Central	3.6
	Eastern	19.2
	Northern	13.9
	Western	17.5
	Kampala	17.8
Youth unemployment rate	Total	5.0
	Rural	1.9
	Urban	15.9
Under employment rate	Total	15.4
Labour force participation rate	Total	67.0
	Rural	67.9
	Urban	62.5
	Central	65.5
	Eastern	68.0
	Northern	71.0
	Western	65.0
	Kampala	66.1
Child labour participation rate	Total	15.0
	Rural	16.6
	Urban	7.4
	Central	15.8
	Eastern	13.9
	Northern	19.5
	Western	13.4

Source: UBOS (2003) Labour Force Survey

The gender differential is also more evident in the urban areas where the unemployment rate for females is about 16 percent while the corresponding rate for males is about 8 percent. This means in urban areas, females are less likely to be employed than their male counterparts. Unemployment rate is highest among the youth (18-30 years) at 5.3 percent but reduces as people tend towards 50 years and above. Female unemployment is higher than that of males for all ages below 50 years.

Although most rural households derive much of their income from subsistence agriculture, many households are moving into production for the market and self-employment outside agriculture (Marter, 2002; Smith, 2001). The share of the households relying on agriculture as their primary activity has declined from 86 percent in 1992 to about 68 percent in 2002 suggesting a shift to non-farm activities.

The household's most important sources of income are agriculture, self-employment, wage employment and transfers. Within the rural economy, trade has been identified as the most common non-farm activity during the period 1988-1992 (Deininger and Okidi, 2000) and 1992/93 to 1996/97 (Appleton *et al.*, 1999). Commodity trading was found to be an important non-farm income source in the rural non-farm employment (RNFE) study in Rakai and Kumi districts in Uganda (Zwick, 2001). In both Rakai and Kumi districts, there was evidence of a growing rural service sector, often requiring considerable capital investment, often engaged by those who have generated sufficient capital through crop and livestock production, commodity trading or conjugal networks. These service enterprises include lodging houses, restaurants, local bars, private medical services (such as midwifery or pharmacy) and agro-processing. Marter (2002) emphasises that Rural Non-Farm Employment (RNFE) in Uganda is largely traditional and artisan. The non-farm activities are strongly linked to primary production, generally entailing low start-up costs and catering for local markets. The most widely spread activities are as outlined by Marter (2002) and summarised in Table 2.10.

Table 2.10 Non-farm activities in rural Uganda

Category	Activities
Traditional processing of primary products	Charcoal burning, beer brewing, bark cloth processing
Trade in primary produce	Trading in maize, ground nuts, millet and other food
Retail trade in household Goods	Used (second hand) clothes, paraffin, salt and sugar
Crafts	Carpentry, brick making, pottery, basket making, weaving, crochet, knitting, broom making, baking and tailoring
Services	Repairs and mechanics, preparation and sale of running a bar, healthcare and midwifery, and carrying
Formal employment	Waged or salaried work in government or service in the village or district headquarters

Source: Marter (2002)

There are gender differences in rural activities. Women are more involved in farming than men (UBOS, 2003c). Women are mainly involved in crop farming whereas men are in livestock, fishing and poultry activities (Smith *et al.*, 2001; Smith, 2003; Zwick, 2001). Male non-farm rural activities, whether primary or secondary, are often differentiated from female occupations. This differentiation is mostly notable among the more profitable occupations, such as commodity trading, for example coffee, and administrative or political employment, which are dominated by men. This pattern may be explained by women's culturally defined role in agriculture and in the home (both productive and reproductive), but also through unequal access to non-farm occupations, whether as a consequence of male dominated social networks, education or other determinants of entry into the non-farm sector.

Given Uganda's employment levels, one of the greatest challenges is to generate sufficient employment opportunities to meet the demands of the rapidly growing population. The economy faces challenges of accelerating growth and human resource development by increasing productivity and competitiveness, improving service delivery and integrating with the world economy. There is a clear need to enable the poor accumulate additional human and physical capital. This is in addition to increasing the returns to the assets they already own, encouraging diversification and growth of the non-farm sector as key elements of any development strategy. It is thus important to consider what the government of Uganda is doing towards achieving these objectives.

2.6 Uganda's Rural Development Policies

During the period 1971 to 1986, Uganda's rural sector suffered from problems related to civil strife and a fall in agricultural prices. The fall in agricultural prices was partly because of internal policies and an unfavourable external environment that prevailed at the time. The internal policies included taxation of export crops through monopoly marketing boards, the associated inefficiencies in input and output markets and an overvalued exchange rate. The combined effect of these factors was to discourage many rural producers from risking exposure to markets and make them shift to food crop production and subsistence farming. Price disincentives, withdrawal of financial

intermediaries, lack of infrastructure maintenance, and deterioration in the delivery of public goods led to the successive de-capitalisation of the rural economy, erosion of international competitiveness, and decline in productivity (Deininger and Okidi, 2001).

To reverse these trends, in 1987 the government of Uganda adopted an Economic Recovery Program (ERP) and has since been implementing new market-oriented economic policies. The adjustment process began with a stabilization programme to reduce the level of inflation and regain control over economic policy. This was followed by the liberalization of markets, which led to free market prices, and the removal of institutional constraints. For example, coffee marketing and exports were liberalised and direct export taxation was abolished (though reintroduced temporarily during the 1994-95 coffee boom). Similar measures were taken in the cotton sector. Liberalisation emphasised the creation of an enabling environment for broad-based economic growth and structural transformation (GOU, 2004b).

In the early 1990s, the focus of the ERP shifted from economic growth and macroeconomic stabilization to structural reforms. Government also liberalized the management of the exchange rate and left its determination to market forces. This reform provided incentives to major sectors of the economy including agriculture, industry, trade and tourism (GOU, 2001). Other reforms included the privatization of state-owned enterprises, which increased private sector participation in the economy. In addition, there was the rationalization of institutions and sectors that included the streamlining of the public sector and the financial sector. Public spending was constrained within an overall budget framework designed to restore budget discipline and macroeconomic stability. Government expenditures were categorized into Priority Programme Areas (PPAs) and other non-priority expenditures. Priority Programme Areas (PPAs) included roads, primary education, primary health, rural water and agricultural research and extension. Expenditures on these areas were protected from cuts in cases of revenue shortfalls (GOU, 2001).

The government's first priority on the country's development agenda is the reduction of poverty. Recognising that macroeconomic adjustment alone did not bring significant gains to rural dwellers led to the development of the first Poverty

Eradication Action Plan (PEAP)¹² in 1997. This included increasing the opportunities for the agriculturally-based poor, and the provision of basic social services. The overall goal of PEAP was to develop policies and resource allocations that will reduce poverty in Uganda as measured by headcount index from 44 percent in 1997 to less than 10 percent by 2017. However, this goal can be achieved if real GDP grows at 7 percent per year and if growth is evenly distributed (GOU, 2004b). The PEAP also sets goals in other areas such as Universal Primary Education, health care and sanitation. In addition, it focuses on cross-cutting issues such as employment, population, social protection, income distribution and regional equity.

To achieve the five pillars of PEAP¹³, the government of Uganda has put in place a number of bodies at the central government responsible for the rural sector. These include the Poverty Monitoring and Analysis Unit (PMAU) and the Uganda Participatory Poverty Assessment Process (UPPAP), which are under the Ministry of Finance, Planning and Economic Development (MFPED). There is also the Plan for the Modernisation of Agriculture (PMA) and the National Agricultural Advisory Service (NAADS) under the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). The PMA and NAADS aim at modernising the agricultural sector through the promotion of a “profitable, competitive, sustainable and dynamic agro-industrial sector”. This is expected to contribute towards the improvement of incomes by raising the farm productivity, increasing the share of agricultural production that is marketed and creating more on-farm employment opportunities. Furthermore, these bodies are expected to help speed up the process of diversification of the predominantly agricultural economy by the development of non-agricultural sectors (GOU, 2000a).

Despite these efforts, Uganda’s rural sector is still weak. Given the current poverty and inequality trend, there are serious policy implications for rural Uganda if the Millennium Development Goals (MDG) of reducing poverty to less than 15 percent by 2017 is to be achieved. Uganda has to lay strategies to make sure that the five pillars of the PEAP and their respective priorities are achieved. Effective

¹² PEAP involves a consultative process and has been revised twice with the first in 1997, then 2000 and the latest in 2004.

¹³ The PEAP is grouped under five ‘pillars’: (1) economic management, (2) production, competitiveness and incomes (3) security, conflict-resolution and disaster-management (4) governance and (5) human development.

implementation of one policy might not in itself make Uganda achieve its target. Each of the specified priorities of PEAP is necessary but not sufficient if implemented alone to make Uganda achieve its target.

2.7 Conclusion

This chapter has presented an overview of Uganda's rural economy focusing on agriculture, poverty, inequality, employment and the policy environment. It is clear that since 2001/2002, the service sector is the largest contributor to GDP followed by agriculture and then industry. Before then, agriculture was the largest. Of the three sectors, agriculture has the lowest annual growth rate. The highest growth has been realised in transport and communication, and formal manufacturing sub-sectors.

With an exception of 2002/03, there has been a decrease in poverty levels in Uganda since 1992. Despite this trend, poverty levels are still high especially in rural areas, accompanied by high levels of income inequality. Agriculture is the major provider of employment and income in rural Uganda with the majority involved in subsistence farming. The benefits of economic growth realised over the past years have favoured the urban more than rural areas. Economic growth has mainly accrued from the service sector and to a less extent cash crop farming. With limited industrial opportunities, a number of government documents reviewed recommend non-farm employment for rural development and poverty reduction. However, this raises a number of research issues that require, among others, an examination of the rural non-farm sector, the determinants of individual participation in non-farm activities and share of non-farm income to total household income in rural Uganda.

It is the issues and concerns raised in this chapter that form the background for and motivate subsequent chapters. The next chapter provides an overview of the data used in the analysis and presents descriptive statistics

CHAPTER THREE

SURVEY, DATA AND DESCRIPTIVE STATISTICS

3.1 Introduction

This chapter provides an overview of the data and descriptive statistics that are used in the analysis. It presents a detailed discussion of the data collection procedures used by the Uganda Bureau of Statistics (UBOS) and describes the questionnaires, the sampling frame and coverage. In addition, the chapter describes the socio-economic factors influencing activity choice and incomes introduced in the conceptual framework. Emphasis is placed on the independent variables, which are included in the econometric models in the next chapters. For purposes of consistency, and to reduce clutter, the descriptive statistics for the dependent variables used in the empirical analysis are discussed in Chapter Five and Six. This chapter further discusses other socio-economic characteristics of rural households in Uganda in 1999/2000. The chapter concludes with a summary of the descriptive analysis as a basis for the empirical results presented in the following chapters. STATA 9 is used to obtain both the descriptive statistics and the econometric results. Appendix 7A and 7F present STATA DO files used to generate the variables and the descriptive statistics respectively.

3.2 The Data

The primary data used in this study are from the 1999/2000 Uganda National Household Survey (UNHS), a national multi-topic survey that was carried out by UBOS. The survey collected detailed information on a range of household characteristics and activities. The data permit the construction of a comprehensive measure of rural household income that can be related to household demographics, education, land and other asset ownership, location and occupation among other things. This survey was nationally representative and the socioeconomic questionnaire was administered to 10,696 households (57,385 individuals), of which 8,344

households (78 percent) were rural. Rural households comprised of 45,891 individuals.

The data collection process mainly used a two stage sampling procedure and in a few enumeration areas, a three stage stratified selection was used (UBOS, 2001). These procedures are discussed in the later sections of the chapter and are included in the empirical analysis. It is important to note that the stratified sampling procedure considered the regional classification for Uganda: Central, Eastern, Northern and Western¹⁴. In addition to the regional disaggregation, the survey data can further be disaggregated to rural and urban level, and also farm and non-farm. This study looks at only the rural households given the fact that farm activities are not so common in urban areas of Uganda and therefore income diversification in urban areas is more within non-farm activities than between farm and non-farm activities.

The survey had four different questionnaires namely; listing (household roster), socio-economic, community, and crop survey questionnaires. The listing questionnaire was used to get the household roster for sample selection purposes. This study uses data from some sections in the socio-economic, community and crop survey data. The socioeconomic questionnaire consists of a series of topics that integrate monetary and non-monetary measures of household welfare and a variety of household behavioural characteristics. These include information on employment, income, consumption expenditure, assets, basic needs and other socio-economic aspects of the households. The community questionnaire collected information on markets, prices, infrastructure and availability of services such as electricity and credit. The crop questionnaire collected seasonal information on labour inputs by gender (own and hired), seed inputs and other inputs such as fertilizers. It also provides information on ownership of land, crop income and cultivated area. The crop survey covered the two agricultural seasons to capture seasonal differences in farm output and labour allocation. These form some of the variables used in the computation of shadow wages. For purposes of this study, information from these sources is categorised as individual, household, community and location variables.

¹⁴ This regional classification for Uganda has often been used in the tabulation of data from the national household surveys conducted by the Uganda Bureau of Statistics.

The information on income that has been used includes income received in-kind as well as in-cash during the 12 months prior to the survey. Household income is measured as income from crop farming; non-crop farming (mainly livestock and poultry); non-agricultural enterprises, and employment¹⁵ (farm and non-farm wage), property income (rent from land, buildings, dividends, royalties and interest); and non-labour sources such as transfers, pensions and remittances. In this study, income sources have been categorised into four sources: farm, wage, non-farm self and non-labour. Farm income comprises of crop farming and non-crop farming. The employment category includes farm wage (mainly casual workers) and non-farm wage. Much as it would have been ideal to separate farm from non-farm wage, it is important to note that the data does not permit this. In rural areas of Uganda, it is unusual to find a household member working on a family farm for a pay. This creates a number of unpaid family workers. Instead, individuals are paid a wage for working on other people's farms. A farm in the Ugandan context is a small holding of an average 2.2 hectares on which households obtain a livelihood mainly subsistence. The common term used is 'gardens'.

3.3 Sampling Procedure and Coverage

The 1999/2000 UNHS covered all the districts in Uganda except Kitgum and Gulu in the Northern region plus Kasese and Bundibugyo in the Western region. This was due to the insecurity that prevailed in these districts at the time. The exclusion of these districts notwithstanding, the data generally represents the prevailing situation in Uganda. The sampling frame was made up of enumeration areas (EAs) from the 1991 population census, just like the rest of the surveys carried out by the Uganda Bureau of Statistics (UBOS) between 1992 and 2000. These EAs were provided at district level with their corresponding number of households. A stratified two stage sampling design was used (with the exception of some districts where a three stage was used due to lack of an enumeration area (EA) frame). The advantage of the two stage stratified sample selection process relative to a pure random process is that it dramatically reduces the scope of fieldwork and therefore reduces the costs of the

¹⁵ Employment data were collected on individuals reported to have earned some income during the last 365 days prior to the survey. For analysis purposes, such information was disaggregated at the household level.

survey. The disadvantage is that standard errors resulting from two stage samples tend to be significantly larger than those resulting from purely random samples (see Howes and Lanjouw, 1998; Datt, Joliffe and Sharma, 1998). The first stage unit (fsu) was the EAs of the 1991 population census¹⁶ in districts with two stage sampling design and households as the second and ultimate stage unit. For districts with a three stage design, the first stage unit was the parish, followed by the local council one (LC1)¹⁷ and the household. Each district was treated as a separate stratum (UBOS, 2001). The descriptive and regression analysis in this and the subsequent chapters takes into consideration sampling weights, clustering and stratification.

In the case of community survey, one LC1 unit was considered per EA. In EAs with more than one LC1, the community survey was carried out only in one LC1, selected on the basis of simple random sampling. The community survey was done using focus group interviews of community leaders and selected residents who have lived in the community for a number of years. The chairperson of the selected LC1 was approached to help organize this group of informants. It was a requirement that each focus group includes at least two men and two women leaders and the total should not exceed 10 persons. This is because large group interviews might sometimes be hard to control and the need to capture both men and women's views.

The sampling frame was divided into fairly homogeneous strata in order to improve the efficiency of the sampling design. To take care of the desired estimates for the urban and rural areas in addition to national estimates, all districts were stratified into 3 sub-strata except Kampala and Mpigi. Kampala district (comprising of only the city of Kampala) has only one sub-stratum and Mpigi has four sub-strata namely: Entebbe Municipality, Mpigi town¹⁸, other urban and rural. Other districts have 3 sub-strata: district town or municipality, other urban and rural areas. The district headquarters were designated as urban while other urban areas included town boards and trading centres as defined during the 1991 population census. In reality, however, some districts which do not have other urban areas, have two strata only. Kampala district was dropped from the analysis because it is purely an urban district.

¹⁶ This was used because there was no up-to-date Census and may be an important source of error in survey estimates. However, Deaton (1997) notes that this is typical of household surveys and does not prevent us from using data to make inferences as long as care is taken in making inferences.

¹⁷ This is the lowest local administration unit in Uganda.

¹⁸ Mpigi is currently a district covering Entebbe municipality as well.

In order to make the survey estimates more representative of the target population and avoid coverage error, the following procedure was adopted. In the first stage, the defined EAs covered all inhabited areas of the country (excluding special areas such as barracks) without omission or duplication. In the second stage, the listing exercise resulted in a complete and accurate sampling frame in terms of coverage of the targeted population. Maps were used to provide visual boundaries of EAs while the listing showed detailed information for the eligible units of selection under the coverage requirement. The lists contained sufficient elements that permitted the identification of the selected households. Both the maps and the listing questionnaire provided complete information of all households within an EA.

Within the selected rural EAs, households were classified as small scale farmers (5 acres and below), large scale farmers (above 5 acres) and non-farming households. This was done by collecting information on whether one or more members of the household operated any crop farming enterprise activity and finding out the estimated area under crops during the last season in acres. This information was collected at the time of listing households for purposes of increasing on the precision of the rural estimates. Agricultural households were visited twice, once at the end of the first season and again at the end of the second season to be able to ascertain areas planted and outputs for each season. Surveying of the socio-economic households and communities was spread over a year to take care of seasonality. The questionnaires were pre-tested in May 1999 in the two districts of Mbale and Mpigi which are located in the Eastern and Central region respectively. Final survey instruments were released after a pilot survey in July 1999 in the seven districts of Mbarara, Ntungamo, Lira, Mubende, Kiboga, Iganga and Mbale, which were selected from all the four regions of Uganda. Field work commenced in August 1999 and was completed in July 2000.

The sample size (10,696 households) comprised of 1,086 first stage sampling units, out of which, 848 were from rural Uganda. Appendix 3 shows the first stage sampling units for rural Uganda. The panel sample of the first stage units (fsu) was selected stratum-wise using the distribution from the 1992/3 Integrated Household Survey (IHS) sample on the basis of simple random sampling. The new sample was selected

with probability proportioned to the number of households in the current domain. As a result, sampling weights were applied in the analysis.

The sample size was determined taking into consideration three major factors: the degree of precision or reliability desired for the study estimates, the cost and operational limitations, and the efficiency of the design (UBOS, 2001). The precision of survey estimates is a function of the sample size and the amount of variability among the population units in the domain. Since there were no available estimates of the variance of the different characteristics of interest within the domains for which similar levels of precision are desirable, a more or less equal allocation was used.

A set of scrutiny notes known as cold-deck scrutiny was developed and used to guide manual checking and assess the consistence of the data collected. A hot-deck scrutiny computer programme was also developed and used for verification and validation during data processing. To minimise errors and inconsistencies, range and consistence checks were included in the data entry program. At national level, the coefficient of variations (CVs) were generally below 4 percent, at regional level below 10 percent and for some selected districts, below 15 percent (UBOS, 2001). These CVs are within acceptable range where according to theory, for reliable estimates, it is desirable to have CVs below 20 percent.

3.4 Descriptive Statistics

The literature and theoretical framework reviewed in the next chapters bring out the importance of using individual data when analysing participation in the different activities and household data when looking at income diversification and inequality. For purposes of deriving a broad understanding of the data, this section is divided into two. The first part describes the individual level characteristics while the second part summarises the household and community level variables. All the results presented in this chapter take into account of the design effects of the survey. Specifically, the results consider weights and all standard errors are adjusted for clustering and stratification.

3.4.1 Individual Level Characteristics

Individual level descriptive information is based on a sample of 14,633 individual observations; some individuals were excluded because of missing values for the important variables, or outliers in the data. This represents a population of 5.9 million people when the weights are included compared to Uganda's rural population of 18.6 million persons in 1999. This is a ratio of about 1: 400 individuals¹⁹. This section presents tabular analysis providing information about the characteristics of individuals (adults) who participated in farm and non-farm activities. However, it does not provide rigorous statistical tests except for the tests for the differences in means between gender groups. This mainly serves to describe the observed determinants of participation and disaggregate them by gender, age or other categorization. Table 3.1 contains the summary statistics of the variables used in the derivation of individual characteristics.

Table 3.1 Individual Characteristics

Variable (Observations 14,633) Population size 5,900,000	Men Population size 2,750,000		Women Population size 3,150,000	
	Mean	Std. Error.	Mean	Std. Error.
Age of household members	38.951	0.220	36.353	0.204
Literate	0.739	0.006	0.505	0.008
No education	0.187	0.006	0.399	0.008
Primary education	0.633	0.006	0.507	0.007
Secondary education	0.161	0.005	0.089	0.004
Tertiary education	0.020	0.002	0.005	0.001

Source: Author's own computations using the 1999/2000 UNHS

Men account for 46.6 percent of the sample and have an average age of 39 years compared with women who are on average aged about 36 years. Men in the sample are generally more literate (74 percent)²⁰. This is not surprising given the nature of the society in Uganda where boys are favoured to go to school than girls. In addition,

¹⁹ This is the same ratio UBOS used corresponding to 4.2 million households or 21.4 million people. It is similar to the one suggested by Deaton (1997: 11). Deaton indicates that national household surveys frequently use sample sizes of around 10,000 households, which corresponds to a sampling fraction of 1:500 in a population of 5 million households or 25 million people.

²⁰ The average national literacy rate is 65 percent with males and females at 74 percent and 57 percent, respectively (UBOS, 2003d).

completion rates for female members are lower than for male members. At regional level, the Central region had the highest literacy rate at 70 percent and the Northern region had the lowest at 55 percent. The low literacy rate in the Northern region could be attributed to the insurgency since 1986, which has disrupted educational programs in the area. Men in the sample have also attained higher levels of education for all the education categories compared to women. Tests for difference in means for these variables show that there are statistically significant differences between the characteristics of men and women. These results are within the expected demographic pattern in developing countries²¹.

3.4.2 Household and Community Level Characteristics

This section presents the selected household and demographic characteristics of sample rural households. Table 3.2 summarises the key household and demographic characteristics at national and regional levels.

Household size and composition

In 1999/2000, the total number of households²² in Uganda was 4.2 million as compared to 3.4 million at the time of the 1991 population census. The largest proportion of households in Uganda (83 percent) is rural based. According to UBOS (2003d), the national average household size was 5.2 persons per household compared with 4.8 persons per household in 1991²³. For rural areas, the average household size was higher than the national average at 5.6 persons per household. Analysis of the distribution of household size shows a variation in rural average household size among the four different regions. The Western region has the largest household size at 5.9 persons per household followed by the Eastern, Northern and Central with 5.6, 5.5 and 5.3 respectively (see Table 3.2). Further analysis shows that the poorest quintiles have the highest household size (6.5 individuals per household). The household size by quintiles reduces as the household welfare improves. The fifth quintile has the lowest average household size of 4.4 individuals.

²¹ See World Bank (2006) and UNDP (Human Development Report) (2006).

²² A household was defined as a group of people who normally live and eat together.

²³ According to UBOS, household size greater than 30 is termed as an institution. The survey had three households in this category, which were dropped from the analysis in the next chapters.

The indicators of household composition presented earlier showed that the country's population was young with 51 percent of the population aged 15 and below. The survey shows the same trend existed in rural Uganda with 46 percent of the sample aged less than 15. The proportion of children below the age of six was 19 percent, while the corresponding figures for boys aged between 6 and 15 is equal to that of girls at 13 percent. The proportion of adult males was equal to that of women (23 percent) and the proportion of elders (≥ 60) was 9 percent. At the national level, in terms of the rural and urban distribution, 44 percent of the productive age group were in rural areas compared to 53 percent in urban areas. This kind of population distribution implies a higher dependence ratio in rural areas as compared to urban areas. This is consistent with the findings in other developing countries in the region (World Bank, 2006).

The regional distribution of household size and composition shows a similar pattern as the national and rural distribution. Children below 6 years constitute between 18 and 20 percent of the population in all the four regions, the Eastern region having the highest proportion. The combined group of children below 15 years constitute 45 percent of the population. This result is consistent with the findings of Okwi (2005) for the Eastern region. The proportion of adult females is higher than that of adult males in the Northern and Western regions, the reverse is true for the Central, and Eastern regions (see Table 3.2).

Age and Gender of Household Head

The average age of household heads was consistently about 44 years at the national level and for all the regions (Table 3.2). Detailed analysis shows that over 50 percent of the household heads were in the 26-49 age groups, and household heads aged less than 18²⁴ constituting only 0.14 percent.

²⁴ According to the Ugandan law, anybody below 18 years is a child.

Table 3.2 Household Characteristics

Variable	Regions					
	Rural Mean	Std. error	Central	East	North	West
Household size	5.589	0.040	5.302	5.606	5.492	5.898
Married household head	0.752	0.006	0.642	0.786	0.791	0.797
Age of household head	44.180	0.201	44.126	44.338	43.212	44.648
Male household head	0.764	0.006	0.730	0.777	0.745	0.794
Proportion of children (<6 yrs)	0.189	0.002	0.181	0.200	0.188	0.187
Proportion of girls(5yr>females<15yrs)	0.127	0.002	0.123	0.121	0.127	0.136
Proportion of boys(5yr>males<15yrs)	0.133	0.002	0.134	0.126	0.130	0.139
Proportion of male adults (>=15<60 yrs)	0.233	0.003	0.255	0.227	0.223	0.224
Proportion of female adults(>=15<60yrs)	0.230	0.002	0.219	0.222	0.245	0.241
Elders (>=60)	0.088	0.003	0.087	0.105	0.087	0.073
Head is literate	0.449	0.007	0.501	0.418	0.408	0.457
Head has no education	0.422	0.007	0.375	0.414	0.469	0.447
Head has primary education	0.496	0.007	0.530	0.506	0.462	0.475
Head has secondary education	0.075	0.004	0.084	0.074	0.063	0.074
Head has tertiary education	0.007	0.001	0.012	0.006	0.006	0.005
Male adult has no education	0.224	0.007	0.161	0.208	0.246	0.286
Male adult has primary education	0.711	0.010	0.691	0.690	0.694	0.763
Male adult has secondary education	0.190	0.007	0.196	0.188	0.191	0.184
Male adult has tertiary education	0.023	0.002	0.018	0.027	0.025	0.023
Female adult has no education	0.405	0.010	0.249	0.385	0.539	0.489
Female adult has primary education	0.667	0.011	0.682	0.653	0.613	0.701
Female adult has secondary education	0.146	0.007	0.178	0.148	0.106	0.139
Female adult has tertiary education	0.009	0.001	0.010	0.010	0.006	0.008
Household in poorest quintile	0.204	0.006	0.082	0.226	0.435	0.158
Household in second poorest quintile	0.199	0.005	0.152	0.217	0.232	0.205
Household in third poorest quintile	0.202	0.005	0.192	0.211	0.169	0.221
Household in fourth poorest quintile	0.198	0.005	0.254	0.187	0.101	0.218
Household in richest quintile	0.197	0.006	0.321	0.160	0.064	0.199

Source: Author's own computations using the 1999/2000 UNHS

The data show that in rural Uganda, individuals become household heads as early as 12 years. This could be attributed to the effects of HIV/AIDS and war which have claimed a number of productive middle-age household heads in Uganda (see Chapter Two and GOU, 2003b). Only 2.4 percent of the household heads are aged 80 and above. Again this is due to the low life expectancy of 42 years in Uganda. This finding confirms the results obtained by UBOS (2001) and Okwi (2005) for rural households in the Eastern region.

The distribution of household heads by gender shows that 76 percent were male-headed households and almost an equal proportion of these were married. More than 70 percent of the households are headed by males in all the four regions. The largest proportion of households headed by males was found in the Western region (79 percent) and the least was in the Central region (73 percent). This finding was unexpected. A low figure of male-headed households in the Northern region was expected because of the war that has ravaged the area for more than two decades and claimed lives of mostly young adult males who were abducted. In terms of marital status, the distribution by region shows that the lowest proportion of married household heads was in the Central region (see Table 3.2). All the other regions had more than 79 percent of the household heads married. This could be the reason why the Central region has the lowest percentage of male-headed households.

Education

Education is categorised into four groups: no education, primary, secondary and tertiary education. A person is expected to take seven years in primary school, 6 years in secondary school and at least two years in tertiary institutions depending on the nature of the course. The distribution of educational attainment in rural is consistently close to the national picture. In rural areas, 42 percent of the household heads had no education. This could be attributed to the fact that people in rural areas have relatively limited access to educational facilities both in terms of distance and financial means. Less than 10 percent of the household heads had attained at least secondary education. Comparing the educational attainment of males and females by age group, more male adults have higher education levels compared to females. The highest percentage of female adults has no education (40.5 percent). Detailed analysis shows that of the respondents aged 10 and above who had never attended school, about 70 percent and

83 percent of their fathers and mothers respectively had never attended school. This shows that there is a high likelihood of parents sending their children to school if they have had some education themselves regardless of other factors. Analysis of these results shows that they are within expected educational patterns in developing countries (World Bank, 2006 and UNDP, 2006).

The regional distribution of educational attainment shows a consistent pattern to that at the national level (Table 3.2). Northern region had the largest proportion of household heads with no education (50 percent) while the Central region had the least (37.5 percent). In terms of primary education, a different pattern is observed. Northern region had the lowest educational attainment at primary level (46 percent) while central region consistently had the highest proportion of household heads who had attained at least primary education. The entire rural Uganda had less than 4 percent of the household heads having tertiary education. This is similar to the percent of household heads in all the four regions. Recent evidence from UBOS (2001) shows that the average national Crude Enrolment Ratio (CER)²⁵ is 38 percent as compared to 40 percent and 35 percent among males and females respectively. This ratio is said to have been rising considerably overtime and this is attributed to Universal Primary Education (UPE) since there is a significant change for the lower age group. Table 3.2 also summarises the distribution of educational attainment in the household by gender and age group. Consistently, we observe that most households have male and female members who have attained at least primary education.

Welfare

Rural sample households were distributed by region and income quintile as indicated in Table 3.2 and show an interesting pattern. Households are ranked by quintile (5 categories), that is, Quintile 1 represents the poorest households, quintile 2 the next poor group of households. This ranking systematically ends on quintile 5, which represents the wealthiest households. As expected, the distribution of the sample rural households by quintile is almost the same (close to 20 percent). Looking at the regional distribution of households by quintile, the Northern region not only has the lowest proportion of households (6.4 percent) in the richest quintile (Q5), but also the

²⁵ The Crude Enrolment Ratio is the percentage of the total enrolment at all levels to the total population

largest proportion (43.5 percent) in the poorest quintile (Q1). In contrast, central region has the least proportion of households (8.2 percent) in the poorest group (Q1) and the largest proportion (32.1 percent) in the richest group. This distribution of households by income quintile is consistent with the distribution when consumption expenditure is used (see also UBOS, 2001). It is not surprising that households in the Northern region are generally poorer than the rest of the regions given that the area has faced almost two decades of civil war.

Assets

Assets in both physical and financial form constitute an important source of livelihood in rural areas of Uganda. The survey collected information on different forms of household assets including housing, possession of electricity in the household, transport, land, livestock, agricultural and other non-agricultural assets. Table 3.3 shows the distribution of assets and community services by region in all the rural areas of Uganda.

Almost all households live in their own houses in rural areas. The lowest proportion of households that did not own a house as an asset was in the Central region, where about 15 percent lived in either rented premises or relatives' property. In all the other regions, more than 90 percent of the households owned at least one house.

Possession of transport assets (bicycles, motor cycles, carts and sometimes even motor cars) is another important dimension in rural areas. Transport assets are used to take goods to the markets and also to carry produce from the gardens to the homesteads. On average 48 percent of the rural households possess some form of transport asset. In comparison to the other regions, the Western region had the lowest proportion of households owning transport assets (41 percent). The Central region had the highest proportion of households with transport assets (54 percent).

Table 3.3 Assets and Communal Services by Region, 1999/2000

Asset Ownership	Rural Mean	Std. Err.	Central	East	North	West
Household owns a house (0/1)	0.917	0.005	0.852	0.941	0.924	0.949
Transport asset (0/1)	0.482	0.007	0.540	0.497	0.488	0.409
Livestock (0/1)	0.552	0.007	0.478	0.544	0.609	0.593
Land size in acres	3.987	0.151	4.066	3.537	4.375	4.144
Land per capita	0.838	0.032	0.815	0.760	1.068	0.801
Land per adult	1.586	0.073	1.539	1.409	1.859	1.649
Log Land per adult	0.702	0.009	0.681	0.657	0.836	0.686
Agricultural equipment (0/1)	0.948	0.004	0.922	0.949	0.960	0.963
Non agricultural equipment (0/1)	0.037	0.003	0.063	0.025	0.031	0.031
Community has electricity (0/1)	0.153	0.013	0.165	0.203	0.117	0.112
Community has credit facilities (0/1)	0.522	0.018	0.571	0.490	0.253	0.670
Distance to district headquarters ²⁶ (Km)	37.217	0.948	37.538	29.126	42.099	42.317

Source: Author's own computations using the 1999/2000 UNHS

Livestock forms an important component of household livelihoods in Uganda. Ownership of various forms of livestock, cows, goats, sheep, poultry and donkeys provides additional sources of income to the household and traction power in areas where the ox-plough is used. However, the distribution of livestock is also associated with traditional forms of living where some societies are pastoral while others are mixed farmers or pure farmers. The regions with more pastoral communities, mainly the northern and western region, clearly have more households owning livestock (close to 60 percent in each of these regions). Central region had the lowest proportion of households owning some livestock (48 percent).

Land is another important factor in the livelihoods of rural residents in Uganda. Ownership of land provides the much needed source of income through farming and rearing of animals. Close to 90 percent of the households in western Uganda reported owning some land while the lowest level of ownership was in the Northern region. The average land size was 4 acres with variations depending on the region. The

²⁶ Many districts in Uganda have one town which serves as the district headquarter.

Northern region has the highest reported land size per household (4.3 acres) and the Eastern region has the lowest (3.5 acres). Households in the Central and Western regions reported having on average 4 acres of land. The reason for the reported land sizes could be due to differences in population densities of the regions. The Northern region is sparsely populated and has the lowest population density in Uganda whereas the Eastern region has the highest population density in Uganda (UBOS, 2003d). The Eastern region has the lowest land per capita (0.76 acres) and land per adult (1.409 acres). Northern region has the highest distribution per capita (1.068 acres) and highest distribution per adult (1.859 acres).

Ownership of agricultural equipment is another important variable in rural areas. Agricultural equipment includes items such as tractors, hoes, ploughs, *pangas* (machetes) and wheelbarrows. More than 90 percent of the households in all the regions owned at least one of these equipments, implying that agriculture is a pillar in rural livelihoods. Non-agricultural equipments were owned by less than 7 percent of the households in all the four regions.

Access to electricity in the community is another form of asset that can be used to generate income for the household. Analysis of the regional distribution of electricity shows that only 15 percent of the households in Uganda live in communities with electricity. Households in the Eastern region have highest access to electricity at the community level (20 percent). This is not surprising given that the Owen Falls Dam, which is located in the Eastern region, generates most of Uganda's electricity. The poorest access is in the Western region where 11 percent of the households reported having electricity in the community.

Access to credit, which is an important source of inputs to both farm and non-farm activities was highest in the Western region (67 percent) compared to the other regions. According to the informal discussions with officials from Bank of Uganda, microfinance institutions are rapidly expanding and growing in western Uganda than the other regions due to relative stability and affluence of the region. Likewise, distances to facilities at the district headquarters are more in the Western region (50 km) than other regions.

Finally, recent studies in Uganda have used UBOS data to address different issues. Appleton (2001b) used the 1992 Integrated Household Survey (IHS) and 1999/2000 Uganda National Household Survey (UNHS) to estimate poverty trends in Uganda using consumption expenditure data. Newman and Canagarajah (2000) studied the trends in rural poverty, changes in income and labour market participation by sector and gender, and the determinants of sector participation by gender using 1992 IHS and the 1995/1996 monitoring survey data²⁷. Deininger and Okidi (2001) analysed the determinants of agricultural productivity and rural non-farm enterprise start-up using the 1992 IHS and the first round of the 1999/2000 UNHS. Ssewanyana *et al.* (2004) looked at the determinants of income inequality in Uganda using income and consumption expenditure data for 1992/93, 1997, 1999/2000 and 2002/2003. They used the Theil's measure of inequality to determine the contribution of different income sources to overall income inequality between 1997 and 1999/2000. They disaggregated the sources of income into farm and non-farm, and found that the proportion of total income from non-farm activities for rural households increased from 41 to 46 percent between the two years. They also found out that the share of non-farm income for the bottom quintile increased from 38 percent in 1997 to 52 percent in 1999/2000 compared to one for the richest 20 percent of the population with less than 1 percent increase in the share of non-farm income. These results provide the basis for analysing the determinants of rural non-farm incomes in Uganda.

Using the 1999/2000 data, the major contributions of this study are three-fold.

- i. Using a multinomial logit model to explore the factors responsible for individual's participation in non-farm activities in rural Uganda
- ii. The use of the ordinary least squares (OLS) estimation, the Tobit and censored least absolute deviation (CLAD) estimations to find the determinants of income diversification and the different income²⁸ shares within a household respectively. The inverse of the Herfindahl index is used to compute the diversification index, which is the dependent variable in the OLS estimation.

²⁷ Monitoring surveys are carried out to track changes in poverty over time or between major household surveys.

²⁸ Income data are often more susceptible to measurement error than consumption expenditure data. However, basic descriptive statistics, such as coefficient of variation provide firm reassurance on the reliability of Uganda's income data (UBOS, (2001) and Ssewanyana *et al.* (2004).

- iii. The use of the descriptive decomposition approaches to income inequality (Gini coefficient and coefficient of variation) to pinpoint the contribution of different sources of rural income to overall rural inequality. This analysis also shows how small exogenous changes in income from different sources affect overall rural inequality.

3.5 Summary

This chapter has reviewed the data collection process and the socio-economic characteristics of rural households in Uganda. The sampling frame comprised of enumeration areas (EAs) from the 1991 population census and the data are nationally representative in terms of regions and the socioeconomic questionnaire was administered to 10,696 households (57,385 individuals), of which 8,344 households (78 percent) and 45,891 individuals were rural. Clearly then, for rural areas, the average household size was higher than the national at 5.6 persons per household. However, there was a variation in rural average household size among the four different regions. The population distribution implies a higher dependence ratio in rural areas as compared to urban areas. Detailed analysis shows that in rural Uganda, individuals become household heads as early as 12 years while over 50 percent of the household heads were in the 26-49 age group. In terms of education, on average, 63 percent of the population has achieved primary education, 16 percent secondary education, and 2 percent tertiary education. The distribution of assets shows an interesting pattern with variations by region, depending on the cultural background. Land is the most important asset for rural households in Uganda since most of them depend on farming for their livelihood. However, other assets such as livestock, transport and non-agricultural assets are also important for the livelihoods of rural households. The majority of rural households (40 percent) are found in the poorest two quintiles (Q1 and Q2). The least proportion is found in the richest quintile.

This chapter forms the basis for the analysis in subsequent chapters. Further analysis is conducted using two different units of reference, namely, the household and the individual. The reason for use of a particular reference unit is explained by the theories presented in the respective chapters. The next chapter describes the contribution of different income sources to household inequality in rural Uganda.

CHAPTER FOUR

CONTRIBUTION OF INCOME SOURCES TO INEQUALITY

4.1 Introduction

This chapter discusses the theory and use of the Gini decomposition and coefficient of variation descriptive approaches to income inequality. It analyses the contribution of different income sources to income inequality in rural Uganda and determines whether an increase in income from a particular source increases or reduces income inequality. This is done at rural level and by region. The focus of analysis is the household and total income is comprised of farm income, wage income, self-employment income and non-labour income. This chapter answers two questions: how much does a particular income source contribute to overall income inequality in rural Uganda and in the four regions: Central, Eastern, Northern and Western? Second, does an income source increase or decrease income inequality among farm households in rural areas of Uganda? Answering such questions allows for a nuanced introduction to the role of different income sources in rural Uganda.

There has been a debate on the contribution of different income sources to income inequality. It is often asserted that non-farm employment reduces income inequality. Reardon *et al.* (2000) and Gordon and Craig (2001) point out that this assertion is based on three empirical assumptions: that the income created by such activities is large enough to influence the rural income distribution; second, that non-farm income is unequally distributed and lastly, that this unequally distributed income source favours the poor. They emphasise that income distribution may worsen if the better-off benefit from non-farm activities to a greater extent than the poor. Reardon *et al.* (2000) present evidence that not one of the non-farm employment sources necessarily reduces rural inequality in developing countries.

The findings by a number of studies in African countries (Ruitenbeek, 1996 in rural Cameroon; Reardon and Taylor, 1996 in Burkina Faso; Francis and Hoddinott, 1993 in Kenya; and Leibbrandt *et al.*, 2000 in rural South Africa) show that non-farm income increases inequality whereas farm income reduces inequality. This was a similar finding to Ssewanyana *et al.* (2004) in Uganda using the Theil's inequality

measure on four Uganda national household data sets. The main finding emerging from Ssewanyana *et al.* (2004) is that the share of non-farm income in total household income is increasing over time even among the poorer households. Its increasing contribution has brought along increasing inequality. They conclude that although non-farm income has a disequalizing effect on income distribution, it was not the case for all the components of non-farm income in Uganda. The increasing nature of inequality by non-farm income in a number of African countries could be because non-farm income is more unequally distributed than farm income

The above findings are contrary to the findings by Adams (1999) in rural Egypt and a number of studies in Asia. Using the Gini decomposition approach, Adams (1999) shows that non-farm income reduces income inequality whereas farm income increases income inequality in rural Egypt. These findings are similar to those in rural Pakistan (Adams and He, 1995), Vietnam (Adger, 1999 and Oostendorp *et al.* 2006), and China (Hussain *et al.*, 1994; Zhu and Luo, 2006). The reason for this difference is the very uneven distribution of land in Egypt, Pakistan, China and Vietnam compared to the relatively more equitable land distribution in many African countries (Adger, 1999). Regression statistics of the determinants of income in these Asian countries and Egypt by the same authors show that land ownership is positively and significantly related to the receipt of farm income, but has no statistical relationship to the receipt of non-farm income.

In rural Pakistan, Adams and He (1995) found out that non-farm income as a whole reduces income inequality but when non-farm income is disaggregated into five categories: self-employment, unskilled labour, government employment, private sectors and others, only unskilled labour decreases income inequality. This can be explained by the fact that the poor, defined as households in the lowest income quintile, depend heavily on unskilled labour employment in rural Pakistan (Adams and He, 1995). This shows the importance of breaking down non-farm activities into their small constituents when decomposing income inequality by source, which this chapter does in its latter sections. The study by Oostendorp *et al.* (2006) in Vietnam indicates that non-farm household enterprises increase income but reduce inequality between households. They only considered non-farm household enterprises, which are part of the non-farm sector. In a similar study in China, Zhu and Luo (2006) found out

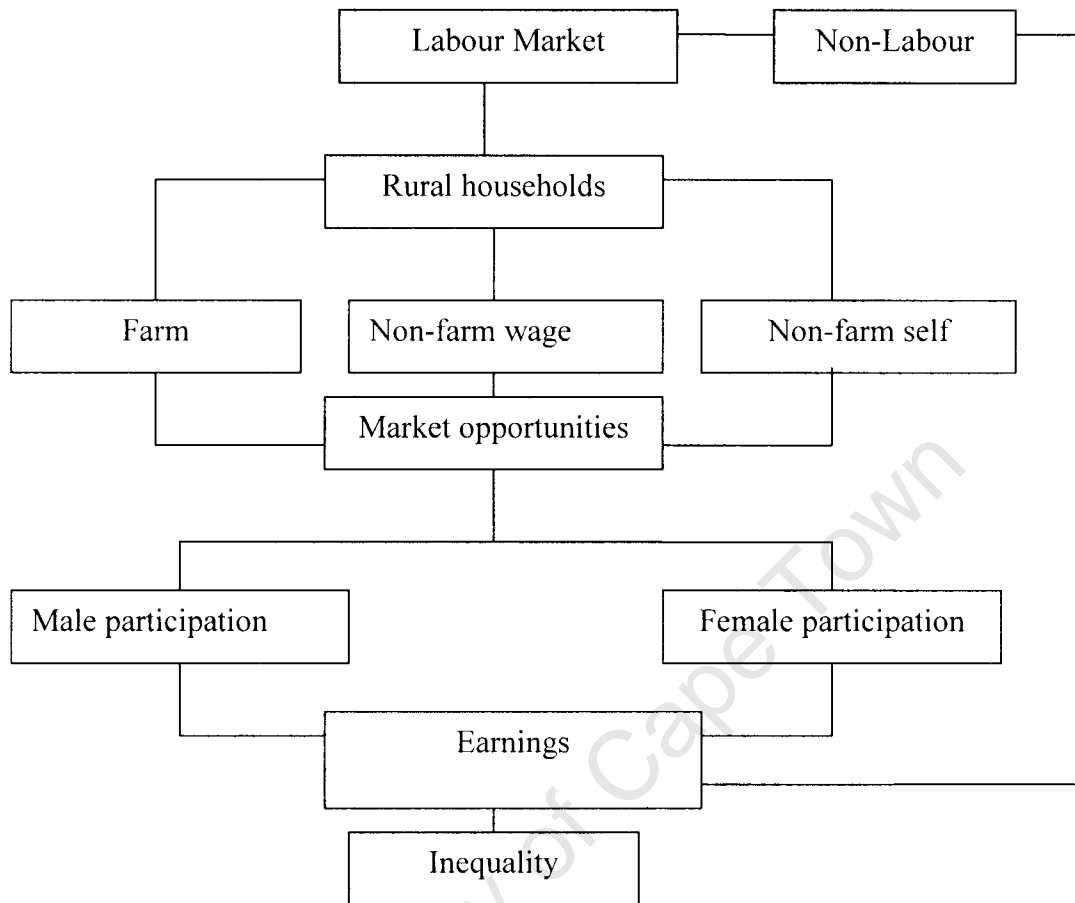
that non-farm activity plays an increasingly important role in rural household income. Their results show that non-farm activity reduces rural income inequality by raising the income of poor households to a larger extent than that of rich households. Given the importance of both farm and non-farm incomes in rural areas of developing countries, the question of under what conditions the different income sources increase or decrease income inequality, is an important issue if proper policies to reduce poverty have to be put in place (Escobal, 2001). The next section discusses the different income inequality decomposition approaches and justifies the use of the Gini coefficient and coefficient of variation in this thesis.

4.2 The Decomposition of Inequality by Income Sources

This section looks at the framework for analysing the contribution of different sources of income to inequality. Income inequality in many developing countries can be linked to events in the labour market. Changes in poverty and inequality overtime are linked to changing labour market position of household members (World Bank, 1995). The labour market presents the avenue where human labour is traded and rewarded. Sources of labour market incomes are mainly through wages and self-employment earnings. The extent to which an individual or a household participates in the labour market and the way in which the market remunerates its labour can determine both the status of the individual or household as well as the risk of inequality. This suggests that labour market outcomes play a key role in determining the socio-economic status of individuals and households and could help in tackling the seemingly intractable problem of inequality in a developing economy like Uganda (Fields, 2000).

The structure of rural labour markets in developing countries is an important factor in explaining the dichotomy that exists between the market and the extent of inequality across different groups in the countries. Figure 4.1 shows connections between labour markets and income inequality. The figure shows that labour markets present opportunities for participants to earn incomes, which will determine their welfare.

Figure 4.1 Links between Labour Market, Non-labour and Income Inequality



Source: Author's conception.

A decomposition approach is applied to find the contribution of the different income sources to inequality. It is important to note that at the start of any decomposition, there is a question of what measure of inequality should be used. Several different inequality measures have been proposed and applied in the literature (Fields, 1980; Kakwani, 1980; Fei *et al.*, 1978; Pyatt *et al.*, 1980; Shorrocks, 1982, 1983; Lerman and Yitzhaki, 1985; Adams and He, 1995; Leibbrandt *et al.*, 2000; Escobal, 2001; de Janvry and Sadoulet, 2001; and Paul, 2004). The theoretical literature on inequality cites five basic properties commonly referred to as the axiomatic approach to inequality measurement (Forster, 1985); these are: Pigou-Dalton transfer sensitivity, symmetry, mean independence, population homogeneity and decomposability.

Pigou-Dalton transfer sensitivity holds if the measure of inequality increases whenever income is transferred from a poorer person to a wealthier one. Most

measures of inequality in the literature, with the main exception of the logarithmic variance, satisfy this principle (Cowell, 1995). Symmetry (sometimes referred to as anonymity) holds if the measure of inequality remains unchanged when individuals switch places in the income order. It requires that the inequality measure be independent of any characteristic of individuals other than their income. Mean independence (sometimes referred to as income scale independence) holds if a proportionate change in all incomes leaves the measure of inequality unchanged. Population homogeneity holds if decreasing or increasing the population size across all income levels will have no effect on the measured level of inequality. This requires inequality measures to be invariant to replications of the population implying that merging two identical distributions should not alter inequality. Lastly, the property of decomposability allows inequality to be partitioned according to sources, regions or socio-economic groups. Decomposability requires overall inequality to be related consistently to constituent parts of the distribution, such as population sub-groups. In this study, our interest is on the decomposability according to income sources, regions and quintiles. An inequality measure can be regarded as source decomposable if total inequality can be broken down into a weighted sum of inequality by various income sources such as farm and non-farm. However, activities that influence a particular source of income are likely to have an effect on other activities that compose total income and therefore any inequality measure that is source decomposable must address the problem of covariance among the income sources.

There are several measures of inequality that meet the five basic properties. These measures include Theil's entropy index T , Theil's second measure L , the coefficient of variation, and the Gini coefficient²⁹. The two Theil measures have an advantage over the other measures in that they are easily additively decomposable into intuitively appealing components of within- and between-group inequality: $I_{total} = I_{within} + I_{between}$. However, the two Theil measures are not decomposable when sources of income are overlapping (Adams and He, 1995). This is because households swap ranks in the distribution of income sources compared to the distribution of total income. This study therefore uses the two remaining inequality measures; the Gini coefficient and coefficient of variation. The use of the two measures is for comparison

²⁹ For an overview of these four inequality measures, see Anand (1983: 89-91)

purposes of the results because different decomposition rules and different inequality indices give different results when the same decomposition exercise is done.

4.2.1 Gini Coefficient Approach

The decomposition of Gini coefficient by income source proposed by Fei *et al.* (1978), elaborated and extended by Pyatt *et al.* (1980), Lerman and Yitzhaki (1985) and Stark *et al.* (1986) provided the first systematic framework for an empirical analysis on how different income sources affect the level of inequality. In this decomposition, the component contributions follow naturally from the functional form of the Gini. Following this natural³⁰ decomposition methodology, Shorrocks (1982, 1983) provided natural decomposition rules for variance, square of the coefficient of variation and the Theil's two entropy measures. Since inequality measures vary in terms of their distributional weights, the decomposition rules differ from each other. By imposing certain restrictions on the decomposition procedure, Shorrocks (1982) also derived a unique decomposition rule, which is independent of the functional forms of the inequality measures. This unique decomposition rule is based on the requirement that a given income source does not contribute to aggregate inequality if every household receives equal income from that source. However, this requirement is untenable because it is well recognised that if each household receives a constant positive income from a source, then the aggregate inequality declines. On this basis, Paul (2004) looks at decomposition rules that assign a negative inequality contribution to any income component that is equally distributed and is positive. Paul (2004) extends Lerman and Yitzhaki (1985) approach that uses the Gini coefficient to other measures of inequality.

Shorrocks (1982) has shown that the results of decomposing any inequality measure depend on the decomposition procedure. In the absence of restrictions, for any inequality measure the inequality of total income can be allocated in many ways between the components of total income. Given the above and the fact that the Gini coefficient is the most widely used measure for these decompositions, it seems best to

³⁰ A natural decomposition rule is the one that follows from the functional form of an inequality measure. It is represented by a function showing the relative contribution of an income component to overall inequality with the property that the sum of these relative contributions is equal to one.

base the decomposition analysis in this study on the Gini coefficient and then check for the sensitivity of the results using another widely used measure (the coefficient of variation).

Assuming that within a given group, there are n households deriving income from K different sources (K different income components). Using notations similar to those in Stark *et al.* (1986: 725), Shorrocks (1983: 311) and Leibbrandt *et al.* (2000:6), let y_i denote total income of household i , where $i = 1, \dots, n$ and y_{ik} is the income of household i from source k , where $k = 1, \dots, K$ implying that $y_i = \sum_{k=1}^K y_{ik}$. Also, let the distribution of total household income be represented by $Y = (y_1, \dots, y_n)$ and the distribution of income component k be represented by $Y_k = (y_{1k}, \dots, y_{nk})$

Using this notation, the Gini coefficient (G) for the distribution of total income within the group can be defined as:

$$G = \frac{(2 \operatorname{cov}[Y, F(Y)])}{\mu} \quad (1)$$

where μ denotes the mean household income of the sample, $F(Y)$ is the cumulative distribution of total household income in the sample (i.e. $F(Y) = (f(y_1), \dots, f(y_n))$) where $f(y_i)$ is equal to the rank of y_i divided by the number of observations (n).

Utilizing the properties of the covariance, equation (1) can be rewritten and expanded into an expression for the Gini coefficient that captures the contribution to inequality of each of the K components of income³¹.

$$G = \frac{2 \sum_{k=1}^K \operatorname{cov}[Y_k, F(Y)]}{\mu} \quad (2)$$

Using the notation of Stark *et al.* (1986), the Gini coefficient in equation (2) can be written as:

³¹ For the derivation of this equation, see Shorrocks (1983) and Stark *et al.*, (1986: 737)

$$G = \sum_{k=1}^K R_k G_k S_k \quad (3)$$

where, S_k is the share of source k of income in total group income $\left(S_k = \frac{\mu_k}{\mu} \right)$

G_k is the Gini coefficient measuring the inequality in the distribution of income component k within the group

R_k is the Gini correlation of income from source k with total income defined

as

$$R_k = \frac{\text{cov}[Y_k, F(Y)]}{\text{cov}[Y_k, F(Y_k)]} \quad (4)$$

Equation (3) shows that the effect of source k income on overall income inequality can be disaggregated into three components:

- a) the share of income component k in total income (captured by S_k)
- b) the inequality within the sample of income from source k (as measured by G_k)
- c) the correlation between source k income and total income (as measured by R_k)³²

The larger the product of these three components, the greater the contribution of income from source k to overall income inequality. However, it should be noted that while S_k is always positive and less than one, G_k is always positive and may exceed one (if many of the source incomes are negative), and R_k can fall anywhere on the interval (-1,1). R_k is equal to zero if Y_k and Y are independent, and is equal to 1(-1) if Y_k is an increasing (decreasing) function of total income. So, if R_k is less than zero (greater than zero), income from source k is negatively (positively) correlated with total income and thus lowers (raises) the overall Gini measure for the sample.

Using this decomposition, it is possible to identify how much of overall income inequality is due to a particular income source. Assuming that additional increment of

³² Leibbrandt *et al.* (2000:7) indicate that R_k is a form of rank correlation coefficient because it measures the extent to which the relationship between Y_k and the rank distribution of total income coincides with the relationship between Y_k and its own rank correlation.

an income source is distributed in the same manner as the original units, it is possible to use this decomposition to determine whether an income source is inequality-increasing or inequality-decreasing based on whether or not an enlargement in the share of income source leads to an increase or decrease in overall inequality. From equation (3), the decomposition corresponding to the Gini coefficient can then be expressed by defining the following terms (Pyatt, *et al.*, 1980; Adams and He, 1995):

$$\sum w_k g_k = 1; \quad w_k = \frac{\mu_k}{\mu}; \quad g_k = R_k \frac{G_k}{G} \quad (5)$$

where g_k is the relative concentration coefficient of income source k in overall inequality.

Using the above decomposition formulation, it is possible to measure how much an increase in any particular increase in income source will increase or decrease overall income inequality. Taking household labour and production decisions as given, suppose there is an exogenous increase in income from source k , by some factor α_k so that $y_k(\alpha_k) = (1 + \alpha_k)y_k$. Then following Stark *et al.* (1986:726) and Adams (1999: 14);

$$\frac{\partial G}{\partial \alpha_k} = S_k (R_k G_k - G) \quad (6)$$

where G is the overall Gini coefficient, and S_k , R_k and G_k denote the income share from source k , Gini correlation and Gini coefficient of income source k respectively. Dividing by G gives:

$$\frac{\partial G / \partial \alpha_k}{G} = \frac{S_k G_k R_k}{G} - S_k \quad (7)$$

Equation (7) states that the relative effect of a marginal percentage change in income source k upon overall inequality equals the relative contribution of source k to overall inequality minus the relative contribution to total income. From equation (7), it

follows that a marginal increase in source k will reduce overall income inequality when;

- a) the Gini correlation between source k income and total income (R_k) is negative or zero; or when
- b) income from source k is positively correlated with total income ($R_k > 0$) and $R_k G_k < G$

By contrast, in order for a marginal increase in source k to increase overall income inequality, it is necessary for $G_k > G$ (that is, the Gini coefficient of income source k is higher than the Gini coefficient for overall income). However, this condition is not sufficient for an increase in source k to raise overall income inequality, because the sign of $\frac{\partial G}{\partial \alpha_k}$ will still be influenced by the strength of the Gini correlation between source k income and total income (R_k).

4.2.2 Coefficient of Variation Approach

The source decomposition based on the coefficient of variation can be developed following Shorrocks (1982) and Pyatt *et al.* (1980). Adams and He (1995) and de Janvry and Sadoulet (2001) used the same approach to decompose inequality in rural Pakistan and Mexico respectively. The percentage decomposition of total income inequality by coefficient of variation approach is as in equation (8).

$$\sum_i w_k c_k = 1; \quad w_k = \frac{\mu_k}{\mu}; \quad c_k = \rho_k \frac{CV_k}{CV} \quad (8)$$

Where $w_k c_k$ is the factor inequality weight of the k^{th} source in overall inequality; μ_k and μ are the mean income from k^{th} source and from all sources, respectively; c_k is the relative concentration coefficient of the k^{th} source in overall inequality; $\rho_k = corr(y_k, y)$ is the correlation coefficient between income y_k from source k and total income y ; CV_k and CV are the coefficient of variation of income from source k and total income respectively. Sources of income with a relative concentration coefficient, c_k , larger than one increase total inequality. On the other hand, sources of income with a relative concentration coefficient smaller than one help reduce total

inequality. From the decomposition equations (5) and (8), it follows that income source k is inequality-increasing or inequality-decreasing according to whether g_k (or c_k) is greater or less than unity.

4.3 Contribution of Income Sources to Inequality in Rural Uganda: Descriptive Results

The theoretical underpinning of the Gini decomposition used in this analysis is based on the works of Lerman and Yitzhaki (1985) and Stark *et al.* (1986). The coefficient of variation decomposition is based on Pyatt, *et al.* (1980). The share of overall inequality contributed by each income source is estimated³³. Table 4.1 presents the results of the Gini decomposition. The results by the coefficient of variation (CV) approach give the same conclusions as the Gini index (see Appendix 4). Results using both methods (Gini decomposition and CV)³⁴ show that farming has by far the largest weight in total income (57 percent), more than the combined weight of the other sources. This is not surprising considering the nature and structure of Uganda's rural economy, which is heavily dependent on agriculture. The decomposition results for relative factor inequality weights of source incomes in overall income inequality consistently indicate that, for both decompositions, farm income makes the largest contribution to overall inequality. Farm income accounts for 54.4 percent of overall inequality. Non-labour sources of income make the smallest contribution to overall inequality (10.4 percent) while self-employment and wage employment income account for 19.6 percent and 15.6 percent, respectively.

The results in Table 4.1 show that among the households that receive income from the different sources, farming is the most remunerative with average annual income of Uganda shillings 719,045; followed by self-employment, non-labour and wage employment with average annual incomes of Uganda shillings 203,573; 185,742 and 173,009 respectively. Looking at the percentage of households with income from a particular source, farming still dominates with 92 percent, followed by non-labour (73 percent), self-employment (22 percent) and wage employment (28 percent). This is

³³ STATA 9 was used to generate the results in this chapter. Appendix 6E presents the *Do*-file used.

consistent with the findings of *de Janvry and Sadoulet (2001)* in Mexico, *Adams and He (1995)* in Pakistan and *Adams (1999)* in rural Egypt.

The relative concentration coefficients show that wage employment and self-employment sources are positively associated with income inequality. By contrast, farm employment and non-labour income are negatively associated with income inequality. There is need to carefully interpret these results. These findings may appear surprising in a country like Uganda where more than 80 percent of rural people depend on agriculture and the highest returns are in non-farm employment. The reason for the current finding (positive association between non-farm income and inequality) could be that the sources of this income (good jobs and remunerative self-employment) are available only to a small fraction of the population such that additional increments in non-farm income could be falling in the hands of those already participating. The findings indicate that all things being equal, additional increments of wage employment income and self-employment income will increase overall income inequality in rural Uganda if additional increments in fall to those already participating in non-farm activities. The results might be different if the increase in wage and self-employment goes to new participants in these activities. It is important to note that the finding about the correlation between non-farm activities and income inequality does not mean causation.

As noted by *Adams and He (1995)*, there is no general agreement on the impact of rural non-farm income on income distribution. On one hand, a study by *Adams and He (1995)* in Pakistan and *Chinn (1979)* in Taiwan indicate that non-farm income reduces rural income inequality. Both studies emphasise that non-farm income benefits the poor in Pakistan and Taiwan because the share of non-farm income varies inversely with farm size. *Adams and He* show that in places where land is far unevenly distributed than income, such as rural Pakistan, non-farm income has a favourable impact on income distribution. On the other hand, some studies have produced quite different results. For example, *Reardon, Delgado and Matlon (1992)* in Burkina Faso; *Collier, Radwan and Wangwe (1986)* in Tanzania and *Matlon (1979)* in Nigeria all find that non-farm income has a negative effect on rural income distribution. Part of this inconsistency is perhaps due to differences in study sites (*Adams and He, 1995*). *Adams and He* explain that in land-scarce labour-rich settings

such as Taiwan, Pakistan and much of Asia, small and inadequate landholdings may tend to push poorer households out of agriculture into the non-farm sector. Thus, in these settings non-farm income may be expected to have a favourable effect on equity. The obverse could hold in land-rich settings, such as many countries in Africa including Uganda, where abundant land may tend to keep most people in agriculture and to pull only richer households into the non-farm sector. This can explain the positive correlation between wage and self-employment income and income inequality in rural Uganda where there is a lot of customary land and the poor tend to concentrate on farming with the rich more involved in wage and self-employment activities.

The results of the source Gini decomposition show that non-farm self-employment income has the highest source Gini (0.893) and is the most unequally distributed income source. This is largely because self-employment is strongly correlated with access to non-agricultural assets, credit, electricity, wealth and education, which are distributed quite unevenly in the rural areas of Uganda. Table 4.1 also shows that farm income has the lowest Gini coefficient (0.544) implying that the mean and standard deviation are roughly equal. This is confirmed by the results of the coefficient of variation (CV) in Appendix 4. The correlation ratios between source income and total income indicate that farm income has a high degree of correlation with total income while wage employment income has the lowest. The CV results show that self-employment income has the largest coefficient of variation by income source (4.319), followed by wage employment (3.483), non-labour (2.48) and the least is farming (1.362).

Table 4.1 Gini Decomposition of Income Inequality by Source (Rural)

	Source	Farm	Wage	Self	Non-labour	Total
Share of source in total income	Sk	0.573	0.135	0.150	0.142	
Gini coefficient for income source	Gk	0.544	0.887	0.893	0.628	0.482
Gini correlation of income source with total income rankings	Rk	0.841	0.629	0.707	0.561	
	SkGkRk	0.262	0.075	0.095	0.050	0.482
Share of income source in total inequality		0.544	0.156	0.196	0.104	1
Percentage change		-0.030	0.021	0.046	-0.038	
Relative concentration coefficient	$g=Rk*Gk/G$	0.949	1.157	1.309	0.732	
Bootstrap standard errors		0.006	0.004	0.005	0.004	0.007
Households with income from the source		7,057	2,172	2,279	6,086	7,691
Mean income from the source among households with income from that source (Ushs)		719,045	173,009	203,573	185,742	1,281,369

Source: Author's own Computations using the 1999/2000 UNHS

The contribution of different income sources is analysed at regional level. Tables 4.2, 4.3, 4.4 and 4.5 give the results for Central, Eastern, Northern and Western regions respectively. The Gini coefficient for central region is 0.478, which is lower than the number for all rural areas in Uganda. Farm income contributes highest to income inequality (55 percent) followed by self-employment (23.7 percent). It is important to note that self-employment income has the highest Gini coefficient followed by wage employment income.

The results show that farm employment income, wage employment income and non-labour income sources are inequality decreasing in the Central region (Table 4.2). This implies that any additional self-employment income increases regional inequality while farm income, wage income and non-labour reduce it. This can be explained by

the large number of self-employment enterprises that supply Kampala City with various services such as welding, brick-making and sand mining. However, the mean income for farming is the highest of all the four sources.

Table 4.2 Gini Decomposition of Income Inequality by Source (Central region)

Central region	Source	Farm	Wage	Self	Non-labour	Total income
Share of source in total income	Sk	0.577	0.118	0.172	0.133	
Gini coefficient for income source	Gk	0.543	0.879	0.888	0.610	0.479
Gini correlation of income source with total income rankings	Rk	0.841	0.533	0.745	0.574	
Contribution of income source to overall income inequality	SkGkRk	0.263	0.055	0.114	0.047	0.479
Share of income source in total inequality		0.550	0.116	0.237	0.098	1.000
Percentage change		-0.027	-0.003	0.065	-0.036	
Relative concentration coefficient	$g=Rk*Gk/G$	0.953	0.977	1.380	0.731	
Bootstrap standard errors		0.013	0.009	0.012	0.007	0.010
Households with income from the source		1812	595	663	1712	2056
Mean income from the source among households with income from that source (Ushs)		898,355	201,184	296,851	219,492	1,615,881

Source: Author's own computations using the 1999/2000 UNHS

In the Eastern region, farm income contributes highest to total inequality (46.8 percent) followed by wage income (21.3 percent) (see Table 4.3). Farm income has the highest mean income of 555,216 Uganda shillings. Like the overall rural income inequality, wage income and self-employment income are inequality increasing while farm income and non-labour income are inequality decreasing. The Gini coefficient

for Eastern region is 0.5 and it is higher than the Gini coefficient for all rural areas. Wage income has the highest source Gini coefficient (0.891) and farm income has the least (0.58). This implies that the highest inequality in the Eastern region is from wage employment income.

Table 4.3 Gini Decomposition of Income Inequality by Source (Eastern region)

Eastern region	Source	Farm	Wage	Self	Non-labour	Total income
Share of source in total income	Sk	0.490	0.169	0.165	0.177	
Gini coefficient for income source	Gk	0.580	0.891	0.861	0.608	0.500
Gini correlation of income source with total income rankings	Rk	0.823	0.707	0.684	0.581	
Contribution of income source to overall income inequality	SkGkRk	0.234	0.107	0.097	0.062	
Share of income source in total inequality		0.468	0.213	0.194	0.125	1.000
Percentage change		-0.022	0.044	0.029	-0.052	
Relative concentration coefficient	$G=Rk*Gk/G$	0.954	1.261	1.178	0.707	
Bootstrap standard errors		0.009	0.009	0.008	0.008	0.011
Households with income from the source		1926	623	698	1768	2084
Mean income from the source among households with income from that source (UShs)		555,216	187,625	190,480	206,225	1,139,546

Source: Author's own computations using the 1999/2000 UNHS

The Northern region has a Gini coefficient of 0.476 (see Table 4.4). In this region, farm income contributes highest to inequality (44.7 percent) followed by wage income which contributes 21.1 percent. Wage income has the highest Gini coefficient (0.902) in Northern Uganda followed by self-employment (0.87). In the Northern

region, wage employment and self-employment income increase income inequality whereas farm income and non-labour income reduce income inequality.

Table 4.4 Gini Decomposition of Income Inequality by Source (Northern region)

Northern region	Source	Farm	Wage	Self	Non-labour	Total income
Share of source in total income	Sk	0.535	0.154	0.160	0.152	
Gini coefficient for income source	Gk	0.510	0.902	0.870	0.711	0.476
Gini correlation of income source with total income rankings	Rk	0.779	0.724	0.693	0.617	
Contribution of income source to overall income inequality	SkGkRk	0.212	0.100	0.096	0.067	
Share of income source in total inequality		0.447	0.211	0.203	0.140	1
Percentage change		-0.088	0.057	0.043	-0.012	
Relative concentration coefficient	$g=Rk*Gk/G$	0.835	1.371	1.266	0.922	
Bootstrap standard errors		0.018	0.015	0.015	0.016	0.014
Households with income from the source		1093	294	392	832	1183
Mean income from the source among households with income from that source (UShs)		427,757	121,069	138,526	121,350	808,702

Source: Author's own computations using the 1999/2000 UNHS

The Western region has the lowest Gini coefficient in Uganda (0.43) compared to other regions. Self-employment has the highest source Gini (0.919) in western region implying that the highest inequality is from self-employment income (see Table 4.5). Wage employment and self-employment increase inequality while farm employment and non-labour income reduce inequality in Western Uganda.

Table 4.5 Gini Decomposition of Income Inequality by Source (Western region)

Western region	Source	Farm	Wage	Self	Non-labour	Total income
Share of source in total income	Sk	0.643	0.122	0.114	0.122	
Gini coefficient for income source	Gk	0.470	0.880	0.919	0.608	0.430
Gini correlation of income source with total income rankings	Rk	0.855	0.597	0.698	0.473	
Contribution of income source to overall income inequality	SkGkRk	0.258	0.064	0.073	0.035	
Share of income source in total inequality		0.600	0.148	0.170	0.081	1.000
Percentage change		-0.042	0.027	0.056	-0.040	
Relative concentration coefficient	$G=Rk*Gk/G$	0.934	1.220	1.492	0.669	
Bootstrap standard errors		0.012	0.009	0.011	0.007	0.009
Households with income from the source		2226	660	526	1774	2368
Mean income from the source among households with income from that source		895,420	162,871	169,079	171,844	1,399,214

Source: Author's own computations using the 1999/2000 UNHS

4.4 Conclusion

The findings in this chapter show that both farm and non-labour income sources reduce income inequality in rural Uganda. This means that with all other factors constant, additional increments of farm income or non-labour income will reduce overall income inequality. In contrast, self-employment income and wage employment income make the largest contribution to overall income inequality and therefore increase income inequality. Therefore, from a policy perspective, strategies aimed at increasing incomes of the rural households in Uganda should consider that income generated from wage employment and non-farm self-employment is more

unequally distributed in favour of the richer households. This could explain the worsening income distribution reported in rural Uganda over time in spite of increasing income levels.

From the regional analysis of inequality, the Eastern region has the highest inequality and the Western has the lowest inequality. With the exception of the Central region, where self-employment income increases inequality, wage income and self-employment income increase inequality in the other three regions. Self-employment income has the highest source Gini in the Western and Central regions while wage income has the highest Gini coefficient in the Eastern and Northern regions.

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CHAPTER FIVE

HOUSEHOLD MODELS AND ALLOCATION OF LABOUR IN RURAL UGANDA

5.1 Introduction

This chapter reviews the evolution, relevance and application of household models to rural labour allocation. It summarises the empirical findings from other studies regarding determinants of participation in rural activities and presents the empirical findings. Household models are at the core of microeconomic research on rural economies in developing countries. Although originally seen as a tool for price policy analysis, household modelling techniques have been used in a number of studies including labour supply, technology adoption, migration, income distribution, biodiversity and deforestation. These are elaborated in the later sections of this chapter.

As a starting point, neo-classical economists assume perfect (complete) markets. This assumption allows households to optimise with respect to production and consumption. A fundamental attribute of the perfect markets model is that it is “separable”. The terms “separable” and “recursive” then “non-separable” and “non-recursive” will respectively be used interchangeably in this thesis. A separable model is associated with perfect market situations whereas a non-separable model applies when some markets are missing (imperfect or incomplete markets). Separability or recursiveness means that production decisions are independent of consumption decisions. Production decisions are assumed to influence consumption decisions only through the budget constraint, meaning that the household first maximises full income from production and then, taking full income as given, chooses its consumption bundle. For the separable model to hold, the markets for all products and factors, including labour must be perfect (Singh *et al.*, 1986; Sadoulet *et al.*, 1998) and all prices are determined exogenously in the food markets. Under separability, farm production is no longer influenced by the household’s labour, given that workers can now be hired from a local labour market to produce food. When a separable situation is assumed, there is no need to derive unobserved “shadow wages or prices” because

the market wages and prices represent the opportunity cost of labour and food in both production and consumption activities.

When one or more markets are missing, an imperfect (incomplete) market situation exists because prices do not carry sufficient information for a household to make production and consumption decisions separately. Rather, production and consumption decisions have to be simultaneously determined. It is this simultaneity in production and consumption decisions that implies that the model is non-separable. Put another way, household production and consumption decisions are non-separable whenever the household shadow wage of labour or shadow price of at least one production-consumption good is not given exogenously by the market but instead is determined endogenously by the interaction between household demand and supply.

A shadow wage is the opportunity cost of labour for farm households whose members do not work for wages. A shadow wage is determined within the household rather than by market forces and is a function of household preferences, technology and all other inputs (Strauss, 1986). If there are differences between market wages for farm labour and the cost of labour within the household (shadow wage), then the labour market is said to be non-separable (Lofgren and Robinson, 1999). The shadow wage and its derivation are discussed in the later sections of this chapter.

Non-separability may arise under a wide range of circumstances (Shapiro, 1990; Jacoby, 1993; Skoufias, 1994; Udry, 1996; Fafchamps, 1993; Mekonnen, 1998). It may be present whenever the market for at least one production or consumption good is “imperfect”, that is when the household in at least one market: (a) is not a price-taker; (b) views the good sold in or purchased from the market as an imperfect substitute to the good that is produced and used on the farm; and or (c) faces gaps between purchase and sales prices (due to transaction costs). Such transaction costs include distance to the market, high transport costs and excessive marketing margins for traders with monopoly power. In some cases of market imperfections, non-separability follows invariably. Typical examples include a situation in which the market price of a good is endogenous whenever trade takes place (a type (a) imperfection) or if the household labour on the farm and non-farm activities are distinct arguments in the household utility function (a type (b) imperfection).

Similarly, non-separability follows when no household labour works in non-farm activities (in spite of the option of doing so). The setting where family and hired labour are separate arguments in the household production function also leads to non-separability. This is the case in Uganda where there are differences in hired and family labour by gender (UBOS, 2001). Other sources of non-separability include situations of thin markets where there are not a lot of buyers and sellers and where there is risk and risk aversion. The situation of imperfect markets in Uganda requires the use of a non-separable model.

5.2 Evolution of Farm Household Models

Farm household models were first introduced, among other things, to explain the behaviour of farm households in the rural sectors of both developing and developed countries. The search for an explanation led to a model in which production and consumption decisions are linked because the deciding entity is both the producer who chooses the allocation of labour and other inputs to crop production and other work activities, and the consumer who chooses the allocation of income from farm profits and labour sales to the consumption of commodities and services. In this case, farm profits included profits from goods produced and consumed by the same household, and consumption included both purchased and self produced goods. In theory, if the farm household faces fixed and identical buying and selling prices for all production-consumption goods, it does not matter that the farm household is both a producer and consumer. As long as perfect markets for all goods including labour exist, the household is indifferent between consuming own-produced and market-purchased goods. By consuming all or part of its own output, which would alternatively be sold at a given market price, the household implicitly purchases goods from itself. By demanding leisure or allocating its labour to household production activities, it implicitly hires labour valued at the market wage from itself (Taylor and Adelman, 2003).

The classic model of the peasant household was first formulated by Chayanov in 1925. The Chayanov peasant model uses the theory of utility maximisation. It focuses mainly on the subjective decision made by the household with respect to the amount

of family labour to commit to farm production in order to satisfy its consumption needs. This subjective decision is seen as involving a trade-off between the irksomeness or drudgery of farm work (disutility of work) and the income required to meet the consumption of the household (utility of income). What this means is that the household has two opposing objectives: an income objective which requires work on the farm and a work-avoidance objective which conflicts with income generation. Because of this, the Chayanov peasant household model is sometimes referred to as the "drudgery averse" peasant model (Ellis, 1993). The main factor influencing this Chayanov trade-off is the size of the peasant household, and its composition between working and non-working members (demographic structure of the household). Chayanov makes four key assumptions: First, he assumes no market for labour, implying no hiring in or hiring out labour by the household, nor wage work by family members outside the household. Second, farm output may be retained for home consumption or sold in the market, and is valued at the market price. Third, all peasant households have flexible access to land for cultivation and lastly, each peasant community has a social norm for the minimum acceptable level of consumption. The uniqueness of household decision making in the Chayanov model is solely attributable to the lack of a labour market, and disappears once a labour market is introduced (Ellis, 1993).

The existence or non-existence of labour market is evidently crucial to how a farm household model works and the kind of predictions it provides. It can be shown (Barnum and Squire, 1979:26-36) that no matter how complete the specification of the various consumption and production alternatives confronting the farm household, in the absence of a labour market, the response of output and labour use to external changes in prices and costs is either indeterminate or negative (as in the Chayanov model). On the contrary, when a labour market is introduced, production decisions become independent of consumption decisions, and the response of the household to a change, say in the price of output becomes predictable and positive. Therefore, a higher output price increases production and labour use when a labour market exists. The Chayanov model cannot be applied to this study given that it does not take into consideration the presence of labour markets and yet labour markets exist in rural Uganda.

The new home economics theory, which originated from the works of Becker (1965) emphasizes the productive role of households and relaxes Chayanov's (1925) assumption of no market for labour in rural areas. Becker presented a theory of the allocation of labour (or time) between different activities with the basic assumption that rural households are producers as well as consumers. It is important to note that time and labour can be used simultaneously as a measurement unit for the amount of labour an individual spends in different activities. According to Becker, market goods and services can only generate utility if they are combined with consumer's own or hired labour, implying that production and consumption are simultaneously determined. For example, having money for food does not generate utility. One needs to use own or hired labour to buy, prepare and consume the food. Only this combination of food and the consumer's own or hired labour generates utility. The theory treats the household as a production unit, in which own labour of household members or hired labour is combined with purchased goods or services to produce items of final consumption. The model assumes the existence of a labour market so that households are able to hire in and hire out labour at a given wage rate. All units of labour, whether in household work, non-farm work, or leisure are valued at their opportunity cost in terms of market wage. The household maximises utility subject to its production function, a total time constraint and a money income constraint. Becker's theory provides the logical structure on which many farm household models in both developed and developing countries are based. It also forms the basis of the analytical approach used in subsequent chapters of this study.

In developing countries, Becker's theory has been applied to the analysis of farm-household behaviour by Barnum and Squire (1979) and Low (1986). Barnum and Squire (1979) developed and applied a model of a farm household which has its roots partly in Becker's model and in a paper by Hymer and Resnick (1969). A lucid description of the model is provided in Singh, Squire and Strauss (1986: chapter 1). The Barnum-Squire model provides a framework for generating predictions about the responses of the farm household to changes in domestic variables such as family size and structure, and market variables such as output prices, input prices, wage rates and technology. The model demonstrates that the constrained maximisation of household welfare subject to the production function and the budget constraint also means profit maximisation for the farm. The profit maximisation level of production may imply

either positive or negative amounts of labour being supplied to the labour market. Negative supply means that the household hires labour. The Barnum-Squire model assumes fully working factor and product market, and describes a semi-commercial family farm enterprise rather than a peasant farm household. The dependence of this model on the assumption of a semi-commercial family farm with a competitive labour market can be seen as a weakness in this model in terms of the applicability of its results (Ellis, 1993). These assumptions are certainly not true of rural Uganda and many parts of rural sub Saharan Africa where production is mainly for subsistence. In addition, the Barnum-Squire model cannot be applied where markets are non-existent, incomplete or highly imperfect. Another shortcoming of the Barnum-squire model is its assumption that land available to the farm household is fixed and that this results in declining returns as more labour is applied on the family farm. This implies that factor endowments matter so that those with little land in relation to the number of workers in the household will be net suppliers to the labour market. In Uganda, land is not fixed as the land tenure system allows it to vary with say household size. There is also evidence of expansion of land by clearing forest for agricultural land (NEMA, 2002). The main difference between Becker's work and that of Barnum-Squire is that the latter deals with a farm (a production unit in the conventional sense) as well as a household. This means the production function refers to farm output which can be traded and not just home production for direct use.

Becker's model has also been applied by Low (1986) in Malawi. Low shows that the household economics approach is relevant to the analysis of indigenous farm-household behaviour in southern Africa and by extension to the rest of sub Saharan Africa. According to Low (1986), labour force participation in indigenous farm households in Africa may be explained in terms of a comparative advantage analysis which is based on the household economics approach. Low is concerned with the existence of a labour market in which wage rates vary for different categories of labour, and especially between men and women. This implies that different household members have different potential for earning wage income. In other words, some members have a greater comparative advantage in wage work than others. This differs from the single market wage rate assumed in the Barnum-Squire model. Low's model permits flexible access to land for farm households according to their family size. This differs from the fixed land assumption of the Barnum-Squire model. Low's

model demonstrates the flexibility of the farm household theory to adapt to alternative assumptions, and to yield predictions pertinent to the varying circumstances which farm households may confront. Even though Low's assumptions differ in almost every respect from those used in the Barnum-Squire model, the same basic idea of optimum labour allocation in the context of a household production function is common to both models and is a tool of microeconomic analysis.

Given Becker's (1965) and Low's (1986) models, each hour devoted to a home production activity by each family member competes with alternative activities such as work in the labour market (non-farm activities) and leisure. Members of households either choose to work on their own farms or non-farm self-employment or for a wage according to their valuations of the opportunity costs of their own labour. Household consumption is viewed as a process that involves spending the money and time of household members. For instance, household members' time may be spent in market production, for example wage employment, or in the non-market production of consumption goods within the household. The non-market production processes may involve the use of varying proportions of purchased inputs and labour (Low 1986).

The new home economics theory developed by Becker (1965) has several similarities with the equilibrium theory of peasant economies put forward by Chayanov (1925). As summarized by Low (1986), both Chayanov and Becker view the household as a single production/consumption unit engaged in non-market as well as market activities. They both stress the paramount importance of family labour effort, but Becker goes further and recognizes that different household members have different relative time values in market and non-market activities. They also recognize the influence of household structure on production and consumption. While Chayanov concentrates on how the structure of a household affects its capacity to supply a household's consumption requirements, Becker emphasizes changes in the value overtime of household members' time and the effect that this has on the pattern of demand for time-intensive versus goods-intensive commodities.

The farm-household model developed by Okwi (2005) using the foundations of Becker (1965) and Low (1986), brings out the importance of a non-separable model in

the analysis of farm-household behaviour in rural Uganda. Okwi's non-separable model is static and is applicable to the Ugandan situation where there are missing markets for fuel wood and labour. This model adopts a quantitative approach to the analysis of farm behaviour and includes a number of variables such as seasonality, gender, and household composition. Rural Uganda is characterized by subsistence production with some households producing little or no surplus for the market. If a household lacks markets for labour, it is forced to be self-sufficient in labour, and production and consumption decisions are guided by a subjective valuation of labour or "shadow wages". This creates a need for the use of shadow wages and therefore a non-separable model in the farm household behaviour analysis in rural Uganda.

The farm-household is an important decision-making unit in many settings and the main form of economic organization in rural Uganda. A distinguishing feature of these farm-households is that they are both producers and consumers of a set of 'production-consumption' goods; that is, goods that are both supplied and demanded by the household. In Uganda, family labour and food products are common examples of such goods. Household production is the production of goods and services by the members of a household, for their own consumption and for the markets, using their own capital and their own unpaid labour (Jacoby, 1993). It should be noted that agricultural production in Uganda comes primarily from family farms, with the family providing most of the labour. Production at home is characterized by a division of labour based on gender. This is also the case in many other developing countries (Kimhi and Rapaport, 2004 and Jacoby, 1992).

Farm household models have advantages over standard consumer models. However, household models have a limitation in that they ignore intra-household decision making. Only collective bargaining household model considers intra-household decisions (Udry, 1995; Banks and Duggan, 1999). There are reasons to expect intra-household issues to be important in the production and consumption decisions of rural households. For example, there may be cultural norms that prescribe a certain division of labour. Byerlee *et al.* (1977) document the fairly rigid division of family labour in Sierra Leone where children undertake bird scaring, women the cultivation of traditional crops (upland rice and groundnuts) and men export crops. Some economic models attempt to explain this division of labour in respect of the endowments of

different household members whereas others take certain constraints as given. For example, Low's (1986) model considers varying wage rates for different categories of labour, in particular between men and women. Thus, although the productivity of household members in farm subsistence production is assumed to be identical, they have different wage income earnings potential. Low's model also assumes that farm households have flexible access to land according to family size, and that farm households are semi-subsistence with farm-gate food prices differing from the retail price of food purchases. Households which are in food deficit (do not produce sufficient amounts to meet their production requirements) hire out family labour to earn the additional income they need. The model shows that, for food deficit households, the amount of labour committed to subsistence food production depends on the ratio of wages to the retail price of purchased food rather than farm-gate price of output. Household members whose real opportunity cost of time is lower than the marginal product of labour in subsistence agriculture engage in farm work (the slope of the real wage line is less than the slope of the production function). Hence, assuming it is men who can obtain the higher wage, it is they who are likely to engage in the labour market.

The gender division of labour by tasks is breaking down and farming women are increasingly undertaking tasks previously done by men (Saito *et al.*, 1994). In Kenya, for example, a higher proportion of women than men are engaged in most phases of food production cycle as well as cash crops and livestock, in addition to their work of preparing food, caring for the children, collecting water and fuel-wood and in varied income generating activities (Saito *et al.*, 1994). Male labour has been drawn more into non-farm activities in both rural and urban areas. So, when men work away from home, women may have to take additional responsibilities on family farms. This therefore reduces men's labour input on the family farm, leaving wives to take on greater farm responsibilities. However, if a household derives a significant part of family income from non-farm activities, such as wage labour or remittances, there may be less need for that household to farm its own land and hence less need for women to be involved in agricultural activities on their own farms.

In many communities in Eastern Uganda, for example, men and women traditionally farmed separate fields (gender specific) and performed separate as well as joint tasks

(gender sequential) (Okwi, 2005). For example, women could plant vegetables and carry out all activities from sowing to harvesting and marketing. In the gender sequential system, women and men would work on the same land but there was a seasonal or task specific division of labour in which, for example, men were responsible for clearing and ploughing land, helping women plant and harvest and building food stores like granaries while women were responsible for preparing the soil, planting and weeding, harvesting and transporting the produce home from the gardens (Ellis, 1993). Women also kept poultry and collected wild plants such as mushrooms, nuts and fruits whereas men contributed through hunting, fishing and herding livestock. The men marketed any surplus from the agricultural output. In this case, the contribution of women was more likely to go unrewarded. However, today, political, demographic as well as social changes have significantly affected this pattern. With migration and improved educational systems, women contribute more to agricultural production than men (Low, 1986).

These changes in intra-household arrangements have exerted a profound impact on the role of women in agriculture. Specifically, women now constitute the majority of smallholder farmers, provide most of the labour, and manage many farms on a daily basis. Not only do women outnumber men in the agricultural labour force, but they also work more hours in agriculture than men. This phenomenon is common in most sub-Saharan countries (Saito *et al.*, 1992). EPRC (2004) report on the status of women in Eastern Africa places rural women, appropriately, at the “centre of agriculture.”

Another issue related to intra-household decision making is the link between women's income and the household (Sahn, 1994). In this case, a woman's labour participation will be determined by household circumstances to a greater extent than is the case for males. Glick (1999) documents how the number of children affects the split of women's time between home and market work in urban Guinea, and Mueller and Lanot (1997) do the same for Yaoundé (Cameroon), though neither presents comparable results for men. Bigsten and Horton (1999) cite several studies (Shapiro, 1990 and Neitzert, 1994) which have found out that women are involved in more labour force than men once household work is included.

Despite the weaknesses of household models, they are useful in that they highlight the role of incentives. It is the balance between these incentives and the constraints confronting rural households that are seen to drive the deployment of labour between home production, own agricultural production, self-employment on non-farm activities, wage work on other farms, wage work on local non-farm activities or even migration to work somewhere else. These models move away from the big picture of sectoral analysis and focus on rural opportunities and constraints experienced by the rural households themselves. The analytical approach used in subsequent chapters of this study is based on the theory of the new household economics by Becker (1965), Low (1986) and the modifications by Okwi (2005).

5.3 Application and Relevance of Farm Household Models

This section reviews studies that have used household models. It is meant to provide evidence and a justification for the use of a non-separable farm household model in rural Uganda.

There is a rich literature that focuses on the use of household models in both developing and developed countries. In Israel, Kimhi and Rapaport (2004) used a household model of time allocation in farm households and found that the demographic composition of the household affected labour supply, namely, the existence of adult children and siblings of the farm couple tends to decrease farm labour supply and increase non-farm labour supply. Strauss (1984) used a farm household model to investigate the determinants of food consumption and calorie intake by rural households in Sierra Leone. He found that the effects of price policies on calorie intake are evident for low-income, semi-subsistence farmers.

Low (1982) applied household models to study peasant households in Southern Africa (Swaziland) where non-farm employment opportunities allow decisions on the allocation of household time given the opportunity cost of time, and in the presence of a life-cycle treatment of the household itself. Low uses this general framework to show that household members with low wage employment prospects will often be used to produce subsistence food crops in preference to non-food cash crops. As a result, they can produce more food than could be purchased with the proceeds of the

cash crops they might otherwise grow. Nieuwoudt and Vink (1989) applied a similar analytical approach to study intra-household effects of increased real income from agriculture in Southern Africa. Their study shows that increased real income may affect household decisions in various ways such as through the income effect, the liquidity effect or the opportunity cost of leisure. Other applications of farm household models include Rosenzweig (1988), Jacoby (1993), Abdulai and Delgado (1999), Singh and Janakiram (1986) and Huffman (1980, 1991).

Empirical application has provided a weight of evidence in support of household models that are non-separable. Inspired by the work of Lopez (1984) using a Canadian data set, separability is rejected as a result of imperfect substitutability between farm and non-farm work. Benjamin (1992) found that, for Java, demographic variables influence the production decision, a link that is incompatible with a separable model. Jacoby (1993) and Skoufias (1994) have rejected the hypothesis that the household shadow wage equals the market wage for Indian and Peruvian households, respectively, an outcome that requires a non-separable model. According to the study carried out by Taylor (1992), the average estimated remittances from migrants are about three times the expected contribution to household income of the same individuals if they had stayed on the farm. Sadoulet *et al.* (1998) in a study on Mexican households, disaggregated according to labour regime, rejected separability for households self-sufficient in labour but not for sellers and buyers of labour. This implies a non-separable model with transaction costs for labour.

From a different perspective, farmers in many parts of the world face significant transaction costs for production-consumption commodities. Rozelle *et al.* (1999) and de Brauw *et al.* (2002) designed and estimated a non-separable farm household model with data from Chinese households to test the proposition of the new economics of labour migration that migrant remittances loosen various market constraints on rural households. They find significant negative effects of families' loss of labour to migration on farm production, incomes, and crop yields, but also significant positive effects of remittances on all of these variables. These findings contradict the assumptions of perfect markets and are evidence that rural Chinese households face imperfections in labour and credit markets.

It is important to note that farm labour markets exist in Uganda, with the highest amount of labour being hired to meet peak period requirements such as during weeding and harvesting (Okwi, 2005). Most rural labour is paid for in cash and in-kind, although in some parts of the country, labour sharing arrangements are common. Available data (World Bank, 1995) reveals significant differences in the casual and permanent labour wage rates across regions and agricultural systems. Higher rates are realized in areas producing mainly cash crops such as coffee, tobacco and tea, reflecting the need for permanent labour, and regional growing seasons, which differ in timing across the country. Agricultural labour in Uganda is usually paid a daily wage. Male and female farm labour in Uganda are not perfect substitutes (Okwi, 2005). In the same way, family labour and hired labour are not perfect substitutes on the farm. Therefore, assuming perfect markets for all products and factors is unreasonable for rural Uganda.

5.4 Determinants of Household Labour Allocation: A Review of Empirical Studies

In light of the above justification to use a non-separable model in this thesis, it is important to review studies that have estimated the determinants of participation in rural employment. This section therefore identifies the factors that determine participation in rural employment in developing countries, which can later be used to build a model for rural Uganda in the next section.

It is important to note that participation in non-farm activities and household income diversification require both motivation to enter and ability to access sustainable and remunerative livelihoods from it. The two aspects of motivation and ability are important because the reasons why people enter rural non-farm employment (RNFE) may have implications for the types of access barriers faced (Davis and Bezemer, 2004). Motivation is determined by profitability while household's capacity by education, income, assets and access to credit. Corral and Reardon (2001) explain that incentives are expressed as the relative returns to and risks of farm and non-farm activities in form of prices of inputs and outputs, wages, and production risks. The capacities are expressed as the vectors of capital including human, physical, social

and organisational, and household characteristics which make it possible for households to respond to incentives.

Individual characteristics of household members affect their participation in farm and non-farm activities (Goodwin and Featherstone, 2003). In Uganda, as in many parts of sub Saharan Africa, participation in farm activities is usually of lower status than in non-farm activities (GOU, 1999). It is therefore very likely that individuals with higher education levels will not work in farm activities due to the low status accorded to them and their low remuneration (low prices for agricultural products) compared to alternative employment possibilities. However, it is difficult to distinguish precisely whether educated household members do not work on farms due to status after controlling for economic rewards. It is also common that households with more educated members tend to locate themselves in urban areas where better paying and more skilled jobs are found.

The literature on human capital (especially education) suggests a strong positive link between access to and level of education on the one hand and involvement in the more remunerative activities (non-farm) on the other hand. For instance, having a more educated household head is likely to lead to increased productivity, confidence in investment, income and employment. According to Lanjouw (1999), the returns to education within the non-farm sector confirm that earnings tend to rise sharply with higher education implying that not only does education determine participation in non-farm activities, but also determine income derived from these activities. A number of authors have addressed the importance of education and skills as determinants of business start-ups and wages earned from non-farm activities in Africa. Better-educated members of rural household have better access to a number of non-farm employment on offer, and are more likely to establish their own non-farm businesses. Better-educated individuals are more likely to migrate to take up employment opportunities in other areas since they have greater chances of success than their less educated or uneducated counterparts. Reardon (1997) infers a self-perpetuating effect of education in the long-run: earnings from migration may be invested in the education of individuals within the migrant's household, which gives new generations a continuing advantage in the non-farm sector. Over time, this appears to lead to a dominance of the non-farm sector by a subset of local families. It

seems that a tradition of involvement in the non-farm sector develops, and members of a household build up confidence in their ability to succeed in that sector.

Vijverberg (1995) concludes that not only do the years of schooling of entrepreneurs and family workers employed in the enterprise have an impact on incomes of such enterprises but also the education of other family members who are not directly employed. This is attributed to the advice provided by the educated non-participating family members. Islam (1997) argues that primary education enhances the productivity of the workforce, whilst secondary education stimulates entrepreneurial activity. In addition, the educated entrepreneurs are better equipped to train employees on the job.

Human capital was also found to affect income strategies and earnings in Latin America (Chile, Peru, Nicaragua and Mexico) among other places by different scholars (Berdegue *et al.*, 2001; Escobal, 2001; Reardon *et al.*, 2001; Corral *et al.*, 2001 and *de Janvry et al.*, 2001). Households of older couples and average education of household members greater than 15 years affects income strategies and adds significantly to total household income in Chile. This was the same finding in Nicaragua by Corral *et al.* (2001). Interestingly, education was found not to have a significant effect on self-employment in the non-farm sector in Nicaragua. This is possible because the products of the firms are for traditional consumption tastes and use traditional technologies.

Another important aspect relating to individual characteristics is age. Several authors address the significance of household members' age in relation to their participation in non-farm activities. Many models have supported the hypothesis of a life cycle (Low, 1986; Huffman, 1980; Sumner, 1982). This contends that individuals will increase their work effort in earlier years in order to accumulate assets to draw on later in life. According to Smith (2003), it is generally the young household members who migrate to urban areas in search of non-farm income earning opportunities. Young farm operators may also want to work more hours to add to their stock of human capital (Mishra and Goodwin, 1997; Goodwin and Mishra, 2004). Older persons tend toward non-farm wage employment. These results accord with the relation of life cycle capital accumulation and the relative capital entry requirements

of the activities. Low (1986) using evidence from Swaziland shows that the domestic development cycle explains a large part of the economic differentiation found in indigenous rural sectors of Southern Africa.

The elderly in Uganda are usually accorded higher status in society and the household, and therefore are less likely to work on the farm for many hours because they have children to substitute for them. Also, because the elderly are less physically able to participate in activities that are quite demanding, they tend to work fewer hours (Okwi, 2005). However, this may depend on the composition of the household, as some households with fewer children may still require the contribution of the elderly. The stage at which an elderly person can be exempted also depends on other factors such as health status of the member or very advanced age, or even the economic status of the household. Again, it is difficult to identify the basis on which the elderly in Uganda are exempted from household work.

There is a consensus in the literature that gender is a significant factor determining access to non-farm activities. Women have long been constrained in the activities in which they are permitted or able to participate, by tradition, religion, or other social norms. According to Ellis (1998) and Newman and Canagarajah (2000), the activities in which women are involved are more circumscribed than those for men. As far as non-farm income is concerned, women participate to a greater extent in wholesale or retail trade or in manufacturing, than in other sectors. Haggblade *et al.* (1989) provide data from five African countries (Benin, Ghana, Nigeria, Kenya and Zambia) where women's share in non-farm employment ranged from 25 percent to 54 percent. Women are more involved in the informal sector than the formal sector due to differences in access to education compared to their men, childcare responsibilities and social expectations.

That said, women's involvement in income earning opportunities has greater significance than simply increasing their own or household income. Islam (1997) states that women's participation in non-farm activities strengthens their decision making power within the household, helps limit family size, and improves child nutrition and education. In both Ghana and Uganda, female participation in non-farm work is increasing (Newman and Canagarajah, 2000). However, they found that

women in both countries earn substantially less than men. In addition, women are identified as a specific group for which access to education is more limited. The effect of this, in combination with childcare responsibilities and other social expectations such as looking after the sick relatives in a home, means that there is greater involvement of women in the informal than the formal employment sector (Haggblade *et al.*, 1989). Men who are not household heads are more involved in the wage employment whereas women and men household heads are involved in self-employment (Corral *et al.*, 2001).

Newman and Canagarajah (2000) compared trends in rural poverty by gender and sector, changes in income and labour market participation by gender and sector, and the determinants of sector participation in Uganda and Ghana. To understand the determinants of sector (farm/non-farm) participation, they used a bi-variate probit model to estimate the joint probability of participation in the two sectors. The data source for Uganda was the Integrated Household Survey (IHS 1992) and the fourth Monitoring Survey (MS 1996). They found out that non-farm activities are very important to women's welfare in both Uganda and Ghana. In both countries, poverty among female-headed households was significantly lower and fell more rapidly over time in those households participating in non-farm activities. Deininger and Okidi (2001) used the 1992 Integrated Household Survey to find out the determinants of agricultural productivity and how these relate with the start-up of non-farm enterprises in Uganda. One of their key findings was that education has a negative effect on participation in agriculture but has a positive effect on non-farm participation. However, a limitation of these studies is that they did not analyse the implications of the various sectors such as non-farm wage employment and self-employment on total household income. They looked at farm and non-farm sectors broadly and as a result they used a bi-variate model. They further did not look at the implications of income diversification on income distribution/inequality in Uganda which this study does.

Land availability and use is also a crucial factor in determining labour use for farm and non-farm activities. To reduce risk, peasant households in rural Uganda allocate their land to different uses, including cash and food crops, and pasture. Households with more land under cultivation (especially mixed crops) may need more labour

input and may therefore utilize all family labour and even hire some. Likewise, households with more land under labour-intensive crops such as rice and finger millet will tend to require more labour than those under perennial crops or pasture. Therefore, a large area under crops is likely to demand more labour.

In some cases, people engage in non-farm wage activity in rural areas in order to be able to hire in labour. This makes sense as there tends to be wage differentials between farm and non-farm activities. Family members are freed up to work in the non-farm sector yet the household still produces. Inadequacy of land also means that non-farm income which may be a steady wage can often be used as collateral for loans. Bryceson (1999) identified a strong generational divide as people (even young, untrained without urban job prospects) seek alternatives to farming due to low and uncertain returns from smallholder production. People want consumer goods and for that they need cash which is not easily derived from agricultural production which is subject to declining world prices. Engagement in non-farm rural activities has been found to be dependent on family size and structure, levels of education and skills, and levels of prior wealth.

Non-farm work often has start-up costs, which act as a barrier to entry to the poorer households or individuals. However, there can be entry barriers in non-farm labour market because non-farm activities may require investment on equipment purchase or rent, skill acquisition and license fees. Hence, if entry barriers in the non-farm labour markets are formidable, the capacity to diversify income sources into non-farm activities will be lower for poorer farm households. This suggests that individual assets and wealth can affect the type of non-farm activities an individual or household picks up (Reardon and Taylor, 1996). As a result, less wealthy farmers may spend most of their time participating in low paying non-farm activities for which the entry barrier is very low. Therefore, the actual participation of farmers in non-farm activities may largely depend on the incentive and their capacity to participate (Reardon, 1997).

The time devoted to non-farm activities is said to be counter-cyclical. That is to say, decreasing in the peak of agricultural season. However, in a study of rural Tanzania, Collier *et al.* (1986) did not find that non-farm activities are counter-cyclical. They found that the days allocated to non-farm activities during farm peak season as

compared to their own farms is 30 percent more than during the year as a whole. The authors give two possible explanations for this: First, non-farm work could provide inputs for or use inputs from farm work. Second, they suggest that because most income is generated during the busy season when labour demand is at its peak as compared to the slack season. This would be an interesting issue to study in Uganda but this study does not look at seasonal variation in employment. However, the data used in this study was collected at the same time in all the four regions of Uganda and over a year to capture seasonality.

There is a consensus in the literature on the critical role of infrastructure and its link to location in the development of the rural non-farm economy. The most important variable determining total non-farm earning in Chile is the location of the household. Households in richer localities were found to earn more non-farm income than those in the poorer localities (Berdegue *et al.*, 2001). Lanjouw (1999) and Binswanger *et al.* (1989) show that banks, marketing, service and training centres, and other support activities tend to be located where infrastructure is adequate. Ellis (1998) states that “in Africa, the prime causes of rural poverty are locational, and reflect not so much lack of access to land, but location specific leading to lack of access to an array of facilities and opportunities (roads, schools, market services, input supplies, power, non-farm activities) as well as environmental constraints” (p.10). Roads, electricity and telecommunication are critical components of infrastructure. Electricity helps to create rural non-farm opportunities in a number of ways (Gordon and Craig, 2001). First, it enables the development of enterprises; this is the most obvious and receives most attention in the literature. Second, its availability reduces the cost of, for example, diesel powered small-scale milling to a viable level. Third, it provides lighting hence increasing the hours that can be spent in particular rural non-farm activities. Lastly, it releases labour from time consuming and low productivity chores such as manual pounding of grains.

One of the principal problems for rural households and individuals wishing to start a business whether in the farm or non-farm sector, is access to capital or credit. Without start-up funds or with only little cash available for investment, individuals or households are limited to a small number of activities which yield poor returns, partly because of the large number of similar low entry barrier enterprises. In the same way,

individuals with little or no personal savings may find themselves unable to meet the start-up costs of migration to urban centres. Bagachwa and Stewart (1992) in a four-country study in Africa found that 30 to 84 percent of rural industries complained of poor access to credit, which was next in importance to lack of infrastructure inputs and markets. Land is often required as loan collateral and this can exacerbate income inequality associated with non-farm activity.

There are a number of reasons for failures in the credit market. First, the lender does not know the default risk of each potential borrower and it is costly to collect this information. This is worsened by the moral hazard problem of rural credit programmes attracting borrowers with no intention to repay. Second, it is difficult and costly to enforce repayment. Third, it is costly to ensure that the potential borrowers take the actions which make loan repayment more likely. Fourth, the cost of providing services to the rural poor is high because they are located in remote areas; want to borrow small amounts; are illiterate and majority lack collateral measures. Rural non-farm activities in rural areas are seen as both a response to, and a consequence of failure in credit market. They are a response in the sense that rural households use rural non-farm income to substitute other sources of agricultural investment, and a consequence in the sense that the nature of rural non-farm activities might be different if credit was more readily available for rural business start-up (Gordon and Craig, 2001).

A further response to the failure in credit markets has been the development of micro-credit initiatives (Gordon and Craig, 2001). Credit schemes for the poor tend to be characterised by the following: small, short term loans and savings mechanisms; simplified loan appraisal procedures; innovative approaches to collateral; rapid approval and disbursement of repeat loans after repayment; high transaction costs; high repayment rates; and savings and loan services provided at a location and time convenient to the poor. Micro-credit schemes are often associated with group lending (where peer pressure effectively substitutes collateral, and other group members may take action to prevent one member from defaulting, for instance, by providing labour to ensure timely harvest), extension inputs arranged by the micro-finance institution, and mobile banking arrangements. Even though there is a wide and growing

experience with micro-credit, the majority of the rural poor in Uganda do not have access to any such scheme.

The size and composition of families are more directly related to household members' participation in different activities and household production (Kimhi, 1996; Kimhi and Rapaport, 2004; Low, 1986; Ellis, 1993). Household composition is critical in farm production. The availability of more men in the family can substitute women's labour in production, but its effect is indeterminate *a priori* because the presence of more adults increases consumption needs thereby increasing demand, including that for female labour. Women's involvement in agricultural activities is likely to free up men's time, enabling them to undertake other activities. If a household for instance, is largely constituted of children, then this could have some positive effects on adult household members' time. Children become contributors to household survival in such activities as grazing animals, fetching water and even farm labour while women, for instance, perform reproductive, productive and community activities (Nankhuni and Findeis, 2003; Fisher *et al.*, 2002). However, this effect may be attenuated by school attendance. The introduction of Universal Primary Education (UPE) in Uganda seems to have significantly reduced the participation of children in a number of household chores including working on the farm. Given the introduction of UPE, if a household is largely constituted by children, then this could have some negative effects on members' participation, and especially women's participation in farm activities.

If the households cannot afford hired labour due to lack of cash or just its unavailability, the adult household members provide most of the required labour on the farm and non-farm activities. As a result, adult household members have to split their time between farm and non-farm activities. Thus, the availability of labour becomes a crucial constraint and the contribution of able household members becomes necessary for these households to survive.

The situation in rural Uganda is such that household size has significantly grown due to the extended family system caused mainly by war and HIV/AIDS as discussed in chapter two. Also improved health conditions, largely due to the massive nationwide immunization programmes, have led to lower mortality rates among the children. This

puts extra pressure on household demand in terms of consumption and time needs. It is expected that members from larger families will participate more in non-farm activities. Reardon (1997) observes that family size and structure affect the ability of a household to supply labour to the non-farm sector. Larger families supply more labour to the rural non-farm sector, as sufficient family members remain in the home or on the farm to meet labour needs for subsistence. This is similar to what Zhu and Luo (2006) found out in China. Zhu and Luo explain that this could be as a result of shortage of cultivable land in larger households leading to lower labour productivity in agricultural activities. Holding other things constant, a larger household will have a lower opportunity cost of having some members working in the non-farm activities.

It is however important to note that the number of workers in a household may not affect participation in non-farm self-employment activities (Zhu and Luo, 2006). One of the likely reason is that non-farm self-employment requires more starting funds and entrepreneurship. This is a constraint in rural Uganda (Deininger and Okidi, 2001). If a rural household has better endowment in physical and human capital, and/or suffer less liquidity constraint from under development of the insurance and credit market, household members will be more capable of participating in non-farm self-employment, other things remaining constant.

Prevailing wage rates are expected to exert an important influence on how households in rural Uganda allocate their labour to farm and non-farm activities. If farm and non-farm labour are assumed to be imperfect substitutes in the household utility function and that family and hired labour are also imperfect substitutes in the farm production function, then at a given market farm wage rate, it is unlikely that the supply of household on-farm labour will equal demand for household on-farm labour (Okwi, 2005). Hired and family labour are considered imperfect substitutes because hired labour incurs an extra supervisory cost and is paid according to hours or area worked which is not the case with family labour. Farm and non-farm labour are not perfect substitutes because of obvious productivity (wage) differences. If households equate the two at the margin, they will act as if they faced a virtual farm wage different from the market wage. The virtual wage is derived implicitly from equating household farm labour supply and demand. It will be a function of both consumption related and production related variables and is endogenous to the household. In eastern Uganda, it

was found that total household wage income is an important factor in men's labour allocation to farming in the dry season. Men's collection time for fuelwood significantly increases in the highlands compared with the lowlands (Okwi, 2005).

Finally, considering Haris and Todaro's (1970) labour migration model, rural labour chooses to migrate to the urban areas (with presumably higher wages) if expected income (minus transaction costs) exceeds the income presently earned in rural employment. This implies that poorer farm households have incentives to participate in non-farm activities because they earn a lower marginal value of farm labour (Woldenhanna and Oskam, 2001). These arguments lead us to propose that in rural Uganda, the participation of household members in farm and non-farm activities will depend on: individual characteristics (gender, age and education), family size and composition; availability of other household labour on the farm (hired and family labour); household farm income (wage); the size of landholding; agricultural and non-agricultural assets, access to formal credit and regional location. The next section presents the empirical strategy of participation taking into consideration the factors raised in this section.

5.5 A Household Model for Rural Uganda

Having introduced household decision models and drawn key variables from the empirical literature, this section firms up the discussion by developing a non-separable household model for rural Uganda. A non-separable model is adopted because of imperfection in the rural labour market of Uganda especially due to gender complexities and transaction costs. Agricultural production in Uganda is known to rely heavily on human labour as an input. Labour market opportunities at existing wages are assumed to exist for both men and women. Households can hire labour to work on the farms or can sell their labour to other households who can pay them in return. In this study, it is assumed that hired and family farm labour are imperfect substitutes. This is because of the additional costs incurred for supervision of hired farm labour. In addition, there are differences in male and female farm labour. In rural Uganda, either household members work on the farm with hired labour and therefore

hired labour is paid per day or they agree on a farm area to be covered or kind of work to be done.

The assumption of non-separability implies that household resource allocation in terms of labour supply between farm and non-farm activities is decided simultaneously, rather than recursively³⁵. It also means that a utility maximizing household would determine its production and consumption subject to a “virtual” or “shadow” wage of farm production which is unobserved and unknown, except to the household itself, and which varies between households depending on household and village characteristics (Sadoulet *et al.*, 1998 and Skoufias, 1994).

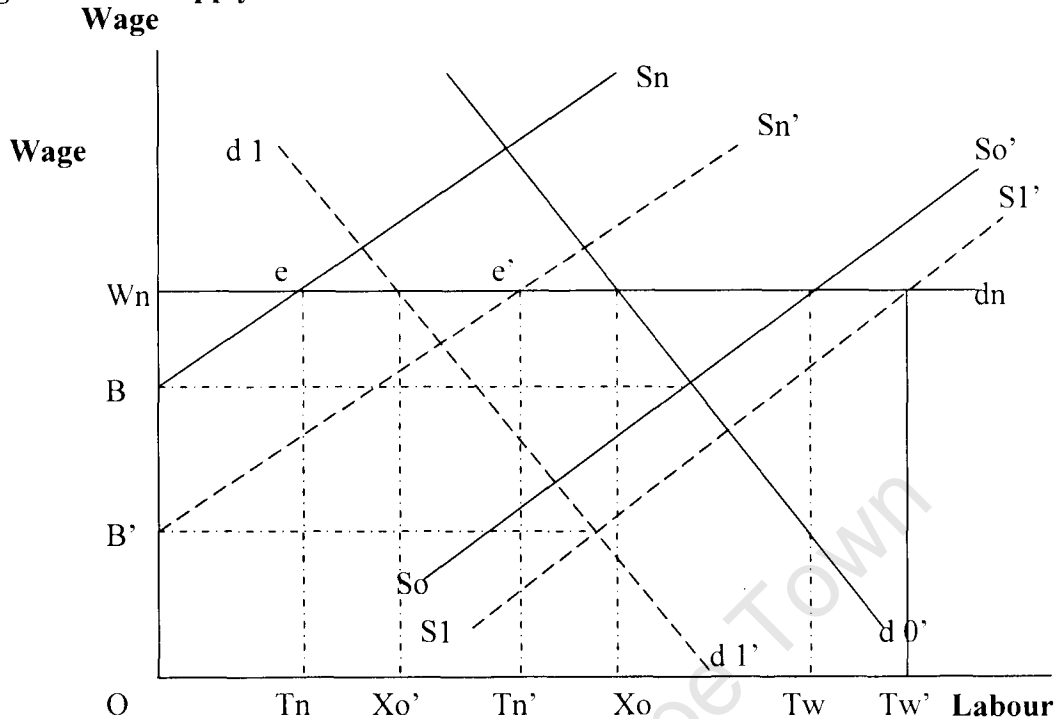
The starting point for a non-separable farm household model is to assume that household members seek to engage in any activity that generates highest returns given its assets and skills. This is a utility maximisation assumption. The economic theory of the family by Ashenfelter and Heckman (1974) and household time allocation (Becker 1965 and Gronau 1973, 1977) proposes that family members specialize in activities in which they have a comparative advantage so as to maximize family welfare. Comparative advantage is in part determined by the opportunity cost of time of each member and in part by the relative efficiency in household production of each member. For example, if males and females produce commodities inside the household efficiently but male wages are higher, then males tend to work outside the household for wages and females work at home. Changes in the value of labour of a family member relative to that of other family members will induce an allocation of labour of that family member toward the activity with the highest reward (Low, 1986). A risk neutral household allocates household members' labour according to a comparative advantage principle, which is determined by the marginal returns to labour. This implies that if a household member can earn more as a wage employee than in farming or household work, the household allocates him/her to wage employment even if the absolute level of his/her marginal contribution to farming is higher than those of other household members.

³⁵ The recursive model would require that hired and family labour on the farm be perfect substitutes, and that there exists perfect markets for agricultural products.

The literature on labour supply decisions indicates that factors underlying implicit wages for individuals are likely to determine the extent of their involvement in labour markets (Goodwin and Mishra, 2004). In the case of farm employment, wage employment and non-farm self-employment, individuals will compare options and allocate their labour time so as to maximise total utility, which implies equalizing marginal returns to labour in the alternative activities and in the consumption of leisure. An important point in this regard is that more time or labour spent in one activity generally implies less in the other.

Figure 5.1 presents a graphical determination of farm and non-farm work to illustrate this point. If the demand curve for farm work is $dodo'$ and the supply curve of labour is $SoSo'$, the supply curve for non-farm labour (excess labour supply) is BSn . If the demand curve for non-farm labour is $Wndn$, equilibrium occurs at e where the quantity of non-farm work is OTn . The total quantity of labour supplied OTw and OXo is allocated to farm work. If the anticipated price of farm output falls, the farm labour demand curve shifts leftward to, say, $dIdl'$, and if leisure is a normal good, the supply curve of labour shifts rightwards to, say, $SISl'$. The new non-farm labour supply curve shifts rightwards to $B'Sn'$. If the demand for non-farm labour remains unchanged, equilibrium non-farm work occurs at e' . The quantity of non-farm and of total work increases to OTn' and OTw' respectively and farm work declines to OXo' . This implies that holding other things constant, a decrease in the price of farm products increases the time allocated to non-farm activities and reduces the one for farm.

Figure 5.1 Supply and Demand for Labour



Source: Huffman (1980)

The model developed in this study assumes that households face different choices in terms of production; they can choose to use their own labour, hire labour entirely or use both own and hired labour, depending on their incentives and capabilities. It assumes a unitary decision making process at the household level with respect to labour allocation following the work by Gronau (1977), Huffman (1980), Jacoby (1993), Scoufias (1994), Newman and Gertler (1994), Sadoulet and de Janvry (1995), Sadoulet *et al.* (1998), Goodwin and Mishra (2004) and Okwi (2005).

Becker (1965) and Gronau (1977) extended the conventional labour supply model of consumption and leisure by incorporating home production as yet another activity that requires human labour. They argue that women's work at home can be valued in a way similar to market work, and that this work will respond to economic incentives such as changes in market wages, unearned income and productivity of work at home. While this extension was insightful, it had a few shortcomings. It paid too little attention to the norms governing male behaviour both inside and outside the household. It was also a model with an empirical focus on developed countries where women's production is less dominated by incomplete market failures (Ilahi, 2000). For example, there was little application to developing countries where women's time

in home production can be constrained by failure or absence of markets for basic services such as water and fuel-wood.

According to Becker (1965), households produce commodities, Z goods, by combining inputs of goods and time according to cost minimization rules of the traditional theory of the firm. The Z goods are not marketable and enter directly into the utility functions of the households. Commodities are produced in quantities determined by maximizing a utility function involving a set of commodities subject to wages and a constraint on resources. The solution to this utility maximization problem is always for the household to situate itself on the highest indifference curve attainable, subject to its budget constraint. The budget constraint, however, assumes different forms, according to the market environment in which the household finds itself.

It is assumed that the all adult members (male and female above 15 years) within a household are employed in either farm or non-farm activities. In this case, non-farm activities include wage employment and self-employment. The number of children in the household as well as the demographic composition of the adult members of the household is considered as exogenous. Households allocate each of their members' labour endowment (T) among four main activities: Farm work (F_i), Market work (M_i), Household production (N_i) and Leisure (L_i) where i indexes males (m) and females (f). Wage employment and non-farm self-employment form what is referred to as market work. It is assumed that the opportunity cost of a household member participating in wage employment and non-farm self-employment is the same. Time devoted to the market work yields income, which permits purchases of market goods (X). The effective real wage for non-farm work, W_i , is assumed to be constant. Time devoted to household production combined with other fixed inputs (denoted by K) yields a household produced composite commodity (for example, meals) described by the production function

$$Z = Z(N_m, N_f; K) \quad (9)$$

The household produced commodity Z is assumed to be perfectly substitutable with the composite agricultural commodity that is either produced by the household or

purchased from the market³⁶. The price of the composite agricultural commodity is used as a *numéraire*. The production function for the composite agricultural commodity produced by the household is specified as

$$P = P(F_m, F_f, H_m, H_f; A) \quad (10)$$

where P is a concave function, F_m, F_f are family male and female labour, H_m, H_f are hired male and female labour and A is a vector of other factors such as land. Hired male and female labour are paid at the corresponding real wage rates, W_m^H and W_f^H . The effective wages received by family members working in the non-farm activities may differ from the wages paid out to hired labour due to transportation costs or other transaction costs ($W_i > W_i^H$). Given this specifications, households are assumed to choose X, N_i, F_i, M_i, H_i so as to maximise utility as in equation (11)

$$U = U(C, L_m, L_f; B) \quad (11)$$

Subject to

$$C = X + Z \quad (12)$$

$$Z = Z(N_m, N_f; K)$$

$$X = P(F_m, F_f, H_m, H_f; A) - W_m^H H_m - W_f^H H_f + W_m M_m + W_f M_f + V \quad (13)$$

$$T = L_i + F_i + M_i + N_i \quad (14)$$

$$L_i \geq 0, F_i \geq 0, M_i \geq 0, N_i \geq 0, X \geq 0, H_i \geq 0 \quad i = m, f \quad (15)$$

C is total household consumption, the sum of the market purchased and home produced agricultural commodity; B is individual and household characteristics influencing preferences; V is real non-labour income (for example remittances). Equations (13) and (14) are income and time (labour) constraints respectively.

Substituting equations (12), (13), (14) and (15) into the utility function (11) yields the household's Lagrange function for the problem as indicated in equation (16).

³⁶ Perfect substitutability is assumed for expositional simplicity. This implies that the contribution of family members by gender to the production of Z goods (for example preparing a meal) and agricultural commodities is the same. In this case, the shadow wage by gender applies to those in farming and those producing Z goods (for example preparing meals) rather than having different shadow wages. It also means that agricultural own produced goods and those purchased from the market are perfect substitutes.

$$\begin{aligned}
\text{Max } \Gamma = & U[X + Z(N_m N_f ; K), T - F_m - M_m - N_m, T - F_f - M_f - N_f ; B] + \\
& \lambda [P(F_m, F_f, H_m, H_f; A) - W_m^H H_m - W_f^H H_f + W_m M_m + W_f M_f + V - X] + \\
& \mu_m M_m + \mu_f M_f
\end{aligned} \tag{16}$$

λ is the Lagrangian multiplier associated with the income constraint and μ_i is the Lagrangian multiplier associated with the inequality constraints on the market work of each labour type ($M_i \geq 0$). Maximisation of this Lagrangian with respect to X, N_i, F_i, M_i, H_i , where $i = m, f$ yields the following first order conditions, assuming participation in non-leisure activities, for the optimal choices of the household:

$$\frac{\partial U / \partial L_i}{\partial U / \partial C} = W_i^* = W_i + \frac{\mu_i}{\lambda} \tag{17a}$$

$$\partial P / \partial H_i = W_i^H \tag{17b}$$

$$\partial P / \partial F_i = W_i^* \tag{17c}$$

$$\partial Z / \partial N_i = W_i^* \tag{17d}$$

Equilibrium condition (17a) implies that households will equate the marginal rate of substitution between consumption and leisure of male and female family labour and the male and female “shadow wage rate”, W_i^* . Condition (17b) states that hired labour will be utilised up to the point where the marginal product of hired labour of each gender is equal to the wage paid to the hired labour. This is the usual first order condition derived from profit maximisation. Conditions (17c) and (17d) imply that family male and female labour on the farm will be utilised up to the point where the marginal productivity on the farm or at home is equal to the respective effective wage.

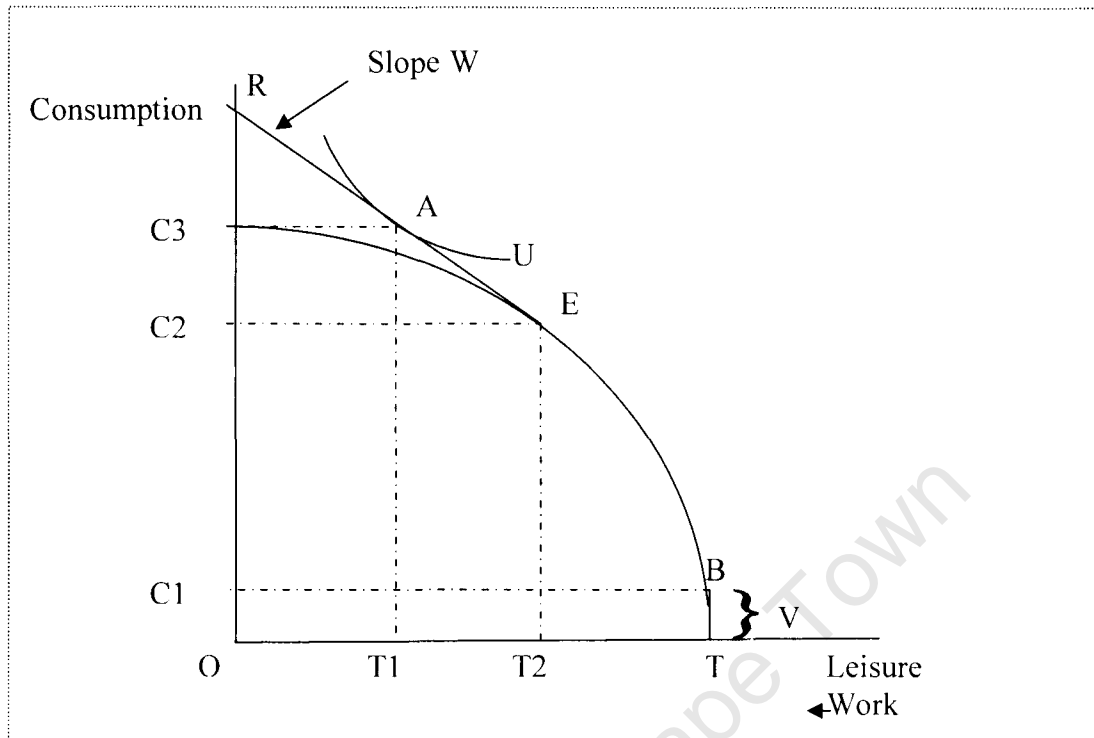
From the above conditions, it implies that if a person is working in the market, then his or her shadow wage rate will be equal to the respective effective wage W_i for male and female. This comes from the complementary slackness condition that requires that $\mu_i = 0$ if a person supplies labour in the market ($M_i > 0$). In contrast, if a person is not working in the labour market, then the shadow wage rate W_i^* will be, in general, greater than W_i . This also follows from the complementary slackness

condition that requires that $\mu_i \geq 0$ if $M_i = 0$ ³⁷. Thus, for a household that supplies male (or female) labour to non-farm work, the marginal rate of substitution between household consumption and male (or female) leisure is equal to the effective market wage rate for males (or females). For households that do not supply any male or female labour to the market, the optimum will occur at the point where the marginal rate of substitution between leisure and consumption is equal to the marginal productivity of male or female labour on the farm. Comparing the effective real wage for non-farm work (W_i), wage for farm hired labour (W_i^H) and the shadow wage (W_i^*) under labour market failure, the shadow wage is the lowest, followed by the wage for hired labour ($W_i^* < W_i^H < W_i$).

Illustration of the first order conditions is provided in Figures 5.2 and 5.3. In order to simplify the graphical exposition, production of the household commodity is left out. Thus, time or labour is divided among market work, farm work and leisure. Transportation costs and other frictions leading to differences between effective wages and market wages are ignored (Skoufias, 1994).

³⁷ It is important to note that the case $M_i = \mu_i = 0$ cannot be excluded in advance since some farmers might not work in the market but supply labour on the farm such that the marginal product on the farm is exactly equal to the market wage rate. In most other cases, $\mu_i > 0$ when $M_i = 0$.

Figure 5.2 Equilibrium Position of an Agricultural Household with Non-farm work



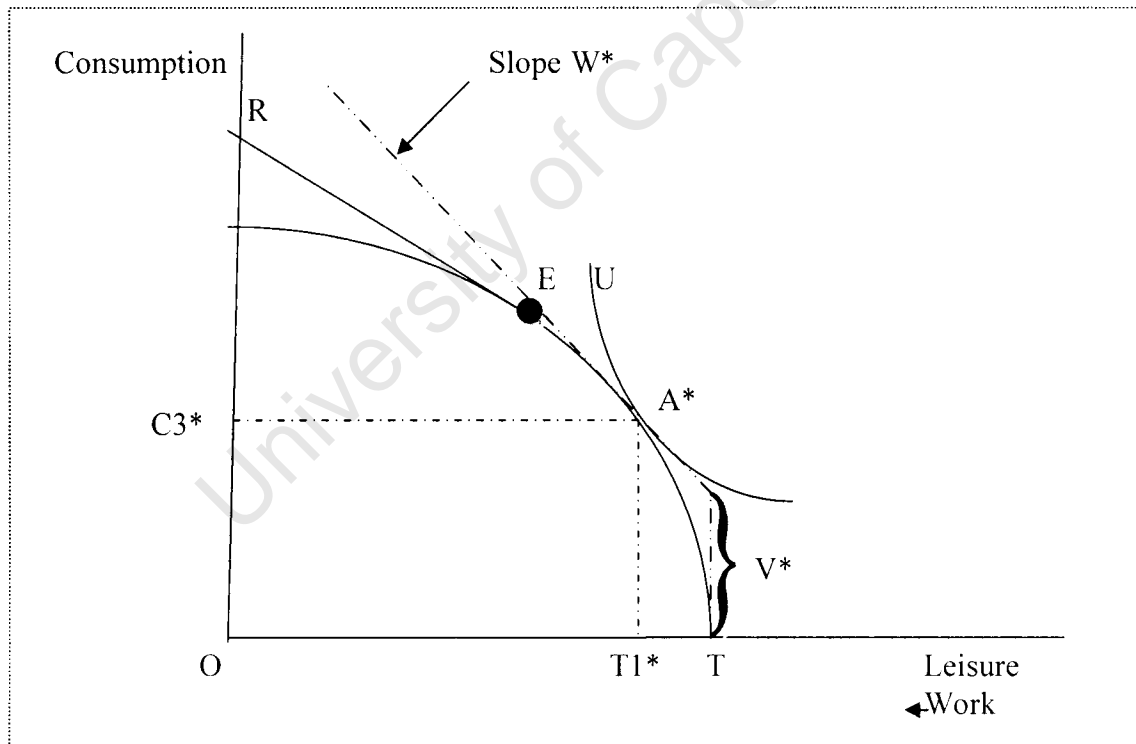
Source: Adapted from Skoufias (1994)

- **TBEC3** represents the production function
- **TBER** represents income constraint
- Vertical segment **TB (V)** of the budget line denotes real non-labour/work income
- Curved segment **BE** describes income from farm production
- Slope of **BEC3** is the marginal product of family labour, which is decreasing as more labour is allocated to farming
- Linear segment **ER** is the market or non-farm work portion of the household budget line. The slope of this line W , is the constant marginal effective wage earned in the market
- **C1C2** represents household consumption from farm activity/time and
- **C2C3** represents non-farm earnings used to purchase market household consumption goods.

The indifference curve U signifies the trade-off between consumption C and leisure (or non-work) time and its slope is the shadow wage rate. If a household is at point T , then all available time is spent on leisure. This however is not usually the case in real

life situation. The household preference is at equilibrium point A where time is allocated to leisure (OT1), market work (T1T2) and work on the farm (T2T). At point A, the household allocates its time to farm production up to the point where the marginal return from farm work is exactly equal to the market wage with the remaining time being divided between market work (non-farm) and leisure. It also implies that at point A, the marginal returns across all activities are exactly equal and the shadow wage rate is equal to the effective wage rate earned in market work and that, the marginal rate of substitution between leisure and consumption equals the wage rate ($\frac{\partial U / \partial L_i}{\partial U / \partial C} = W$). Figure 5.3 shows the case for a consumer with a relatively strong preference for leisure.

Figure 5.3 Equilibrium Positions of an Agricultural Household without Non-farm work



Source: Adapted from Skoufias (1994)

The household's equilibrium occurs at point A^* where time is allocated only between leisure ($OT1^*$) and work on the farm ($T1^*T$). Given the household's preferences and the market wage rate W , the household finds it optimal to use all its labour on the farm and not supply any labour on the market work (non-farm). At the equilibrium point A^* , the shadow wage rate denoted by W^* , is equal to the slope of the farm production

function at the point A^* . At A^* , the shadow wage rate W^*I is greater than the market wage rate W which suggests that the market wage rate W may underestimate the opportunity cost of time of such households.

There are two key insights provided by Figure 5.2 and 5.3. Assuming that the household income constraint in Figure 5.3 forms a convex set, it can be linearized at the point of tangency with the household indifference curve (Skoufias, 1994; Jacoby, 1993). This implies that it is possible to replace the non-linear income (budget) constraint with an artificial linear constraint, which would induce the household to arrive at the same optimal choices. The slope of the linearized income constraint is W_i^* , the marginal wage. This therefore requires redefining the income of the household as;

$$V^* = \pi_F^*(W_m^*, W_f^*, W_m^H, W_f^H; A) + \pi_Z^*(W_m^*, W_f^*; K) + V \quad (18)$$

Where:

$$\pi_F^*(.) = \max_{H_i, F_i} \{P(F_m, F_f, H_m, H_f; A) - W_m^H H_m - W_f^H H_f - W_m^* F_m - W_f^* F_f\} \text{ and}$$

$$\pi_Z^*(.) = \max_{N_i} \{Z(N_m, N_f; K) - W_m^* N_m - W_f^* N_f\}$$

Expressing income in this manner amounts to using the intercept of the linearized income constraint at the zero labour (hours of work) position ($L_i = T$) at an estimate of the shadow income of the household (see V^* in figure 4.3)³⁸.

Linearizing the budget constraint at the optimum allows one to reformulate the leisure time for males and females in a household as the solution to a traditional model of family labour supply. In particular, the equilibrium points A and A^* in Figures 5.2 and 5.3 respectively, may be expressed as the solution to the following problem:

$$U = U(X, Z^*, L_m, L_f; B) \quad (19)$$

Subject to

$$X + Z^* + W_m^* L_m + W_f^* L_f = V^* + W_m^* T + W_f^* T \quad (20)$$

³⁸ In this case, if a person participates in non-farm, then $W^* = W$ and V^* in equation (18) must be calculated by replacing W^* with W .

Here the left hand expression in equation (20) is the value of total household expenditures on goods and leisure, with Z^* denoting the amount of the Z commodity produced at the optimum N_i^* , W_m^* and W_f^* being the shadow values of labour (time) defined in equation (20). The right hand expression denotes “shadow full income”. The solution to this maximisation problem yields the structural demand function for leisure.

$$L_i^* = L_i(W_m^*, W_f^*, V^*; B), \quad i = m, f \quad (21)$$

or the corresponding structural labour supply function

$$G_i^* = G_i(W_m^*, W_f^*, V^*; B), \quad i = m, f \quad (22)$$

Where $G_i^* = T - L_i^* = F_i^* + N_i^*$, if $M_i^* = 0$ and

$$G_i^* = T - L_i^* = M_i^* + F_i^* + N_i^*, \text{ if } M_i^* > 0$$

G_i^* is labour (the total hours of work) of family member of gender i in farm production, market work and hours devoted in producing the composite commodity Z .

The difference between the labour supply function derived from this framework (equation 22) and the one derived from the more traditional labour supply model using observed market wages and full income, is that W_i^* and V^* are endogenous variables. At the theoretical level, condition (17a) implies that the shadow value of labour (time) W_i^* is generally a function of the Lagrangian multipliers λ and μ_i . Any change in the exogenous variables in the system will lead to new optimal values for these Lagrangian multipliers that in turn lead to a new optimal value for the shadow wage rate W_i^* . At the empirical level, the variables of the right hand side expression W_m^* , W_f^* and V^* will be correlated with the unobserved variables summarised by the error term in the labour supply regression. The reason for this correlation is that the estimated marginal productivities of family male and female labour depend on their labour supplied. This framework and the introduction of market imperfections provides a reference point in the coming analysis for how rural individuals choose to devote their labour and what determines the income of their households.

5.5.1 Estimation of Farm Shadow Wage

Under imperfect labour market situations in rural Uganda, a non-separable is needed. The assumption of non-separability requires that shadow wages rather than market wages be used to distinguish the determinants of labour supply and labour demand of the farm household. Shadow wages are used to measure the opportunity cost of labour and summarise the interdependence between production and consumption decisions in a farm household. Shadow wages are important in that they make it possible to include in the analysis individuals who participate only in farm activities. A shadow wage is determined within a household and is a function of household preference, technology and all other fixed inputs and market prices affecting household choices.

An estimate of the shadow wage rate W_i^* could be obtained either from the marginal product of each family labour type in agricultural production or from the marginal productivity of family labour in the production of Z goods. The latter is a particularly useful method of deriving estimates of the value of labour of members that do not work in the non-farm activities. This implies that the shadow wage method is applicable irrespective of whether family members work on the farm or non-farm. The production function approach is used to derive the shadow wage in this study. This is similar to the approach of Scoufias (1994). The estimation consists of two main steps. The first step is to obtain estimates of the marginal productivity of family female and male labour by estimating a Cobb-Douglas production function with family female and male participating in farming and hired male and female labour specified as heterogeneous inputs. In the estimation of the total production function, the factors influencing the amount of labour devoted to farming are determined. The Cobb-Douglas production function is specified as:

$$\ln Y_h = \ln X_h \beta_h + N_h \delta_h + \varepsilon_h \quad (23)$$

where $\ln Y_h$ denotes the total value of agricultural crops (TVA) produced by farm household h, X_h represents the quantities of inputs j used by household h , N_h represents household characteristics affecting household choices such as sex of the household head, household assets and education of the household head; β_h and δ_h are

parameter vectors and ε_h is an error term summarising the influence of all other omitted variables. The inputs denoted by X_h include hired male labour (HM), hired female labour (HF), family male labour (FM), family female labour (FF), family and hired child labour (TC), value of seeds (SV), value of all other inputs (OIV) and cropped area (AREA).

The second step is based on the estimated parameters of the production function in equation (23) where the corresponding marginal products of labour (shadow wages) are computed. In practice, an estimate of the shadow wage can be obtained from the marginal productivity of family labour in the production of a commodity. Following the approach used by Skoufias (1994) and Jacoby (1993), the marginal product of labour for the respective gender is computed as the product of labour input elasticities and the ratio of value of output by household h to family male or female labour. This is specified as:

$$\hat{W}_m^* = \left(\hat{Y}_h / FM_h \right) \hat{\beta}_{FM} \quad (24)$$

$$\hat{W}_f^* = \left(\hat{Y}_h / FF_h \right) \hat{\beta}_{FF} \quad (25)$$

where

- \hat{W}_m^* (\hat{W}_f^*) is the shadow wage rate for males (females) of farm output produced by household h,
- \hat{Y}_h is the fitted (predicted) value of output by household h derived based on the estimated coefficients ($\hat{\beta}_j$) and the estimated household fixed effects (μ_h).
- FM_h (FF_h) is the family male (female) labour for household h spent on farm activities,
- $\hat{\beta}_{FM}$ ($\hat{\beta}_{FF}$) is the parameter estimate for the variable FM_h (FF_h).

Shadow wages for family males and females are computed for those participating in farming. Those in wage employment and self-employment activities are assigned the highest shadow wage (marginal product) than those participating in farming. The

estimated shadow wages are household specific because it is expected that in the absence of hired labour, the shadow wage rate would be a result of the household's attempt to equate supply and demand for its own labour and this depends on household characteristics and resource endowments. Once the shadow wages have been estimated, they are matched with participation data, household demographic variables and other variables in the theoretical model in order to estimate the determinants of participation. The derived shadow wage for males and females or marginal revenue product of labour is then subsequently used in estimation of the multinomial logit model for the determinants of participation in the different activities in rural Uganda as discussed in the next section.

5.5.2 A Simultaneous Discrete Choice Model of Labour Supply

Given the above discussion on labour supply functions, one of the important issues to consider in this study is individuals' motivation to engage in non-farm activities. A choice between various possible activities within a household is motivated by two interrelated factors (Blau *et al.*, 1956). Household members look at the individual's valuation of the rewards offered by different alternatives, commonly referred to as incentives and the individual's appraisal of his or her chances of being able to participate in the activities, sometimes referred to as capacity. The standard approach for modelling simultaneous occupational choices in the economics literature has been based on the analysis of discrete choice models. In this case, simultaneity means that individuals do not separately face sets of occupational choices. The simultaneous discrete choice approach used to analyse the determinants of occupational choice in rural Uganda is the multinomial logit model (MNL) (Schmidt and Strauss, 1975; Christiadi and Cushing, 2006; Kurosaki, 2001; Nickell, 1982; Greenhalgh and Stewart, 1985; Miller and Volker, 1985; Robertson and Symons, 1990; Connolly, Micklewright and Nickell, 1992; Harper and Haq, 1997). The MNL model (Greene, 2003; Maddala, 1983) is consistent with the notion of random utility maximization. Such a model allows the scrutiny of the statistical association between non-farm activities or incomes and specific characteristics, holding the influence of other characteristics constant.

Three broad categories of occupational choices or activities in the rural areas namely; farm activities, wage employment and non-farm self-employment are considered. Some studies (Jonasson, 2005) consider labour on another household farm as a farm activity rather than non-farm whereas others (Ersado, 2006) consider it as part of wage employment and therefore as non-farm. Barrett, Reardon and Webb, 2001 emphasize that classifying farm wage employment as non-farm employment rather than farm employment is the most common error. This is because they use a sectoral approach to classify farm employment and non-farm employment rather than a location approach. In this study, the wage from working on other households' farms has been classified as non-farm (together with the non-farm wage category) for two reasons. First, analytically if farm wage is merged with farming, then it means that the derived shadow wage for females and males also applies to farm wage employment. This will imply that there is no difference between the shadow wage and hired wage. This would contradict with the assumption that family labour and hired labour are not perfect substitutes. Second and purely expediently, farm wage employment does not have enough observations to stand on its own in the sample used for analysis in this thesis (only 23 individuals - 0.16 percent). Even then, before dropping any observations, it was accounting for only 2 percent of those who were interviewed. In addition, when it comes to income data, farm wage income and non-farm wage income data were collected as employment income and therefore it is not possible to differentiate them. Farm employment includes crop farming and non-crop farming (poultry and livestock). Wage employment and self-employment form the non-farm employment category in this study.

Different authors (Carney, 1998; Islam, 1997; Reardon *et al.*, 1998; Gordon and Craig, 2001) have identified a number of variables that determine the poor people's participation in rural non-farm activities in developing countries. The specification of the model draws from this literature suggesting that the choice of a primary occupation in the rural sector is affected by individual characteristics; household characteristics; community characteristics; and location characteristics. The interest in this case is to know how each of these variables affects the odds of a person engaged in non-farm activities relative to other possible choices.

At the individual level, we consider age, gender and education status. Household characteristics include age of the household head, education of the household head, land holding per adult and different assets. Choice models assume that households living in a more favourable economic context and with more assets will have greater choice and access to non-farm jobs, which will earn them more than households in the opposite situation. Community level and location characteristics include access to electricity, access to credit, distance to the nearest district headquarters and regional dummies. In a country like Uganda, it is probable that spatial/geographic variation provides an important additional dimension in explaining employment patterns. This study allows geographical factors to influence results in that regional dummies are introduced within each respective model.

In the multinomial logit model, the individual's choice among j alternatives is the one with maximum utility. Let U_{ij} denote the utility that an individual i gets from choosing alternative activity j (Schmidt and Strauss, 1975; Kooreman and Wunderink, 1996) with $j = 0$ if the person does not participate in non-farm work; $j=1$ if the person participates in wage employment; $j = 2$ if the person participates in non-farm self-employment.

$$U_{ij} = \beta_j X_i + \varepsilon_j \quad (26)$$

Where $i = 1, 2, \dots, N$; j indexes the type of activity or employment in the choice set including 0,1 and 2. X_i is a vector of individual, household, community and regional characteristics and remains constant across alternative activities; β_j is the coefficient and varies according to activity and ε_i is a random error term. The male and female shadow wages computed using equations 24 and 25 respectively are some of the household variables represented by X_i in equation 26.

Assuming that the random error term is identically and independently distributed (iid) with extreme value distribution across the alternative activities (Judge *et al.*, 1985; Greene, 2003; Hausman and Mcfadden, 1984), the probability of individual i choosing activity j can be represented as

$$P_{ij} = \frac{\exp(\beta_j X_i)}{\sum_{j=0}^2 \exp(\beta_j X_i)} \quad (27)$$

In principle there are two econometric problems with using estimated shadow wages in a MNL model of labour activity like the one in equation 26. First, the shadow wages are estimated, and therefore are random variables with sampling error. This implies that the error term in the random utility model cannot be identically and independently distributed as it also includes the sampling error from the estimated shadow wage. The error term in the MNL model can only be assumed to be identically and independently distributed when the shadow wage is known and not estimated. Second, the non-separable household model implies that the shadow wages are endogenous. If a MNL is estimated under the circumstances of estimated shadow wages, the standard errors for the parameters on the shadow wage variables are probably underestimated as they do not take into account the error in the estimated shadow wages.

A number of approaches have been suggested to address the endogeneity problem. Instrumental variable methods are commonly used to account for the potential endogeneity of the estimated shadow wages (Skoufias, 1994; Jacoby, 1993; Mekonnen, 1998). This study follows the approach suggested by Malchow-Møller and Svarer (2004). This approach is based on a two-step strategy. In the first step, a regression of the explanatory variable under consideration on some exogenous variables is conducted. This is done in equation 23. In the second step, the multinomial is estimated including the residual from the first step regression as an explanatory variable. This implies that X_i in equation 26 includes ε_{it} specified in equation 23. The inclusion of the residual in the multinomial logit is to ensure that the coefficients of the male and female shadow wage variables are purged for biases.

The multinomial model requires that a particular occupational category be designated as the *numeraire* against which all results should be compared. In this study, this can be a key occupation of the poor in rural Uganda. Choosing a category for comparison purposes allows us to ask whether the other occupational categories can be regarded as systematically different in any way. This implies that parameter estimates for the

categories which are included should be interpreted not as correlates of employment in a given occupational category, but rather as relative to the base category.

This model has been used by Lanjouw and Shariff (2004) in India and Christiadi and Cushing (2006) in the United States. Setting $\beta_j = 0$ for $j = 0$, the multinomial model can be written as

$$P_{ij} = \frac{\exp(\beta_j X_i')}{1 + \sum_{j=1}^2 \exp(\beta_j X_i')} \quad (j=1, 2) \quad \text{and} \quad P_{i0} = \frac{1}{1 + \sum_{j=1}^2 \exp(\beta_j X_i')} \quad (28)$$

The model can be estimated using the maximum likelihood estimation method. The model's log likelihood is

$$\text{Log}L_{MNL} = \sum_i \sum_j d_{ij} \log P_{ij} \quad (29)$$

Where $d_{ij} = 1$ if the activity is chosen and 0 otherwise. Applying maximum likelihood estimation yields parameter estimates $\hat{\beta}_j$. Using the values of $\hat{\beta}_j$ and the fact that $\sum_i P_i = 1$, each of the three probabilities for $j = 0, 1$ and 2 can be computed

5.6 Empirical Results

This section is divided into two sub-sections. The first sub-section provides a description of the dependent variables in the multinomial logit estimation. A description of the independent variables is presented in Chapter Three. The second sub-section presents the empirical results of the multinomial logit model. Both the descriptive and empirical results in this chapter take account of survey design effects.

5.6.1 Descriptive Statistics of the Dependent Variable

The survey had a total number of 45,891 rural individuals, with females constituting 50.4 percent³⁹. These rural individuals are obtained from 40 strata⁴⁰ (districts). The rural sample used comes from 38 strata. Kotido and Moroto districts were dropped from this analysis because of inconsistencies and missing values for key variables. We consider only adult individuals who indicated participating in gainful activities and these represent 31 percent of the total rural individuals⁴¹. Individuals involved in activities without pay, profit or family gain are excluded. These include: the young or old, disabled, full time students, unemployed, voluntary political, social and religious leaders and those attending to domestic duties. Those with missing information on usual activity are also excluded. Table 5.1 gives the numbers and percentages of these categories out of the total rural sample in the survey.

Individuals aged 15 years and above are considered because according to the Ugandan rural system and International Labour Organisation (ILO), individuals aged 15 and above are expected to get involved in gainful activities. In addition, in many rural areas of Uganda, girls get married off as early as 15 years and boys are expected to be almost self-reliant and contributing significantly to household chores once they are 15 years. The study considers only usual and regular members of the household, leaving out visitors and former usual members who have stayed away from the home or outside Uganda for six or more months.

Participation is categorized into three: farm employment, wage employment and non-farm self-employment. These participation or employment categories are obtained using data on the individual's main (usual) industry and activity status. The first five usual activity categories in Table 5.1 are considered. Due to data limitations, secondary activities are left out of the analysis. Some studies have categorised participation in four categories including breaking farming into own-farm and farm wage. As discussed above, this study has not done this.

³⁹ Details of the data and the collection procedures are in Chapter 3.

⁴⁰ The entire survey covered 41 strata. Kampala district is all urban and therefore dropped from the analysis

⁴¹ STATA 9 was used to generate the results in this chapter. Appendices 6B and 6C present the *Do*-file used.

Table 5.1 Usual Activity Status of Rural Individuals in the Survey

Usual (Main)⁴² Activity Status	Frequency	Percent	Cumulative
Employer ⁴³	5	0.01	0.01
Own account worker ⁴⁴	8,762	19.09	19.10
Unpaid family worker ⁴⁵	6,827	14.88	33.98
Government employee ⁴⁶	435	0.95	34.93
Private employee ⁴⁷	1,067	2.33	37.25
Too young or old	9,814	21.39	58.64
Disabled	286	0.62	59.26
Student	17,387	37.89	97.15
Unemployed	80	0.17	97.32
Political, social or religious worker	35	0.08	97.40
All domestic duties	1,123	2.45	99.85
Others	44	0.10	99.94
Missing information	26	0.06	100.00
Total	45,891	100.00	

Source: Author's own computations using the 1999/2000 UNHS

Farm activities include crop, livestock, poultry, fishing, forestry and hunting. Farm employment is therefore the work done by persons who operate their own farms. These include employers, own account workers and unpaid family workers on farm activities. Non-farm activities comprise: mining; quarrying; manufacturing; electricity services; gas welding; water plumbing; conservation, sale, maintenance and repair of motor vehicles and motorcycles; wholesale and retail trade; mechanical and electrical workshops; hotels and lodging, bars, restaurants and canteens; transport and communication; finance, legal accounting and architecture; photographic activities; public service; defence; education; health; community service activities; hair dressing and beauty clinics and non-household farm employment. Individuals participating in political, social and religious activities are left out from this analysis given the fact that the data does not differentiate those doing it voluntarily from the non-voluntary

42 Main (usual) activity is defined as the normal activity situation pertaining to a person in respect of his or her participation in gainful or non-gainful activities during the last 365 days preceding the interview. The main activity is based on time but not monetary gain. For purposes of simplicity and due to data limitations, we ignored secondary activity.

43 Employer is a person who operates his or her own economic enterprise or engages independently in an economic activity, and hires one or more employees.

44 Own account worker is a person who operates his or her own economic enterprise without employing other people as helpers and work for his or her own or household's consumption or profit.

45 Unpaid family worker is a household member who works in an enterprise (farm or non-farm) operated by a relative living in the same households or at times in a different household without pay or profit

46 Government employees are those engaged in the civil, public and parastatal organizations in addition to the central and local governments.

47 Private employees are persons engaged by privately owned or registered companies

ones. However, it would have been ideal to include the non-voluntary ones in the analysis. Non-farm activities are further divided into wage employment and non-farm self-employment.

Wage employment refers to works for a fixed payment per time period (for example per hour, day or month) or per unit of work done (for example, a piece-worker who is paid for each piece completed). The location of the work is mostly at the employer's place of business, and hours and conditions of employment are set by the employer. The person should be paid regardless of the employer's profit and the payment can be in the form of cash or in kind. The person can be employed by government or private employer. Wage employees include; permanent employees, temporary employees and casual employees (UBOS, 2003a). Non-farm self-employment is the work done by persons who operate their own non-farm enterprises or are engaged independently in a profession or trade on own account or with one or a few partners. In this study, it comprises of employers, own account workers and unpaid family workers in non-farm activities. After data cleaning and dropping those involved in non-gainful activities, 14,633 observations were obtained and these form the sample that is used in the multinomial model in the next section.

Tables 5.2 and 5.3 show the individuals' participation in farm employment and non-farm employment by region and income quintile⁴⁸. A few issues relating to the distribution of activities are worth noting. First, there is a greater reliance on farm employment by rural households and individuals. On average, 88 percent of the individuals participate in farm employment. This is expected given the fact that Uganda is mainly an agricultural economy. All the regions and quintiles (poverty or welfare) groups had at least 81 percent of the individuals participating in farm activities. However, participation in farm activities declines as the welfare of the households where participating individuals live improves. Second, the importance of the other activities is relatively low in rural areas. Reliance on wage employment and non-farm self-employment is only 7 percent and 5 percent respectively, reflecting the limited but important roles these activities play in rural areas. From a spatial

⁴⁸ Income quintiles represent a break down of the sample by income groups: quintile 1 is the poorest group followed by quintile 2, quintile 3, quintile 4 and quintile 5 is the least poor. Income quintiles are based on the income per adult equivalent as developed by Appleton 2001 and generated according to national population.

dimension, participation in wage employment is more than non-farm self-employment in all the four regions. On the other hand, participation in wage employment and non-farm self-employment increases as household's welfare improves (Table 5.2). This shows the importance of these activities given that about 18 percent of the individuals in the fifth quintile participate in wage employment and self-employment as compared to 7 percent in the first quintile reflecting the ability of wealthy households to meet the pre-requisites for wage and self-employment.

Table 5.3 shows the regional distribution of participation in farm employment and non-farm employment by quintile. For all the regions, more than 90 percent of the poorest individuals (quintile 1) were involved in farm employment. The proportion of those involved in farm employment decreases as incomes increase for all regions. On the contrary, the proportion of individuals involved in wage employment and non-farm self-employment increases as incomes increase. This is true for all the regions and income groups except for quintile 2 in the Western region and quintile 3 in the Northern region.

Table 5.2 Individual Participation in Farm and Non-farm Activities, by Region and Quintile

		Employment activity			Total
		Farm employment	Wage employment	Non-farm self-employment	
Region	Central	88.02	6.93	5.05	24.04
	Eastern	87.70	6.80	5.50	27.30
	Northern	91.95	4.30	3.75	14.92
	Western	87.56	8.45	3.98	33.75
Quintile	1	93.31	3.92	2.76	20.01
	2	90.41	6.01	3.58	20.00
	3	89.08	6.11	4.81	20.00
	4	87.11	8.32	4.57	20.01
	5	81.90	10.72	7.38	19.98
Total		88.36	7.00	4.64	

Source: Author's own computations using the 1999/2000 UNHS

Table 5.3 Regional Distribution of Participation in Farm and Non-farm activities, by Quintile

Region/Quintile	Farm employment	Wage employment	Non-farm self-employment
Central region			
Quintile 1	91.67	6.60	1.74
Quintile 2	89.35	6.84	3.80
Quintile 3	91.97	4.24	3.79
Quintile 4	88.25	6.87	4.88
Quintile 5	84.03	8.64	7.33
Eastern region			
Quintile 1	94.60	2.27	3.13
Quintile 2	90.66	4.37	4.98
Quintile 3	88.17	6.10	5.73
Quintile 4	86.30	8.28	5.43
Quintile 5	75.87	15.03	9.10
Northern region			
Quintile 1	94.82	2.54	2.64
Quintile 2	92.31	4.14	3.55
Quintile 3	88.12	6.35	5.52
Quintile 4	89.04	5.94	5.02
Quintile 5	83.33	10.53	6.14
Western region			
Quintile 1	90.31	6.82	2.86
Quintile 2	89.84	7.74	2.42
Quintile 3	88.33	7.17	4.50
Quintile 4	86.31	10.06	3.63
Quintile 5	83.50	10.14	6.35

Source: Author's own computations using the 1999/2000 UNHS

The analysis of participation in different activities by gender and age group of individuals, land size owned and education is presented in Table 5.4. About 96 percent of the rural women in Uganda participate in farming as compared to 80 percent of the men. However, more men participate in both wage employment (13 percent) and non-farm self-employment (7 percent) than women (wage employment-1.6 percent and non-farm self-employment - 2.4 percent). This result is significant at 5 percent and shows that there is a gender bias in individual participation by employment activity, as more women tend to concentrate on farming activities than men. Participation in farm activities by sex of the household head is almost equally distributed for male and female-headed households (88 percent). The distribution is also consistent for wage employment (7 percent) and self-employment (5 percent). In terms of age groups and gender, women participate more in farming than men regardless of whether they are below or above 35 years (30 percent for women below 35 years and 28 percent for those above 35 years). This is the reverse with wage employment and non-farm self-employment activities where men of both age groups (below and above 35 years) participate more.

Table 5.4 Participation by Gender, Age, Land size owned and Education

Variable	Farming	Wage	Non-farm Self	Total
Individuals gender				
Women	95.90	1.66	2.44	100
Men	79.72	13.16	7.12	100
Gender of household head				
Women	87.34	7.71	4.95	100
Men	88.63	6.84	4.54	100
Age group by gender				
Men < 35	18.60	44.84	36.19	21.25
Women < 35	29.87	8.17	18.32	27.81
Men >= 35	23.41	42.51	35.60	25.32
Women >= 35	28.12	4.47	9.90	25.62
Land ownership				
Land size	4.51	4.03	4.31	4.46
Land per adult	1.74	1.44	1.70	1.71
Education level of individuals				
No education	31.82	16.15	13.29	29.87
Primary	57.45	43.39	63.07	56.73
Secondary	10.27	30.25	22.75	12.25
Tertiary	0.45	10.21	0.89	1.15
Education level of household heads				
No education	43.85	42.32	40.32	43.58
Primary	48.54	50.39	48.74	48.68
Secondary	6.91	6.61	10.49	7.06
Tertiary	0.70	0.68	0.44	0.68

Source: Author's own computations using the 1999/2000 UNHS

The average land size of the households in which the sample individuals live is 4.5 acres. The average land size by activity is highest in farm employment (4.5 acres). This situation could be due to the fact that those with land resort to farm employment. The average distribution of land per adult is 1.7 acres. Adults involved in farm employment and non-farm self-employment own on average 1.7 acres while those in wage employment own 1.4 acres. This is an interesting finding given that Uganda is said to have abundant land and yet the average land size per household even for those in farming is just 4.5 acres.

The education level of individuals and household heads is also summarised in Table 5.4. More than 57 percent of those in farming have primary education followed by 32 percent with no education. On the other hand, 43 percent of those in wage employment have primary education followed by secondary education with 30 percent. Non-farm self-employment has the highest percentage (63 percent) with primary education. The results show that individuals with secondary and tertiary education participate more in wage employment as compared to farm employment and non-farm self-employment. Turning to participation by education of the

household head, the highest percentages of household heads in all the three employment activities have primary education followed by no education. Compared to participation by individuals' education where there is a divergence, the distribution of participation by household head is not very different within the same education level. In total, about 85 percent of the individuals in farm employment and 92 percent of the household heads have either primary or no education. This shows the low levels of education amongst individuals in rural Uganda.

The next section shifts the focus from the descriptive statistics to the derivation of shadow wages used in the determinants of participation in different activities among rural individuals.

5.6.2 Estimation of Shadow Wages for Participation in Farm Activities for Rural Areas in Uganda

Before exploring the role of individual, household and community variables on participation, this section explains how the marginal products and shadow wages for farm employment are derived. The process of computing the marginal product of labour in farm activities (shadow wage) was described in detail in the theoretical model presented in the earlier sections of this thesis. The estimation of the shadow wage was based on Skoufias, (1994) and Jacoby (1993). Similar approaches have been used in Ethiopia (Mekonnen, 1998) and Uganda (Okwi, 2005).

In practice, an estimate of the shadow wage is obtained from the marginal product of each family labour type in farm activities or from the marginal productivity of family labour in production of Z goods. As in Skoufias (1994), detailed data on crop production and inputs are used to estimate the marginal productivity of family labour. The basis is the parameters derived from the agricultural production function explained earlier. This approach is considered invaluable in the estimation of the value of labour of household members who work on their own farms. As indicated in equation 23, the dependent variable (value of crop production) and a number of inputs such as seeds, male and female labour (hired and own), land, location and value of all other inputs are included in the model.

The initial step in deriving shadow wages is to obtain marginal products of family male and female labour. This is done by estimating a Cobb-Douglas⁴⁹ production function with participation by family male and female labour and hired male and female labour as specified in equation 23. A total of 6,625 households are considered in the estimation of shadow wages. Table 5.5 contains the empirical definitions and summary statistics of the variables used in the analysis.

Table 5.5 Description, Mean, and Standard Deviation of Variables used in the Estimation of the Agricultural Production Function

Variable	Description	Mean	Linearized Std. error
Lncropinc	Crop income in logs	12.914	0.023
Lnmalefamir	Number of family males working on family farm	0.900	0.009
Lnfemafamir	Number of family females working on family farm	1.266	0.009
LnMalehired	Number of males hired	0.354	0.008
LnFemahired	Number of females hired	0.199	0.006
Lnchildcrop	Number of family children working on family farm	0.471	0.008
Lnotherinpr	Cost of other inputs	2.483	0.074
Lnseedcostyr	Cost of seeds	9.383	0.020
Lncroplandyr	Amount of land under crops	1.510	0.011
Transpasset	Dummy for ownership of transport assets	0.503	0.008
Hseasset	Dummy for ownership of house assets	0.953	0.003
Livestckast	Dummy for ownership of livestock assets	0.589	0.007
Reg4	Region dummy for Western	0.291	0.006
Reg2	Region dummy for Eastern	0.298	0.006
Reg3	Region dummy for Northern	0.163	0.007
Sexhh	Sex of household head	0.768	0.006
Hhnoeduc	Head has no education	0.426	0.007
Hhseceduc	Head has secondary education	0.071	0.004
Hhterteduc	Head has tertiary education	0.005	0.001
Residuals	Error term	12.891	0.011

Source: Author's own computations using the 1999/2000 UNHS

Given the functional form used in the estimation (equation 23), the marginal product of labour on farm was computed as the product of labour input elasticities and the ratio of predicted quantity to household labour inputs (equation 23 and 24). For households with zero crop income, the shadow wages are obtained by using the maximum shadow wage rate (marginal product) for male and females respectively. This is because it is assumed that these households have an equally high opportunity cost for participating in farm activities.

⁴⁹ Given the presence of zero values in some inputs, the logarithmic transformation was carried out by adding one to all input levels (i.e., $\ln X = \ln(X+1)$).

The marginal products for household male and female labour used in farm production are 0.09 and 0.74, respectively. The dispersion as measured by the standard deviation was 0.07 and 0.44 for men and women, respectively. As expected, family female labour seems to have a bigger effect on farm output compared to family male labour, probably due to the nature of the operations typically performed by family females (e.g., sowing, transplanting and weeding). These results are consistent with the findings of Skoufias (1994) and are consistent with the hypothesis that female family members make larger contributions to farm output compared to male family members. If the physical marginal products are converted to monetary units using average market wages for male and female labour by region, then shadow wages are derived for the different regions, respectively. The shadow wages for females range from US\$ 2,027 to US\$ 61,263 and 1,503 to 6,285 for men in the four regions. Tests for the difference of means show that they are statistically different between men and women across regions. It is also evident that the shadow wages for both male and female family labour are lower than the market wage for all the regions. A test for the equality of shadow wages and the observed market wages shows the presence of transaction costs or frictions in the rural labor market in Uganda. Both the market wages for males and for females are higher than the respective shadow wages for males and females. Details of the observed market and shadow wages are presented in Table 5.6.

Table 5.6 Distribution of Farm Shadow and Market Wages for Men and Women, by Region

Region	Men				Women		
	Shadow wage		Linearized Std. Error	Market wage Mean	Shadow wage		Market wage Mean
	Obs	Mean			Mean	Std. Error	
Central	1676	2391	43.80	24522	8488	117.70	11507
East	1843	2114	44.88	22627	3669	64.86	5464
North	1011	2649	79.19	25894	24348	577.16	30797
West	2095	2232	36.98	22537	5958	76.99	7601

Source: Author's own computations using the 1999/2000 UNHS, UBOS (2003c) and GOU (2006)

Finally, it is important to note that the estimated marginal products for family male and female labor and the derived shadow wages are household-specific and thus take

on the same value for different individual members of the household of the same gender.

5.6.3 Determinants of Participation in Farm and Non-farm Activities among Rural Individuals

This section presents the results of the econometric analysis of the discrete choice model (multinomial logit model) that analyzes the determinants of individual's participation in farm employment, wage employment and non-farm self-employment activities in rural Uganda. The analysis is done with a total of 14,633 individual adults (15 years and above) and follows the theoretical framework presented in the previous sections of this chapter. This study captures main (usual) activities of the individuals. However, only 26 percent of the sample used in the analysis indicated having a secondary activity. For the multinomial logit estimation, participation in farm employment is the choice comparison. The explanatory variables that are used in the analysis are derived on the basis of the theoretical framework presented earlier in this chapter and are categorized as individual, household, community and location characteristics. The model draws on the broader literature exploring labour supply decisions in farm households (Skoufias, 1994; Adhikari *et al.*, 2004; Kimhi and Rapaport, 2004; Sadoulet *et al.*, 1998; Abdulai and Delgado, 1999; Jacoby, 1993; Low, 1986; Mekonnen, 1998; Okwi, 2005)

Individual characteristics include age, gender and education level. The household characteristics include marital status of the household head, household composition by age and gender, land asset per adult, shadow wage by gender, ownership of agricultural assets, transport asset and livestock. Information on individual and household characteristics was obtained from the socioeconomic data. The male and female shadow wages were computed using crop data for farm inputs and the socioeconomic data as discussed in the previous section. Community characteristics were obtained from community data and include access to electricity, credit, and distance to the nearest district headquarters. Regional dummy variables were included in order to take care of regional labour market differences. Some studies have used district dummies instead of regional dummies, but in Uganda, it was found that there are no

significant differences between districts within a region. This study therefore used regional dummies rather than district variables.

Table 5.7 presents the regression results, with coefficients significant at 1 percent, 5 percent and 10 percent highlighted with asterisks. The marginal effects in the table represent the percentage change in the probability for an infinitesimal change in each independent, continuous variable and the discrete change in the probability as each dummy variable moves from 0 to 1. In assessing these marginal effects, all other variables are taken at their means.

The results show that individual characteristics affect participation in wage employment and non-farm self-employment relative to the base category of farm employment. The age of the individual significantly affects participation and shows the expected life cycle pattern. Younger individuals are more likely to participate in wage employment and non-farm self-employment in the early stages of life compared with farm employment. This is consistent with the findings of Smith (2003) who noted that it is generally the younger household members who migrate in search of non-farm income-earning opportunities. However, as they grow older, they reach a stage where they begin to participate less in both wage employment and non-farm self-employment because they are old and less active, hence they resort to farm employment. In other words, a one year change in the age of the individual would increase participation in both wage employment and non-farm self-employment during the early years of adulthood and decrease participation as the individual grows older. This accurately depicts the situation in rural Uganda as people retire from public service and other self-employment jobs, they tend to settle in rural areas and participate more in farming. The results are also consistent with the life cycle capital accumulation and the relative capital entry requirements of activities (Corral and Reardon, 2001).

Gender has a significant role in the choice of an activity. The results show that men are more likely to participate in wage employment and non-farm self-employment than women. This implies that men participate in non-farm activities as women work on the farm. This is consistent with the expected results since most women in rural areas of Uganda are confined to farm activities and household chores.

Table 5.7 Determinants of Individual Participation: Multinomial Estimation with Farm as a Comparison Choice (Marginal Effects)

Variables	Wage employment		Non-farm self-employment	
	Coefficient	s.e	Coefficient	s.e
Individual variables				
Individual's age	0.053	[0.021]**	0.080	[0.028]***
Age squared	-0.001	[0.000]***	-0.001	[0.000]***
Individual's sex (Male =1)	2.360	[0.181]***	1.011	[0.184]***
Individual has no education	0.157	[0.106]	-0.469	[0.144]***
Individual has secondary education	1.329	[0.097]***	0.654	[0.105]***
Individual has tertiary education	3.324	[0.253]***	0.934	[0.506]*
Household variables				
Marital status of household head	-0.075	[0.102]	-0.044	[0.107]
Men below 35 years in a household	-0.049	[0.150]	0.102	[0.174]
Women below 35 years in a household	-0.332	[0.258]	-0.715	[0.220]***
Log of land per adult	-0.060	[0.074]	0.009	[0.080]
Household owns agricultural assets	-0.006	[0.233]	-0.237	[0.224]
Household owns transport asset	-0.001	[0.094]	0.032	[0.093]
Household owns livestock asset	-0.101	[0.090]	0.023	[0.093]
Log of shadow wage for males in household	-0.155	[0.017]***	-0.145	[0.016]***
Log of shadow wage for females in h/hold	0.058	[0.016]***	0.080	[0.018]***
Community variables				
Community has electricity	0.374	[0.169]**	0.463	[0.153]***
Community's access to formal credit	0.140	[0.098]	0.145	[0.109]
Log of distance to nearest district h/quarters	-0.111	[0.056]**	-0.142	[0.061]**
Locational Dummies				
Household located in central region	-0.253	[0.114]**	-0.015	[0.140]
Household located in eastern region	-0.450	[0.127]***	-0.318	[0.138]**
Household located in northern region	-0.798	[0.155]***	-0.461	[0.195]**
Fitted values	-0.183	[0.082]**	-0.205	[0.085]**
Constant	-1.552	[1.189]	-1.198	[1.283]
Observations	14633		14633	
Standard errors in brackets				
* significant at 10; ** significant at 5; *** significant at 1				

Source: Author's own computations using the 1999/2000 UNHS

However, the result varies between wage employment and non-farm self-employment, with wage employment having a higher coefficient than non-farm self-employment. Clearly, men would rather gravitate toward wage employment whose income is certain than self-employment which is unpredictable and seasonal in certain cases. This result confirms the descriptive results presented in Chapter Three and also shows that participation in rural activities is gender-biased.

Education plays a significant role in determining participation in farm employment and non-farm activities. An interesting pattern that emerges from the results is the positive association between secondary and tertiary education, and the likelihood that the individual participates in non-farm wage and self-employment. This conforms to the relative entry requirements of non-farm activities. It is important to note that wage employment has a higher coefficient in terms of level of education than non-farm self-employment. However, in both wage employment and non-farm self-employment, the coefficients increase as education level goes higher. This shows the importance of education in non-farm employment. This is because education is an exit path from low paying farm activities to better paying wage and self-employment activities. Higher level of education is a key factor in determining participation in the more remunerative non-farm activities. In rural areas of Uganda, like in many other developing countries, gains are greatest for those who study beyond primary education compared to those with only primary or no education. This is because they have some basic skills and therefore a significantly higher likelihood of participating in better paying non-farm wage and self-employment. Reardon (1997) shows that better educated individuals have better access to any non-farm employment on offer, and are also more likely to establish their own non-farm business (self-employment). These results agree with those of Evans and Ngau (1991) for a rural zone in Kenya, as their regressions show that more education means greater non-farm income. The findings of *de Janvry and Sadoulet* (2001) in Mexico also confirm this result as they show that for individuals who went beyond secondary education, gains are greatest because they are more likely to find jobs in remunerative non-farm employment.

The results at the household level show that household composition has a role to play in choice of activity. Younger females (women less than 35 years old) are more engaged in farm work and less in non-farm self-employment. This is the age group that is most able to work on the farm according to African tradition. They participate less in non-farm self-employment. This result is consistent with the theoretical expectations that labour allocation decisions in the household are sometimes based on gender. Thus, young women tend to take on more tasks on the farms, more especially in the planting and harvesting season when labour demands for agriculture are highest. This result is consistent with findings of Okwi (2005) for rural areas of Eastern Uganda. With more young women in the household, the other groups tend to

decrease their participation in farm work, probably diverting their labour to other market based activities such as non-farm self-employment. This result supports the common belief that women are the pillars of agricultural production in Uganda.

The shadow wage for men and women brings out interesting results. Surprisingly, males respond to changes in opportunity costs of farming by cutting down their participation in wage employment and non-farm self-employment. A higher shadow wage for males reduces participation in wage employment and non-farm self-employment. This implies that as the male shadow wage increases, more male labour is supplied to farming activities and hence an upward sloping male labour supply in farming. On the contrary, a higher shadow wage for females increases participation in wage employment and non-farm self-employment activities. This leads to a backward bending female labour supply in farming. These results are similar to the findings of Skoufias (1994) in rural India and Jacoby (1993) in Peru. This could be capturing the income effect on target workers. Given that wages in non-farm activities are always assumed to be higher than those in farm employment, women would prefer working in non-farm activities once they have achieved the target (mainly food for home consumption) and would prefer to go out and get higher income from non-farm activities. This could suggest that farm employment is inferior to non-farm employment in the face of the women and therefore they would prefer to get involved in non-farm employment once they achieve a target in farm employment.

The results for men can be explained by the fact that either men will have achieved an income target from non-farm activities or men are usually pushed to non-farm activities because of low wages in farm employment. This implies that farm employment has the characteristics of a normal good in the face of men in rural Uganda. This result may also be explained as an indication of men's relative valuation of the opportunity costs of their labour and by the fact that since farming is critical to household survival, when labour shortages occur in the household, men may come in to save their households by working on their own farms. This result is consistent with the theoretical predictions and further confirms that shadow wages have a significant effect on participation of individuals in farm employment and non-farm employment.

Community variables are shown to affect participation in farm employment and non-farm employment. Access to electricity increases participation in wage employment and non-farm self-employment. Availability of electricity in the community makes a difference in terms of the activities that can be undertaken. Electricity significantly enhances business opportunities and production and therefore attracts individuals to participate in self-employment activities such as welding, wood work, tailoring, and also encourages them to seek employment in small scale industries such as agro-processing that may have been set up in the area while diverting them from farm activities. A unit change in the availability of electricity within communities is associated with a positive and significant effect of participation in wage employment and self-employment. These findings about the role of the infrastructure variables are particularly important as infrastructural provision is, potentially, a policy activity.

Another interesting result is the distance from communities to the nearest district headquarters. A longer distance from district headquarters negatively affects wage employment and non-farm self-employment. District location affects the supply of opportunities⁵⁰ by decreasing individuals' participation in non-farm employment. In other words, the further the distance to the district headquarters the lower the participation in non-farm employment, hence increasing participation in farm activities. For rural individuals, ease of access to the district headquarters is key to participation in remunerative non-farm employment. Clearly, there is limited wage employment opportunities in rural areas compared to district headquarters. This result is consistent with the findings of *de Janvry and Sadoulet (2001)* in rural Mexico. It justifies our previous community related variable on electricity given that most district headquarters have electrical installations and tend to be business as well as administrative centres.

Finally, there are variations in terms of participation due to regional location. Compared to the Western region, there is less participation in wage employment in the Eastern and Northern regions. Individuals in the Western region, which is more dynamic and wealthy, are better placed for access to non-farm employment. The basic reason for this situation could be that the Western region is well endowed in terms of

⁵⁰ In rural areas of Uganda, district headquarters are usually provided with better infrastructure like water, roads, electricity, social services and shops, hence they act as business centres for the rural communities.

infrastructure and has more opportunities in terms of wage employment and non-farm self-employment. The descriptive results show that the Western region has the highest proportion of households in quintile 5.

5.7 Conclusion

The estimation of an empirical model has shown itself to be useful in highlighting a number of factors that play a surprisingly large role in the determination of participation in farm employment and non-farm employment in rural Uganda. Participation has been categorized into three: farm employment, wage employment and non-farm self-employment. All these activities are important sources of income for rural households. Participation in farming is highest for the poorest quintile and least for the individuals that are better off, whereas, it is the reverse for wage employment and self-employment. There is a gender bias in individual participation by employment activity, as more women tend to concentrate in farming activities than men.

This chapter applied an econometric approach that permits estimation of the determinants of participation in farm employment and non-farm employment of farm household members under the alternative and more plausible assumption of non-separability. Using household survey data from rural Uganda, estimates of the marginal productivities of family male and female labor were derived from a Cobb-Douglas agricultural production function. Marginal products and shadow wages for male and female household labour indicated that females contributed more to agricultural production than males in rural Uganda.

According to the empirical results, it is observed that individual, household, community and location characteristics all play an important role in explaining participation in farm employment and non-farm employment in rural Uganda. Key among the determinants are: age (positive for wage employment and non-farm self-employment); education (positive for higher education); gender (positive for men for wage employment and self-employment); number of women below 35 years (negative for non-farm self-employment); shadow wage for males (negative for wage employment and self-employment) and shadow wage for females (positive for wage

employment and self-employment). The use of the estimated shadow wages in a structural model of determinants of family members' participation in farm employment and non-farm employment indicated that individual family members respond significantly to changes in the household's economic opportunities (shadow wages).

Other important variables in determining employment in rural Uganda include: access to electricity (positive for wage employment and non-farm self-employment); distance to district headquarters (negative for wage employment and non-farm self-employment), and location by region (with limited wage employment opportunities for individuals in the Eastern and Northern regions). These results point towards the need for a review of the rural development strategies in Uganda and generally conform to theoretical expectations. This is discussed in Chapter Seven.

CHAPTER SIX

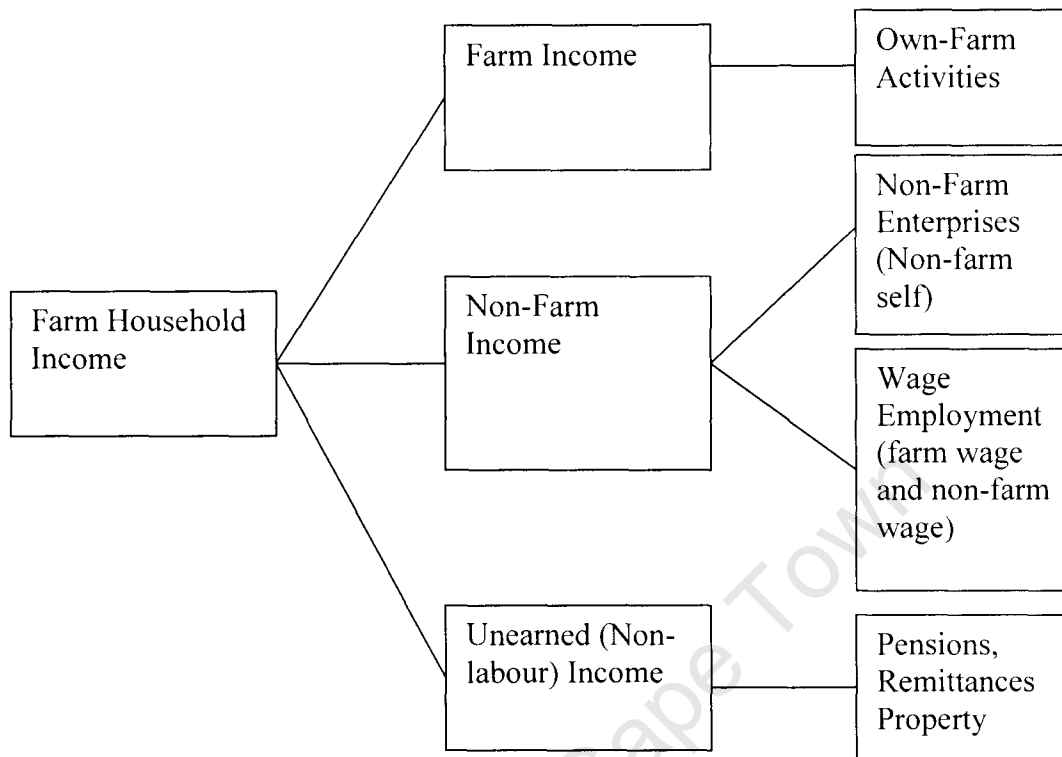
DETERMINANTS OF INCOME DIVERSIFICATION AND SHARES

6.1 Introduction

This chapter discusses the determinants of household income diversification in rural Uganda. It further discusses the determinants of income shares in total household income. Unlike Chapter Five, which considers the individual as the unit of analysis, this chapter takes the household as the unit of analysis. This is because diversity of sources of income observed at the household level results from diversification among the individual members of the household, not diversification by individuals (*de Janvry and Sadoulet, 2001*). It was important to look at the determinants of rural employment by the economically active individuals in rural Uganda (Chapter Five) before discussing income diversification. This is because the ability of households to diversify their income sources depends largely on the characteristics of their economically active members (*Stifel, 2007*).

The analysis in this chapter is done primarily to understand the important factors determining a household's decision to obtain income from more than one source (income diversification), and also determine whether a household will obtain income from one source versus another source. Potential sources of income are likely to vary substantially in importance among households and exhibit wide variations in their attractiveness as sources of pecuniary gain. These variations between components of income have a major effect on the decision making of households and there is need to understand the importance of each income source. Figure 6.1 systematises the diverse income sources of rural households in Uganda.

Figure 6.1 Potential Sources of Farm Household Income in Rural Uganda



Source: Adapted from Davis and Pearce (2001)

Figure 6.1 shows that household income sources are divided into three major categories: farm income, non-farm income and non-labour income. Farm income and non-farm income form what is referred to as “earned income”. Non-farm income can further be categorised as non-farm self-employment income and wage employment income. Wage employment income includes farm wage income and non-farm wage income. This follows Davis and Pearce (2001) and *de Janvry and Sadoulet* (2001). However, as mentioned in the previous chapter, some scholars (Reardon *et al.*, 2001; Stifel, 2007; Barrett *et al.*, 2005; Reardon, 1997; Barrett and Reardon, 2000; and Barrett, Reardon and Webb, 2001) have included farm wage income as part of the farm category. Clearly the ideal situation is one in which one does not have to make an assumption either way and rather use separate information on farm wage income, non-farm wage income, non-farm self-employment, own-farm income and non-labour income and to explicitly explore the interrelationships between these five. In nearly every situation, this is not possible. Barrett, Reardon and Webb (2001) highlight that analysts are constrained by the design of the survey data they have to use. The income data used in this thesis does not differentiate between farm wage income and non-

farm wage income. Farm wage income and non-farm wage income data were collected as employment income.

The analysis of determinants of income diversification and income shares considers four income sources: farm income, non-farm self-employment income, wage employment income and non-labour income. An income diversification index is computed using the inverse of the Herfindahl index approach. Then, ordinary least squares (OLS) estimation is used to find the determinants of this income diversification. Despite this, there is a need to look at the determinants of income shares to be able to understand why some households are able to generate more income from one income source versus the others. The Tobit approach and the censored least absolute deviation (CLAD) are used to estimate the determinants of the income shares. The use of these two approaches is to be able to find the best alternative estimator and results. This chapter is organised in three major parts. The next section reviews both the theoretical and empirical studies of income diversification in developing countries. This is followed by the empirical strategy of estimating income diversification and income shares. A discussion of the results is presented in section 6.4 and the conclusions are presented in the last section

6.2 Income Diversification and Shares: A Review

This section is divided into two sub-sections. The first sub-section reviews the theoretical literature while the second sub-section presents the empirical literature. The literature on rural income shows that non-farm income accounts for a considerable share of farm household income in rural Africa, more than in other regions in the world (Reardon, 1997; Reardon *et al.*, 1998). These studies show that rural households obtain income from farm employment and non-farm employment. The key question that is asked in many studies of income diversification behaviour is, why do households diversify income? A number of theoretical and empirical studies try to answer this question.

6.2.1 Theoretical Review of Income Diversification

Reardon (1997), Barrett and Reardon (2000) and Barrett *et al.* (2001) provide a detailed discussion of the theoretical literature and conceptual issues on income diversification. Income diversification by rural farm households emerges naturally from diminishing or time-varying returns to labour or land, from market failure, for example, for credit or friction, for example, for mobility or entry into high-return niches, from *ex ante* risk management, and from *ex post* coping with adverse shocks (Barrett *et al.*, 2001:8).

Where returns to productive assets vary across time, for example, land, labour or livestock across dry and wet seasons or among individuals within a household, data aggregated across time (seasons) or individuals will exhibit diverse activities and incomes. Such aggregation accounts for a substantial proportion of the diversification reported in income or activity diversification empirical studies (Barrett *et al.*, 2001; Barrett *et al.*, 2005). This is the case in rural Uganda where women work on own household farms as men go to work on other people's farms during the peak agricultural season of planting and harvesting.

Income diversification can also be explained by incomplete markets, for example, for labour, land, credit, or insurance. In situations of perfect markets, the concern about income diversification and potential income gains from the rural non-farm sector appears unmotivated. However, under missing or imperfect labour and price markets that prevail in Uganda and many developing countries (as discussed in Chapter Five), the situation is different. Incomplete or missing markets for key goods and services such as labour (Fafchamps, 1993), food (*de Janvry et al.*, 1991; Omamo, 1998), credit (Eswaran and Kotwal, 1986; Rosenzweig and Wolpin, 1993), insurance (Bromley and Chavas, 1989) and land (Barret *et al.*, 2001) can exert considerable influence on rural agricultural production. In the presence of imperfect markets or absence of consumption, credit and farm products insurance markets, and an ineffectual social safety net⁵¹, households will be forced to diversify their income sources (Reardon, Delgado and Matlon, 1992).

⁵¹ Reardon (1990), in a review of survey evidence from Northern Nigeria, Senegal and Burkina Faso, found that inter-household transfers were only a small part of income and consumption and highly insufficient to compensate farming shortfalls.

Missing land markets and labour market imperfections, for example, can explain why a household with skilled carpenters and land asset will spend scarce time farming although their comparative advantage lies in carpentry. In the absence of land markets and in the presence of labour market imperfections that preclude the skilled carpenters from simply hiring others to work for them on their land, the optimal use for the household labour may well include working on their own farm, else their land asset returns nothing to the household. Observed income diversification for this kind of household would then be attributed primarily to the absence of markets⁵². The labour market imperfections in rural Uganda sometimes make household members with different skills work on the household farms even if they have a comparative advantage in non-farm wage employment. In addition, the absence of a land market pushes rural households in Uganda to grow food on their land.

In a similar way, in the absence of well functioning land markets, a household that is endowed with much labour but relatively little land will have some labour work on their own farm, and hire some labour for non-farm activities mainly farm wage employment if the household members cannot find employment in other non-farm activities (Barrett *et al.*, 2001). This is because individual factors of production face diminishing returns in most productive activities. When individuals or households are not endowed with the ratio that maximises profits at prevailing shadow prices and there are not well-developed asset markets through which they can exchange assets to achieve the optimal mix, diversification becomes the natural response. Households rationally allocate assets across activities to equalize marginal returns in the face of fixed complementary assets (such as land) or mobility barriers to expansion of existing farm or non-farm enterprises. For the poorest, this means highly diversified portfolios with low marginal returns, which is a desperation-led diversification (Barrett *et al.*, 2001; Reardon *et al.*, 2000; Little *et al.*, 2001).

Income diversification is said to be a norm (Barrett *et al.*, 2001), especially among agricultural households whose livelihoods are vulnerable to climatic uncertainties. For households facing substantial crop and price risks and consequently farm income risks, there is a strong incentive to diversify their income sources. Rosenzweig (1988)

⁵² This study uses the concept of “absence of markets” in the sense of *de Janvry et al.* (1991), meaning that for the household under study, transport and search costs would make it irrational to participate in the market even if it exists.

emphasises that as long as households prefer to smooth their consumption over time and/or are risk averse, resources will in part be allocated to minimise the risk in income and/or to smooth consumption. Theory predicts that households that are risk averse and face returns across sectors that are not perfectly correlated will diversify their sector income to reduce overall risk (Reardon *et al.*, 1998; Reardon, 1997; Reardon *et al.* 1992). Mellor (1976) and Hazell and Roell (1983) suggest that in the presence of imperfect markets, risk neutral farmers will divide their labour supply between farm and non-farm employment opportunities such that the expected marginal returns to all activities are equal. However, if farmers are risk averse, less time will be allocated to the more risky jobs when the expected returns are the same. Alternatively, the farmer will accept lower wages in a less risky environment, which is commonly termed as “paying a risk premium”. Non-farm labour can be used by farmers to reduce the total variance of their income, which is the overall risk, or to increase the total returns to labour. Diversification is a primary means by which many households reduce risk.

In principle, risk related income diversification could be accomplished mainly through financial asset diversification. However, both credit and insurance markets in low-income countries are beset by moral hazard, information problems, and covariance of crop output over households within a given region (Biswanger, 1986). The consequence is severely under-developed credit and insurance markets, which is the case in rural Uganda. The absence of a well functioning capital market in developing countries often means that some diversification strategies are not feasible for some households (Stifel, 2007). This means that households are unable to smooth consumption in the absence of complete credit and insurance markets. When financial markets (for credit and insurance) are complete, economic theory suggests that individuals or households will consume only the permanent portion of income and save (dissave) any transitory positive (negative) earnings. If households are risk averse, they would purchase insurance to relieve themselves of income risk.

Lack of financial services remains a key problem limiting households from involving in non-farm activities especially non-farm self-employment in Ugandan (Beijuka, 1999; GOU, 2000b). Financial services provision in Uganda is hampered by poor physical and communication infrastructure and by a weak legal system that makes it

difficult to penalise defaulters. For example, access to formal credit hindered diversification in both Kumi and Rakai districts (Beijuka, 1999). For institutional, infrastructural, technological, and information reasons, financial markets are incomplete in rural Africa. In this situation, households must act outside of financial markets in order to reduce consumption variability driven by real income variability (Barrett *et al.*, 2001).

Understanding whether households respond to new opportunities in the non-farm sector (demand-pull) or are driven to seek non-farm employment because of no opportunities in the farm sector (distress-push) has been a key area of discussion in the income diversification literature (Davis and Pearce, 2001). Household's income diversification is a result of "pull" and "push" factors. Pull factors are a result of returns to RNFE being higher than returns to farming or when returns to farming are more risky (Reardon *et al.*, 1998). Examples of such pull factors include: potentially lower risk; higher returns and greater social status attributed to non-farm activities. Conversely, push factors are a result of inadequate farm output; limited opportunities for consumption smoothing (credit and crop insurance), or absent output markets. In particular, households are thought of being pushed to engage in non-farm employment because of imperfections in inter-temporal and factor markets and/or entry barriers to high return activities (Deininger and Olinto, 2001). Examples of such push factors include: lack of access to productive resources (such as land) to expand farm output, risk to the farm production and lack of access to credit. Households that are "pushed" into non-farm activities resort to diversification as a safety net. It is the incentives that either pull or push households to diversify. However, a household may have the incentive to participate in non-farm employment and have a diversified income source. For example, because of higher wage rates offered in non-farm activities, but if the capacities are not in place (such as skills to qualify for the job), then even though the incentives are in place, the households will not take advantage of them.

The idea of push and pull factors has led to diversification being termed as either "distress-push" or "demand-pull" (Davis and Pearce, 2001). Distress-push diversification is as a result of push factors and will dominate in rural areas which have one or more of the following characteristics: geographical isolation, low quality physical infrastructure, low human capital, undeveloped markets, scarcity of

resources, or recent shocks to the natural environment, economic system or agricultural sector. On the other hand, demand-pull diversification is possible in the presence of expanding technological innovations (whether within or outside agriculture), market development or intensifying links with markets outside the local economy. Table 6.1, adapted from Davis and Pearce (2001), outlines the key features of demand-pull and distress-push.

Table 6.1 Push and Pull Factors of Rural Income Diversification

Push factors	Pull factors
<ul style="list-style-type: none"> • Population growth • Inadequate access to fertile land • Low farm productivity • Low returns to farming • Lack of access to farm input markets • Decline of the natural resource base • Temporary events and shocks • Lack of access to rural financial markets 	<ul style="list-style-type: none"> • Higher return on labour in the non-farm activities • Higher return on investment in non-farm activities • Lower risk of non-farm activities compared to on-farm activities • Economic opportunities, social advantages offered in urban centres and outside the region or country • Appeal of urban life to younger people • Generation of cash to meet household objectives

Source: Davis and Pearce (2001)

Distress-push and demand-pull diversification activities will be more clearly and separately observed as income inequality increases (Davis and Bezemer, 2004). One implication of the distress-push and demand-pull diversification approach is that the distribution of diversification activities over households would follow a bi-modal distribution over households' incomes. There would be two clusters of low return and high return activities, in which the poor and affluent households are engaged respectively⁵³. If distress-push diversification dominates, it is expected that poorer households are more involved in diversification than others. In the case of predominantly demand-pull diversification, it is expected that higher income households engage more in non-agricultural diversification than the poorest households. This relationship between returns to diversification activities and income

⁵³ This kind of distinction does not take care of households that are neither rich nor poor. Studies that have analysed RNFE and diversification tend to distinguish between the extremes of the poor and the rich and yet the situation on the ground does not often have this clear cut. It is often important that diversification typologies are not over simplified. This study uses quintiles to take care of the different household categories.

levels of households engaged in them is reflected in some empirical findings on rural diversity (Seppala, 1996; Carter and May, 1999).

It is worth noting that there are a number of diversification typologies in the literature (Davis and Bezemer, 2004). Based on the peasant economics theory (Ellis, 1993), income and activity are the key focus areas in analysing diversification. The income-driven non-farm diversification hypothesis assumes that diversifiers are after profit maximisation. On the other hand, the activity-driven non-farm diversification emphasises the different comparative advantage of household members as underlying incentives for non-farm diversification. Thus, two types of non-farm diversification may be defined as follows: first, income-driven diversification coincides with a period of capital accumulation including financial, social and information. Second, activity-driven diversification, often occurs later when capital accumulation has already taken place. However, income and activity – driven diversification sometimes overlap or occur at the same time. Income diversification does not necessarily exclude activity diversification and for many households capital accumulation is the consequence of income diversification and not the aim of income diversification.

Davis and Bezemer (2004) argue that the diversification process is comprised of two phases. First, the income dominant phase that is more linked to the aim of covering households' basic needs. This phase will be dominant so long as meeting of basic needs is the households' main priority, as reflected in low levels of income. When incomes are securely above a particular threshold, a certain amount of capital (whether financial, education, physical or land) may be accumulated. This is a consequence of the income diversifying stage. This then enables the activity diversification motive to become more important, allowing household members to pursue their comparative advantages in selecting particular activities, free from the necessity of catering for basic needs by whatever means available to them.

The inherently risky nature of agricultural production and its effects on food security, coupled with lack of insurance markets in rural areas, underdevelopment of credit markets, information and incentive problems provide strong explanations for the dominance of the family farm in sub-Saharan Africa and the cause of market imperfections. Risk explains the division of labour between different activities in rural

areas, both within agriculture and between agricultural and non-farm activities. With these conceptual issues as backdrop, the next section looks at the patterns that exist in the empirical evidence on the determinants of income diversification and income shares in developing countries.

6.2.2 Empirical Review of Income Diversification and Shares in Developing Countries

This section reviews the empirical findings of income diversification studies in developing countries. The variables used in the estimations in the latter sections of this chapter are derived from what is found in these other studies and how this relates to the situation in rural Uganda. In line with the above theoretical review, recent rural income diversification research has shown a positive correlation between higher diversification and a number of qualitative factors such as household size, the level of education, access to infrastructure and access to credit and financial assets (Block and Webb, 2001; Deininger and Olinto, 2001; Ersado, 2006; Escobar, 2001; Barrett, Reardon, and Webb 2001; Barrett, Bezuneh, and Abound, 2001; Barrett *et al.*, 2005; and Stifel, 2007).

Block and Webb (2000) found strong evidence that income diversification is positively determined by the dependence ratio, age of the household head and level of livestock ownership. A higher dependence ratio (lower proportion of working adults compared with children and non-working elderly) derives a larger share of income outside farming in rural Ethiopia. This was a similar finding by Barrett and Reardon (2000) in African agriculturalists areas. Smith *et al.* (2001) indicate that in Rakai and Kumi districts in Uganda, high dependency ratios which are attributed to HIV/AIDS have encouraged group formation to pool resources intensively to start-up non-farm enterprises especially by women. Block and Webb (2000) further show that female headed households have lower levels of diversification. They also show that location determines income diversification. Households located in the highlands tend to have higher levels of diversification as compared to those in lowlands in rural Ethiopia. Stifel (2007) found that households have diversified income sources in rural Madagascar. Stifel finds education to be the major factor determining rural labour earning. Returns to schooling are largest among those in non-farm sector, and among

wage employed in particular. Ersado (2006) found that the gender of the household head is negatively associated with income diversification. Female headed households are less likely to diversify income sources in rural Zimbabwe. Higher rainfall and access to credit increase income diversification in rural Zimbabwe.

The findings by Escobal (2001) in rural Peru show that 51 percent of the net income of Peruvian rural households originates from non-farm activities. The key determinants of household income diversification in rural Peru are: Ownership of private and public assets; ownership of fixed agricultural assets; credit access and human capital. No gender bias in the income diversification strategies was found despite the existing gender roles in farming in rural Peru. Income diversification was found to vary in extent and nature with household wealth (Escobal, 2001). This is consistent with the findings by Lanjouw (1999); Elbers and Lanjouw (2001) and Reardon *et al.* (1998). They show that although the pattern of income diversification between farm and non-farm activities varies sharply across regions, it is clearly linked to the assets or endowments of rural households.

While income diversification is a natural response to substantial climatic risk and transaction costs in lower potential agricultural areas, the evidence from Africa largely finds that non-farm income is highest in areas of better-than-average agricultural productivity and incomes (Reardon, 1997; Haggblade *et al.*, 1989). Most of the reviewed studies indicate the motivation to diversify as income maximisation, income stabilisation or both. It is however important to note that the desire and capacity to diversify are functions of various factors specific to households, communities and location (agro-ecological zones) characteristics. Households across agro-ecological zones would have different incentives to diversify in the case where the risk of farming and the correlation between returns to farming and non-farming sectors differ. The inter-sectoral growth linkage literature (Mellor, 1976 and Hazell and Roell, 1983) suggests that agricultural development leads to the development of non-farm activities that are linked to farming or the demand for which is spurred by increases in farm incomes. The implication is that the greater the level of farm development in an area, the more opportunity for inter-sectoral “growth linkages” between farming and non-farming (Mellor, 1976; Hazell and Roell, 1983). Some rural areas in the Western and Central regions of Uganda supply agricultural products in

different quantities to a number of urban centres including Uganda's capital city, Kampala. These could be having more agricultural income and it is worth finding out whether location of a rural area determines income diversification and the share of farm and non-farm income in total household income.

Within any rural area, distress-push diversification attracts households who are either less well endowed or have lower incomes. These households will enter non-farm activities that are, on average, less rewarding (for example in terms of labour productivity) than demand-pull diversification activities, since the higher return activities typically require higher investment that only the richer households can afford. For instance, poorer households will obtain a larger share of their non-farm income from casual wage employment, while richer households have better opportunities to enter non-farm activities in their own independent enterprises. Islam (1997) argues that the poor tend to engage in low paid employment, often as wage labourers, or they are self employed at home. Reardon *et al.* (1998) agree in part, although emphasising the importance of labour intensive wage employment more than self-employment.

Poorer households are less able to tolerate negative shocks to their income, and are therefore likely to diversify into less risky activities. Better-off households on the other hand, are often engaged in industry, commerce and trade as entrepreneurs and employers, occupations from which they have the possibility of earning higher incomes than those available to the poor. Reardon (1997) states that own cash sources are an important determinant of households' capacity to start non-farm businesses. Therefore, upper income strata households have much higher shares of non-farm income as a proportion of total income, and have higher absolute non-farm earnings. Bryceson (1999) also comments on the growing divide between those with and without sufficient financial capital to enter non-agricultural activities with high returns to labour. Low-asset households can spend a large share of their time in non-farm employment, but receive a low wage. Smith *et al.* (2001) found similar patterns in their qualitative study on rural livelihoods in Uganda.

The implications of household income for labour allocation are varied and difficult to distinguish. It is expected that households with higher incomes will tend to hire more

labour and also purchase some goods from the market. However, this may not hold if a large proportion of income is derived from farm activities, such as maize growing or rice cultivation, because the households' demand for their own labour will increase since they may have to work on their own farms in addition to hiring labour. However, if most income is derived from non-farm activities such as remittances or work outside the farm, households may not need to work on their own farms hence the demand for their own labour is low. Such households tend to use their income to purchase food and non-food items from the market. The decision to allocate household labour to non-farm activities may be viewed as part of a household "survival strategy" to diversify sources of income as a method of coping with uncertainties of production in the peasant household. However, when one member works away from home, the others may take on additional responsibilities on the family farm. For instance, in rural south India, to diversify sources of income and reduce risks and uncertainties, husbands work for wages away from the farm whenever possible. This reduces their labour input on the family farm, leaving wives to take on greater farm responsibilities (Desai and Jain, 1994).

6.3 Income Diversification and Shares: Empirical Strategy

This section discusses the measurement of income diversification in this study and how the determinants of diversification are estimated. It further discusses the Tobit approach and the censored least absolute deviation (CLAD) approach used to estimate the determinants of the shares of income in total household income.

6.3.1 Measuring Income Diversification

Attempts to quantify the level of income diversification in rural areas mainly focus on using two approaches: the number of income sources and the share of non-farm income in total household income (Ersado, 2006; Block and Webb, 2001; Barrett and Reardon, 2000; Barrett *et al.*, 200; Lanjouw, Quizon and Sparrow, 2001; Escobal, 2001; Schwarze, 2004). The advantage with the number of income sources approach is that it does not involve accounting for the actual household incomes from various sources. However, this approach has been criticised on a number of grounds. First, a

household with more economically active adults, all things being constant, will be more likely to have more income sources. This may reflect household labour supply decisions as much as a desire for diversification. Second, it is argued that there is discrepancy when comparing households receiving different shares of their income from similar activities. For instance, a household obtaining 99 percent of its income from farming and 1 percent from wage labour has the same number of income sources as a household with 50 percent of its income from farming and 50 percent from wage labour (Ersado, 2006).

On the other hand, the share of non-farm income as a measure of the degree of income diversification assumes that a higher share of non-farm income amounts to higher income diversification. The share of income approach assumes that income shares coming from farm, wage employment, non-farm self-employment and non-labour income are a function of exogenous input and output prices and the different fixed assets that are available to the household. The fixed assets include fixed farm assets (land or cattle); fixed non-farm assets (experience in trade); financial assets that facilitate access to credit; human capital including family size and composition (by age and gender) as well as education; public assets such as electricity and roads.

As discussed by different scholars in different countries (Ersado, 2003; Barrett and Reardon, 2000; Reardon, Delgado and Matlon, 1992), some important difficulties are associated with using the share of non-farm income as a measure of the degree of income diversification. For instance, the share of non-farm income as the proxy indicator for income diversification gives equal risk-mitigation weight to households deriving a given percentage of non-farm income from one versus three income sources. To overcome this, it is important to provide a breakdown of non-farm income share into, for example, the wage employment income share and the non-farm self-employment income share. This is what is done in this study. In addition, the share of non-farm income approach requires an accurate accounting of the level of income from all farm and non-farm sources. This is not strange given that there is always a concern that income data are often susceptible to measurement error. However, basic descriptive statistics, such as coefficient of variation (see Appendix 2) provide firm reassurance on the reliability of our income data. The advantage of using the number of income sources approach and the income share in total household income approach

is computational simplicity and ease of communication. The disadvantage is that they work best at relatively aggregate levels of analysis, for example, when one is simply comparing farm and non-farm earnings or share of non-farm farm and remittances. When one is interested in reasonably disaggregated analysis, it becomes difficult to interpret a vector of levels of shares (Ersado, 2006; Barrett and Reardon, 2000). This requires a richer measure of income diversification based on a more disaggregated classification beyond the simple farm and non-farm income categorisation.

Various measures of concentration and diversity are available particularly in the industry literature (Patil and Taillie, 1982). The most commonly used diversity indices are some special cases of the following form (Hannah and Kay, 1977; Ersado, 2006):

$$D_i = \left[\sum_{j=1}^n S_j^\alpha \right]^{1/(1-\alpha)} \quad (30)$$

Where,

D_i is the diversity index of household i

S_j is the share of income source j ($S_j = \frac{Y_j}{Y_i}$) in household i

Y_j is total income from source j in household i

$Y_i = \sum_{j=1}^n Y_j$ is total household income from all sources; $j= 1, 2, 3, \dots, n$ in household i

α is the diversity parameter, such that $\alpha \geq 0$ and $\alpha \neq 1$.

As α approaches 1, the index becomes the entropy-index which is calculated as

$$D = \left[- \sum S_j \log S_j \right] \text{ where log is the natural logarithm (Tauer, 1992).}$$

For $\alpha = 2$, the index (D) becomes the inverse of the Herfindahl index (equation 2) that is commonly used to measure industry concentration (Hanson and Simons, 1995;

Ersado, 2006). The Herfindahl index is computed as $\sum_{j=1}^n S_j^2$

$$D = \frac{1}{\sum_{j=1}^n S_j^2} \quad (31)$$

The general index (equation 30) measures the number of income sources and the evenness of income shares, with the parameter α determining the weight of the number of sources versus evenness in the distribution of income shares. The higher the α value, the greater the emphasis on the income share distribution. A parameter value of $\alpha = 0$ simply counts the number of income sources. The upper limit value of the index for any α value is the number of income sources and the lowest limit is 1. The lower value occurs when a given household has only one source of income and the upper value occurs only if the shares are equal (the distribution is even across all income sources). In this study, the inverse of the Herfindahl index is used to measure income diversification taking $\alpha = 2$.

There are two commonly used measures of diversity: The inverse of the Herfindahl index and the Shannon equitability index. Schwarze (2004) used the Shannon equitability index in Indonesia. Like the inverse of the Herfindahl index, the Shannon equitability index takes into account both the number of income sources and their evenness. Both are calculated for every household and increase continuously with higher diversity. The Shannon equitability index states the percentage share of the actual income diversification in relation to the maximal possible diversity of income. From the computational procedures of the Shannon equitability index and the inverse of the Herfindahl index, the two lead to similar conclusions about household income diversification.

The equation analysing the determinants of overall diversity is estimated using standard ordinary least squares (OLS) estimation, corrected for the design effects of the sampling. The OLS specification model for income diversification is as follows:

$$D = \beta_0 + \beta_i X_i + \mu \quad (32)$$

Where D is the dependent variable representing income diversification index, explained by β_i which represents a vector of parameters and X_i is a vector of

exogenous explanatory variables (Pindyck and Rubinfeld, 1991). X_i includes age of the household head, sex of the household head, marital status of the household head, education of the household head, education of male and female adults household members, assets, distance to the nearest district headquarters, access to credit and electricity. The independent variables used in this section of the analysis are described in Chapter Three.

6.3.2 Determinants of Income Shares

This section looks at the empirical strategy of estimating the determinants of the share of income sources to total household income. This is meant to help in understanding why some households generate more income from a particular source as compared to other sources. The income sources considered are: Farming, wage employment, non-farm self-employment and non-labour. It is important to note at the onset that cross sectional data on household income sources are complicated by the existence of zero observations on certain income sources. The presence of zero values in some observations in the four income shares means that households do not participate or derive any income from activities with zero shares. The standard Tobit model (Tobin, 1958) was developed to accommodate censoring in the dependent variable and was designed to overcome the bias associated with assuming a linear functional form in the presence of such censoring. Broadly, the Tobit model assumes that all zeros are attributable to standard corner solutions (Wooldridge, 2002). Estimating income shares with zero values using OLS would yield biased and inconsistent results (Pindyck and Rubinfeld, 1991). Therefore, by using a Tobit model, the zero observations are accounted for and the censored regression provides a more accurate estimation (Wooldridge, 2002). The Tobit equations take the following specifications (Tobin, 1958)

$$\begin{aligned}
 y_i^* &= \beta x_i + \mu_i & u_i &\sim N(0, \sigma^2) & i &= 1, \dots, n & (33) \\
 y_i &= y_i^* & & & & & \text{if } y_i^* > 0 \\
 y_i &= 0, & & & & & \text{otherwise}
 \end{aligned}$$

y_i^* is the unobserved latent variable, y_i is the observed censored variable, which is equal to the unobserved latent variable y_i^* when y_i^* is bigger than zero. In all other cases, y_i is equal to zero. β and x_i are as in equation (32). The model errors μ_i are assumed to be identically and independently distributed as $N(0, \delta^2)$, conditional on x_i 's (Tobin, 1958; Wooldridge, 2002). The coefficients are estimated by Maximum Likelihood Estimation (MLE). MLE produces consistent estimates of the parameters of the Tobit model, under appropriate assumptions such as homoscedasticity and normality of the error terms. The likelihood function of the Tobit model can be written following Tobin (1958) as:

$$L(\beta, \delta^2) = \prod_0 \left[1 - \phi\left(\frac{\beta x_i}{\delta}\right) \right] \prod_1 \left[\delta^{-1} \phi\left(\frac{y_i - \beta x_i}{\delta}\right) \right] \quad (34)$$

The consistency of MLE estimators requires a complete and correct specification of a parametric family of the error distribution. If the model is misspecified, model assumptions must be relaxed, and the estimators are needed which remain consistent under more general assumptions. The estimated coefficients identify two effects (Wooldridge, 2002):

- 1) The effect of an independent variable on the probability of having income for the non-participating households (the censored observations)
- 2) The effect of the explanatory variables on the income share for the households participating.

These two techniques can be distinguished by a decomposition technique proposed by McDonald and Moffit (1980). As noted above, Tobit estimates are generally inconsistent if the error terms are heteroskedastic or not normally distributed (Greene, 2003; Wooldridge, 2003). In light of this potential problem, Kennedy (2003) suggests the use of robust estimators such as censored least absolute deviations (CLAD) to control for heteroskedasticity.

The CLAD estimator was first proposed by Powell (1984). The censored regression comes from a model where $Y_i^* = a + bx_i + \mu_i$. Y_i^* is the latent demand and if it is positive, Y_i^* is equal to the actual demand Y_i . However, when Y_i^* is negative, the

actual demand is equal to zero from censoring, the minimum allowed. The actual demand Y_i therefore equals $\max(0, a + bx_i + \mu_i)$. The censored regression model is;

$$y_i = \max(0, x_i\beta + \mu_i) \quad (35)$$

$$i = 1, 2, \dots, n$$

where the error term μ_i and the parameter vector β are unobserved.

The CLAD model is a median estimator. To make the estimator robust to misspecification problems, the sample is reduced by eliminating data points and observations that fall outside the uncensored region from the sample (the re-censoring step). Least absolute deviations is applied to the remaining observations (the regression step). Bootstrapping is used to compute the residuals. The advantage with the CLAD estimator as compared with the Tobit estimation (sometimes referred to as censored maximum likelihood estimation - MLE) is that no assumption is needed about the distribution of the error terms. Therefore, it is robust to non-normality and heteroskedasticity, and provides consistent estimates in the presence of censored data. The CLAD estimation assumes only the functional form for the regression but the Tobit estimation specifies both the functional form for both the regression equation and for the distribution of the error process. The estimator, however, may be less efficient than the Tobit model depending on the extent to which outliers are a problem in the dataset. This study uses both the Tobit estimation and the CLAD estimation with the objective of obtaining a superior model⁵⁴ to explain the determinants of income shares in rural Uganda.

6.4 Determinants of Income Diversification and Shares in Rural Uganda

This section discusses the descriptive and empirical findings of income diversification and income shares in rural Uganda⁵⁵. The analysis is based on 7,691 households in rural Uganda out of a total of 8,344 that were in the sample. Some households were dropped due to missing key information. The households considered come from 38

⁵⁴ A superior model is the one with generally smaller standards errors compared to the other when used on the same data

⁵⁵ STATA 9 was used to generate the results in this chapter. Appendix 6D presents the *Do*-file used.

strata. As already mentioned in Chapter Five of this thesis, it should be noted that the entire survey covered 41 strata but Kampala district was dropped from this analysis because it was all urban and the other two (Kotido and Moroto) were dropped due to data inconsistencies⁵⁶. The analysis considers four income sources: Farm employment, wage employment, non-farm self-employment and non-labour.

6.4.1 Descriptive Statistics of the Dependent Variables

The contribution of each income source is summarised in Table 6.2. Farming is the major income source in rural Uganda accounting for 59 percent, followed by non-labour income with 18 percent. This is the same trend in all the four regions of Uganda. This is expected given that agriculture is a dominant activity in rural Uganda (GOU, 2005). This suggests relative underdevelopment of the rural areas and the scarcity of wage employment and self-employment opportunities. Those with skilled labour have to migrate to the urban areas in search of better paying employment opportunities. Self-employment is not common in rural areas due to requirements of adequate human and financial capital. This is worsened by the high poverty rates and low education levels in rural Uganda.

Table 6.2 Share of Income Source by Region and Quintile

	Diversification Index		Farm share		Wage share		Non-labour		Self share		Total
	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	
Region											
Central	1.672	0.015	0.575	0.014	0.134	0.010	0.170	0.005	0.121	0.010	26.78
Eastern	1.800	0.016	0.511	0.009	0.127	0.007	0.231	0.006	0.131	0.006	27.15
Northern	1.660	0.023	0.602	0.014	0.108	0.008	0.159	0.006	0.132	0.010	15.3
Western	1.608	0.014	0.663	0.010	0.109	0.006	0.148	0.004	0.080	0.006	30.77
Quintile											
Quint 1	1.727	0.017	0.605	0.009	0.108	0.006	0.197	0.006	0.090	0.006	20.00
Quint 2	1.714	0.017	0.616	0.008	0.108	0.006	0.182	0.006	0.094	0.005	20.00
Quint 3	1.690	0.016	0.614	0.009	0.108	0.007	0.177	0.006	0.101	0.006	20.00
Quint 4	1.670	0.015	0.589	0.010	0.126	0.007	0.174	0.006	0.111	0.007	20.00
Quint 5	1.641	0.016	0.502	0.014	0.153	0.009	0.169	0.007	0.175	0.012	20.00
Total	1.689	0.008	0.586	0.006	0.120	0.004	0.180	0.003	0.114	0.004	100

Source: Author's own computations using the 1999/2000 UNHS

⁵⁶ These had one primary sampling unit each

Farming accounts for 50 percent or more in all the quintiles. This shows the importance of farming in rural households of Uganda regardless of the household's welfare. Just like the regional distribution, non-labour income is the second highest source in all the five quintiles. The distribution by quintile shows that households in the highest quintile have less variability in their non-farm shares, a sign of the ability to diversify their non-farm income sources more equitably than the rest. It is expected that the shares of self-employment and wage employment are higher for the richer quintiles that have better education, skills and access to resources such as credit and infrastructure. The highest variability is in the lowest and second quintile. Interestingly, the contribution of self-employment is relatively low for the poorest quintiles and it keeps increasing as households get wealthier. This is not surprising given that self-employment requires capital and it is mainly the wealthier households who invest significant amounts of capital and be able to get reasonable benefits from it. The income obtained from wage employment steadily increases with higher income quintiles. These statistics indicate that poorer households in rural Uganda tend to concentrate on lower paying but easy entry agricultural farm employment, and less on wage and self-employment. This is due to their scant education, credit and cash constraints. On the other hand, richer households with more education and fewer cash constraints tend to pursue slightly less agricultural activities and spread their incomes to wage and self-employment activities such as commerce and agro-processing and formal employment.

The average of the diversification index, which measures overall diversification is 1.689, ranging from 1 to 3.89 (Table 6.3). This is not surprising given that the average number of income sources per household is 2.295. The Eastern and Central regions have the highest diversification index (higher than the average) of 1.800 and 1.672 respectively. In addition, the diversification index is highest for the poorest households (first two quintiles). This trend is in line with the hypothesis that diversification is undertaken for risk purposes (Lanjouw, 1999; Elbers and Lanjouw, 2001; Reardon *et al.*, 1998). The Northern and Eastern regions have the highest poverty levels in Uganda and they are the areas with the highest diversification index.

Analysis of simple correlation between income sources is shown in Table 6.3 and Figures 6.2a and 6.2b. Farm income share and non-labour income share are negatively correlated with total income. In contrast, the correlation between wage employment income and total income is positive. This is the same with non-farm self-employment income and total income. Though the correlation between total income and the income shares is significant, they are weakly correlated. All the other sources are negatively correlated with farm income. Wage income share and non-labour income share are significant and negatively correlated with non-farm self-employment.

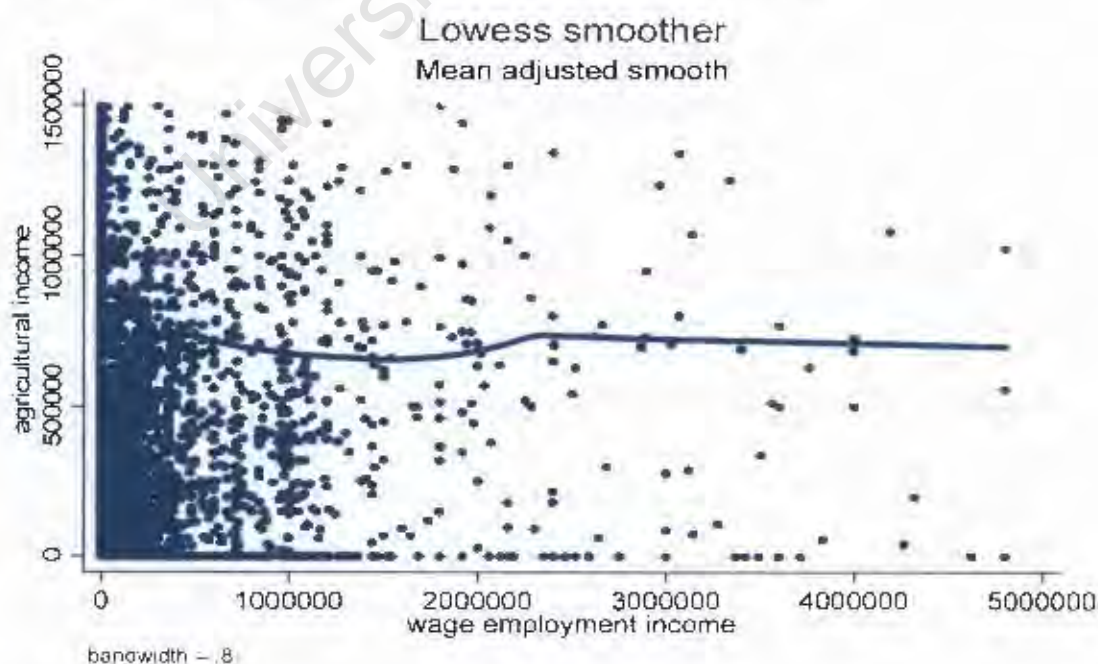
Table 6.3 Simple Correlation between Total Income and Income Sources

Source of Income	Total	Farm	Wage	Self-employment	Non-Labour
Total	1				
Farm	-0.0449*	1			
Wage	0.0416*	-0.5409*	1		
Self-employment	0.1391*	-0.4647*	-0.1813*	1	
Non-labour	-0.1354*	-0.3887*	-0.1703*	-0.1651*	1

Significant at 1 percent

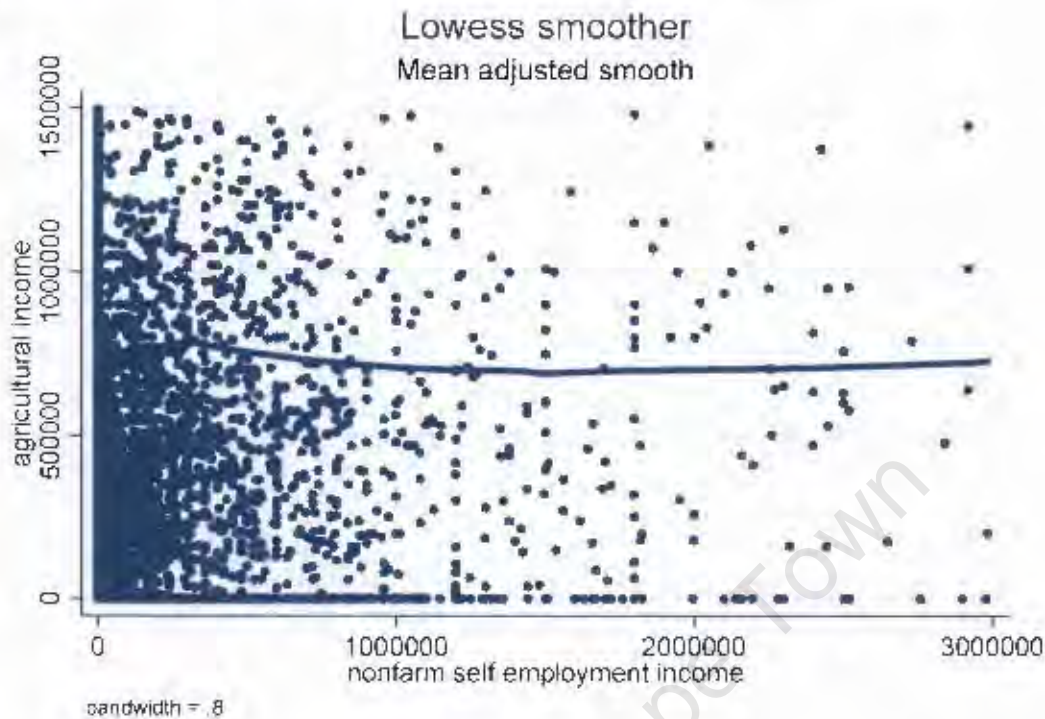
Source: Author's own computations using the 1999/2000 UNHS

Figure 6.2a Farm Income versus Wage Employment Income



Source: Author's own computations using the 1999/2000 UNHS

Figure 6.2b Farm Income versus Non-farm Self-employment Income



Source: Author's own computations using the 1999/2000 UNHS

6.4.2 Model Comparison

The income share models are estimated using the Tobit and CLAD in econometrics software package STATA SE Version 9. It should be noted that STATA provides two ways to analyze survey data: First, the use of survey commands that begin with *svy*. The use of survey commands is the best way to analyse survey data. Survey commands incorporate the effect of clustering and stratification as well as the effect of sampling weights when computing the variance, standard error and confidence intervals. Second, if the analysis technique to be used does not allow the use of survey commands, then using the estimation commands with probability weights (*pweights*) and robust cluster options would be a good choice. The second option includes the Tobit estimation approach. The estimation commands consider sampling weights and clustering but have no option for specifying the stratification variable. As a result, the standard errors may be larger than they would be using the survey commands. Therefore, the shortcoming with the results in this section is that they do not account for survey design effects.

Estimation of the models using the CLAD and Tobit approaches reveals that the CLAD performs better than the Tobit model for two income sources, farm share and non-labour income (results for comparative Tobit and CLAD models are presented in Appendix 5). While the coefficients have mostly the same sign and almost equal in magnitude, the standard errors of the CLAD are generally smaller than those produced through Tobit estimation which is not surprising given that the former estimates are robust to heteroskedasticity (potentially caused by the continuous variables) while the latter are not. For example, the farm income share equation shows that the coefficient for livestock assets using Tobit is 0.060 and 0.054 for the CLAD model. However, the estimated standard errors are lower for the CLAD model 0.007 compared with 0.008 for the Tobit model. For the non-farm labour equation, the CLAD estimates have shown even better results. Standard errors are lower than for the Tobit model (almost half in some cases) for most of the variables. This suggests that the CLAD model is superior for the farm share and non-labour model. The estimates for the remaining two models are run using the Tobit approach due to limited observations with nonzero values. Convergence could not be achieved⁵⁷ when the CLAD model is applied.

6.4.3 Empirical Results

The equations estimated in this section are those representing the diversification index which was derived using the inverse of the Herfindahl index and the share of total rural household income in each of the four income sources (farm income, wage employment income, non-farm self-employment income and non-labour income). The analysis is based on the empirical strategy presented in Section 6.3 of this chapter. The diversification index considers all income sources and therefore all households have at least one income source, justifying the use of ordinary least squares (OLS) for this estimation. In the sample, approximately 8.2 percent, 72 percent, 70 percent and 21 percent do not have farm income, wage income, self-employment income and non-labour income respectively. This implies some zero values in shares of these income sources. Given these distributions, the OLS model would return biased results and, as discussed earlier, the Tobit estimation (Greene 2003) and censored least absolute

⁵⁷ It is very common to have problems with convergence using CLAD and MLE (Wooldridge, 2002). This is why many analysts still use the two-step option.

deviation (Powell, 1984) are used. The results of the estimations⁵⁸ are presented in Table 6.4.

In the first column, the results of the determinants of income diversification measured by the inverse of the Herfindahl index are presented. The remaining columns present the results of the shares of income from different sources using the Tobit estimations. The table also shows the number of left censored observations in each equation as well as a likelihood ratio test as a goodness-of-fit indicator. There were no right censored variables in all the Tobit estimations.

The role of human capital is analysed by considering the contribution of different categories of household members by age, gender, education and marital status. Age of the household head plays a significant influence on income diversification strategies and the contribution of all the income sources. An older household head has lower chances of diversifying household income compared to a household headed by a younger person. This result is the reverse with the findings of *de Janvry and Sadoulet (2001)* in Mexico and could be capturing the effect of older children who migrated to urban areas.

The results also indicate that older household heads earn more farm and non-labour income, and less wage and self-employment income. An increase in farm share as the household head grows older implies that they are more likely to concentrate on farming activities. The increase in non-labour share as the household head grows older implies that they are more likely to receive income from pensions, property and remittances. For wage employment, this result is not surprising since in the early stages of life, household members tend to work in wage employment until a certain age when they retire. A typical example of this is the formal employment category such as public service. *Smith (2003)* notes that generally the younger household heads migrate in search of wage employment. For the case of self-employment, there is a negative influence of age of the household head on the income share. In this case, as household heads grow older, there is less involvement in self-employment. The results show what is expected in a life cycle pattern.

⁵⁸ A comparative table in Appendix 5 shows the results of the alternative model (Tobit model for farm share and non-labour share).

Table 6.4 Determinants of Income Diversification and Shares in Rural Uganda

	Diversification Index *	Farm share ***	Wage Share **	Non-labour Share ***	Self-employment share **
Age of household head	-0.002*** [0.000]	0.002*** [0.000]	-0.004*** [0.001]	0.002*** [0.000]	-0.007*** [0.001]
Sex of household head	-0.054** [0.022]	0.017* [0.010]	0.276*** [0.026]	-0.099*** [0.004]	-0.016 [0.023]
Marital status of household head	0.026 [0.021]	0.021** [0.010]	-0.102*** [0.026]	0.020*** [0.004]	0.029 [0.024]
Household size	-0.005 [0.003]	0.014*** [0.001]	0 [0.004]	-0.006*** [0.001]	-0.001 [0.003]
Female adults -primary education	0.039*** [0.010]	-0.010** [0.005]	-0.012 [0.013]	0 [0.002]	0.056*** [0.011]
Female adults sec & tertiary education	0.061*** [0.015]	-0.036*** [0.008]	0.069*** [0.019]	-0.002 [0.003]	0.073*** [0.017]
Male adults primary education	0.025** [0.010]	-0.018*** [0.005]	0.046*** [0.012]	-0.009*** [0.002]	0.023** [0.011]
Male adults –sec and tertiary education	0.018 [0.014]	-0.055*** [0.007]	0.149*** [0.018]	-0.021*** [0.003]	0.015 [0.017]
Head has primary education	-0.015 [0.015]	0.028*** [0.007]	-0.017 [0.018]	0.009*** [0.003]	-0.015 [0.017]
Head has sec & tertiary education	-0.048* [0.027]	-0.025* [0.013]	0.089*** [0.033]	0.002 [0.005]	-0.043 [0.031]
Community's access to credit	-0.013 [0.017]	-0.01 [0.007]	-0.002 [0.018]	-0.004 [0.003]	0.008 [0.016]
Community has electricity	-0.021 [0.028]	-0.01 [0.010]	0.029 [0.025]	-0.020*** [0.004]	0.02 [0.022]
Distance to district headquarters	-0.017* [0.009]	0.018*** [0.004]	-0.039*** [0.010]	0.001 [0.002]	-0.028*** [0.009]
Central region	0.064*** [0.022]	-0.044*** [0.009]	-0.021 [0.023]	0.004 [0.004]	0.100*** [0.021]
Eastern region	0.186*** [0.022]	-0.194*** [0.009]	0.023 [0.023]	0.048*** [0.003]	0.162*** [0.021]
Northern region	0.055* [0.028]	-0.063*** [0.011]	-0.003 [0.028]	-0.012*** [0.004]	0.167*** [0.025]
Household owns a house	0.075*** [0.028]	0.376*** [0.013]	-0.342*** [0.029]	0.016*** [0.005]	-0.117*** [0.028]
Household has transport asset	-0.031* [0.017]	0.009 [0.007]	-0.076*** [0.019]	-0.009*** [0.003]	0.134*** [0.017]
Households has livestock assets	-0.009 [0.016]	0.054*** [0.007]	-0.072*** [0.019]	0.001 [0.003]	-0.019 [0.017]
Household owns non-agric assets	0.196*** [0.048]	-0.081*** [0.016]	-0.133*** [0.046]	-0.01 [0.007]	0.393*** [0.034]
Land size	-0.018* [0.010]	0.056*** [0.004]	-0.097*** [0.012]	-0.005*** [0.002]	-0.011 [0.010]
Constant	1.707*** [0.052]	0.024 [0.023]	0.287*** [0.056]	0.135*** [0.009]	-0.025 [0.052]
Observations/final sample (CLAD)	7691	7630	7691	7676	7691
Left censored observations			5519		5412
Uncensored observations			2172		2279
Log likelihood			-4343.08		-4225.35
Chi-Squared			828.81		682.85
R-squared/pseudo R- squared	0.04	0.11		0.04	
Standard errors in brackets	* significant at 10%; ** significant at 5%; *** significant at 1%				

* OLS estimates, ** Tobit estimates and *** CLAD estimates

Source: Author's own computations using the 1999/2000 UNHS

The gender of the household head plays an interesting role in determining income diversification and income shares from farm, wage and non-labour sources. The results show an unexpected finding that male-headed households are less likely to diversify compared to female-headed households. It was expected that male-headed households are more likely to diversify than female-headed households given that the earlier findings show that men are more likely to participate in wage and non-farm self-employment. This finding could be attributed to the high level of non-labour income (see Table 6.2) with a high level of remittances which favours female-headed households compared to men. Without the non-labour income source in the income diversification analysis, the results show that male-headed households are more likely to diversify than female headed ones (see Appendix 6). Much as men are more likely to participate in wage employment and non-farm self-employment, these two activities have lower household income shares compared to farm and non-labour income where female-headed households generate most of their income.

This is similar to the findings by Ersado (2006) in urban areas of Zimbabwe but contrary to his findings in rural Zimbabwe. It is also contrary to the findings Block and Webb (2000) find in Ethiopia and Ersado (2006) in Zimbabwe. The results are similar to those of Block and Webb (2000) and Ersado (2006) if non-labour income is not considered.

This is true in the case of rural areas of Uganda where the women, usually take on additional roles of searching for extra household income by participating in activities like brewing local alcohol, operating kiosks or crafting mats and other products. For farm and wage shares, there is a strong positive relationship, implying that male-headed households receive more income from farming and wages. When the household head is a man, the household derives significantly less income from non-labour sources. This implies that female-headed households are less likely to earn income from wage source but more from non-labour due to reasons of differential access to education, childcare responsibilities and social expectations. Non-labour income is composed of remittances (97 percent), property income (2.7 percent) and other benefits such as pensions (0.3 percent). An analysis of these non-labour sources of income shows that the average income from property and pensions for male-headed households is higher than for female-headed households. On the other hand, the

average income from remittances is higher for female-headed than male-headed households. Given the contribution of remittances (97 percent) to non-labour, this result is not surprising. It is known that working siblings (mostly in urban areas) tend to support female heads than a household headed by a man whom they expect to be a breadwinner. The siblings look at the female heads as vulnerable since women do not participate in formal employment and therefore cannot earn pension. In addition, many women in rural Uganda do not possess assets such as land and housing due to cultural constraints and therefore cannot earn property income.

Marital status of the household head has a positive and significant influence on income share from farming and non-labour income. This indicates the importance of married women and men in farming and possibly of their immigrated children in remitting resources or pension/property incomes. This result reflects the structures of rural Uganda where married individuals often resort to dependence on farming and non-labour sources. The negative influence on the share of wage income could be that wage employment is mostly available in distant places. Married couples are less likely to break their social networks by working far from home. Broadly this indicates, social networks seem to reduce married household heads' involvement in activities that are far from their homes.

Household size is another significant factor influencing the contribution of income sources to total income in a household. However, the results are mixed. Larger households add significantly to the share of total income received from farming. On the contrary, it is negative for non-labour income sources. This is consistent with the findings by Reardon (1997) who observes that family size affects the ability of a household to supply labour to the farm. Larger families are able to supply labour on the farm to meet the farming labour needs. For the non-labour share, larger households have limited ability to save and invest in property, education and skills of their siblings (for future remittances), and therefore the effect is negative.

The level of education of adult household members, particularly female adults positively affects diversification of income sources in rural Uganda. We analyse education by gender for all adults in the household. Households that have educated females are more likely to diversify income opportunities compared with those

without. A household that has more females with primary education is likely to increase self-employment income and over all diversification. An increase in females with secondary and tertiary education increases over all diversification, wage and self-employment but reduces farm income share. This means that there is greater involvement of women with primary, secondary and tertiary education in wage (such as public service) and self-employment activities (such as agro-processing, kiosks and making local brew). This result implies that educating more women in the household expands the opportunities for households to improve income and reduce their dependency on farming. Likewise, having more men with primary education increases overall diversification and income shares from wages and self-employment but reduces the income share from farming and non-labour income. The farm share and non-labour share reduce with more educated adult males in the household. However, wage share increases with a higher number of male adults. This is an expected result since education generally increases wage employment opportunities available.

Interesting results are obtained when the education level of the household head is considered. Generally, households headed by individuals with secondary and tertiary education are less likely to diversify income sources and earn farm income. Instead, household heads with primary education are more likely to depend on farm and non-labour income. This shows that more educated individuals are better exposed to stable income earning opportunities compared with the less educated ones. This result is consistent with the findings of *de Janvry and Sadoulet (2001)* in Mexico. *Islam (1997)* argues that primary education enhances the productivity of the workforce, whereas secondary education stimulates entrepreneurial activities.

Ownership of non-agricultural assets increases the share of self-employment income in total household income and reduces the need for undertaking wage and farm employment. This is consistent with the findings by *Escobal (2001)* in rural Peru. The effect is positive and significant for overall diversification index, implying that non-agricultural assets relax the constraints on all the four sources of income, allowing more diversification. Other key assets affecting income diversification include permanent house, transport (vehicles, bicycles and motorcycles) and land. Ownership of more land and livestock increases the incentive to obtain income from farming but reduces wage and self shares. This could be because livestock may lead to higher land

productivity through the use of manure for fertilization and oxen for ploughing. This is expected given that rural Uganda is mainly an agricultural economy and land is a key input in farming. Ownership of a permanent house increases incomes from farming, non-labour sources and overall diversification but reduces wage and self-employment income. A house provides storage for agricultural farming and households are able to store some of their farm outputs up to the time when their prices are averagely high. The negative relationship between house ownership and self-employment incomes is strange and difficult to explain. Ownership of any of the transport asset (bicycles, motorcycle and ox-driven carts) increases self-employment income. A recent trend in the Ugandan transport industry is the introduction of *boda-boda*⁵⁹ cycles. These bicycles and motor cycles have provided employment for many youths in the rural areas and also significantly improved rural transportation. On the other hand, transport assets reduce income from wage, non-labour labour and over all diversification.

Access to some public services (such as electricity, credit and markets) is important in explaining why some rural dwellers in Uganda have better income sources. For example, distance to the nearest district headquarters is important in the development of different income sources. A longer distance to the district headquarters, which acts as the market in many cases, reduces the incentive to obtain income from wage, self-employment and a diversified income source. This may be because they increase the transaction cost of investing in self and wage employment. However, they may boost investment in agricultural sector, as it is the cheapest and most viable option under these circumstances. As for electricity, its availability reduces the share of income from non-labour sources. Availability of electricity does not have any effect on overall diversification as expected.

Finally, geographical location is another key determinant of household income diversification in rural Uganda. Relative to the Western region, in all the other regions, incomes derived from farming are lower even after controlling for other factors. This is expected given that the Western region is relatively more productive in terms of agricultural products, both livestock and agriculture. The Western region

⁵⁹ *Boda boda* is a term used in Uganda to describe bicycles and motorcycles used to transport people for usually short distances.

supplies agricultural products such as milk, beef and bananas to almost all the other regions in Uganda. In effect, the higher productivity of the western region has led to a stronger agricultural sector and a greater farm income share in overall income. However, the story is different for self-employment and non-labour income. In all the other regions compared to the Western region, the shares of incomes derived from self-employment and non-labour income (except for the Northern region) are higher. The overall diversification index is positive and higher in all the other regions relative to the Western region, showing the importance of self-employment and non-labour income in the other regions.

6.5 Conclusion

Presently, nearly 40 percent of the net income of Ugandan rural households originates from activities other than own-farming. It is clear from these statistics that non-farm activities should no longer be considered as “marginal” like has been in the past. This chapter has highlighted that the importance of certain activities and attributes goes beyond their role in agriculture. Education is key for households to obtain income from wage and self-employment where returns are said to be high. Ownership of non-agricultural and transport assets can help households increase their incomes from self-employment. Urbanisation of rural trading centres would help in wage and self-employment. This is because a longer distance to the nearest district headquarters reduces incomes from wage and self-employment. Many farmers compensate for inadequate land, credit and livestock with wage employment, self-employment and non-labour incomes. Access to public services such as towns and electricity are important in explaining why some rural households have better income sources in Uganda. Regional location shows that households located in the Western region do not diversify as much as those in the other regions. The results show there is a gender bias in income diversification strategies of rural household heads in Uganda.

CHAPTER SEVEN

CONCLUSION, POLICY IMPLICATIONS AND AREAS FOR FURTHER RESEARCH

7.1 Conclusions

Uganda has been experiencing decreasing but high levels of poverty especially in rural areas. The majority of rural households (40 percent) are found in the poorest two quintiles (Q1 and Q2). The least proportion is found in the richest quintile. This is accompanied by high levels of income inequality. Agriculture is the major source of employment and income in rural Uganda with the majority involved in subsistence farming. Since 2001/2002, the service sector is the largest contributor to GDP followed by agriculture and then industry. Before then, agriculture was the largest. Of the three sectors, agriculture has the lowest annual growth rate. The highest growth has been realised in transport and communication and formal manufacturing sub-sectors. The benefits of economic growth realised over the past years have favoured the urban more than rural areas. This could be as a result of rural individuals and households relying more on farming than non-farm activities where higher income returns are realised. This thesis therefore examined the determinants of non-farm employment and income diversification in rural Uganda.

The analysis is done at both individual and household level. The motivation for such analysis was fourfold: Understanding the determinants of individuals' participation in non-farm activities; examining the determinants of the contribution of different income sources to total household income; understanding the determinants of overall household income diversification; and to examining the contributions of income sources to overall income inequality and determine whether an income source increases or reduces income inequality.

The primary data used in this study are from the 1999/2000 Uganda National Household Survey (UNHS). This is a national multi-topic survey that was carried out by Uganda Bureau of Statistics. The survey collected detailed information on a range

of individual and household characteristics and activities. The sampling frame comprised of enumeration areas (EAs) from the 1991 population census. The data are nationally representative in terms of regions and the socioeconomic questionnaire was administered to 10,696 households (57,385 individuals), of which 8,344 households (78 percent) and 45,891 individuals were rural. The analysis used 14,633 adult individuals (15 years and above) and 7,691 households. A number of conclusions and policies are derived and discussed in this chapter.

Notwithstanding the weaknesses of income data, the findings of the inequality decomposition analysis using both the Gini coefficient and the coefficient of variation approaches show that farm income and non-farm labour income are negatively associated with income inequality whilst an increase in income from wage employment and self-employment is positively associated with income inequality in rural Uganda. As earlier on explained, these results should not be mis-interpreted to mean causation but rather correlation between income sources and inequality.

Self-employment income is the most unequally distributed income source. This is largely because self-employment is strongly correlated with non-agricultural assets, wealth and education, which are distributed quite unevenly amongst rural households in Uganda. On the other hand, farm income is the most equally distributed income in rural Uganda. This is explained by the fact that Uganda is still an agricultural economy with more than 80 percent of the households deriving income from farming.

From the regional analysis of inequality, the Eastern region has the highest inequality and the Western has the lowest inequality. With the exception of the Central region, where self-employment income increases inequality, wage employment income and self-employment income increase inequality in the other three regions. Self-employment income has the highest source Gini in the Western and Central regions while wage income has the highest Gini coefficient in the Eastern and Northern regions. This implies that any redistribution strategies need to carefully focus on self-employment and wage income in the respective regions.

The unit of analysis for the determinants of participation is the individual. This study considered 14,633 adult individuals (15 years and above) who were gainfully

employed at the time of the survey and have complete information on the variables of interest. Three employment activities were considered: farm, wage employment and non-farm self-employment. On average, 88 percent of the individuals participated in farming, 7 percent in wage employment and 5 percent in self-employment. At regional level, all the four regions in Uganda had more than 85 percent of the individuals participating in farm activities. This is expected given the fact that Uganda is mainly an agricultural economy. Participation in farming is highest for the poorest quintile and least for the individuals that are better off (fifth quintile). More than 7 percent of the individuals in the fifth quintile participate in non-farm self-employment and wage employment. In contrast, less than 4 percent of the poorest quintile participates in wage employment and self-employment respectively. Generally, farming activities are the most important for all income groups.

A multinomial logit model was estimated to understand the determinants of individuals' participation in non-farm activities based on the theory of household production and consumption. The three employment categories (farm employment, wage employment and non-farm self-employment) were used as dependent variables against individual, household, community and location independent variables. Given the existence of imperfections in Uganda's rural labour market, this study considers the production and consumption decisions of farm households in rural Uganda to be non-separable. In these cases, it is the shadow wage of agricultural household production rather than the market wage that determines the labour supply and demand choices of the household (Strauss, 1984; Jacoby, 1993 and Benjamin, 1992). The basis of the model is the framework by Becker (1965), Gronau (1973, 1977) and Low (1986) and used in a number of studies that have been reviewed in Chapter Five.

The findings indicate that age, gender, education, shadow wages, access to electricity, distance to the nearest headquarters and regional location are key in determining individual participation in different employment activities. Individuals in rural Uganda are more likely to participate in wage and self-employment in the early stages of life and resort to farming as they grow old. This is consistent with the fact that as people retire from formal and self-employment, they tend to settle in rural areas and participate more in farming. From the gender perspective, men are more likely to participate in both wage employment and non-farm self-employment than women.

This is consistent with the patriarchal nature of Ugandan society which tends to confine women to farm and household chores. Men participate more in wage employment than self-employment.

Education plays a key role in determining choice of employment. Individuals with no education are less likely to participate in both wage employment and self-employment. The reverse is true for individuals with secondary and tertiary education. Education is a pathway out of the low-paying farm activities to better paying wage and self-employment activities.

The results suggest that individual family members respond significantly to changes in the household's economic opportunities. A higher shadow wage for males reduces participation in non-farm wage employment and self-employment implying that more male labour is supplied to farming activities as the opportunity cost of farming increases. Higher shadow wages for females increase participation in non-farm wage employment and self-employment activities leading to a backward bending female labour supply in farming. This result is rather unexpected given the patriarchal nature of Ugandan society in which women do the bulk of farm and household chores. This could be due to the broader measure of labour supply used in this thesis. Access to electricity encourages participation in both wage employment and self-employment. The results further show that the further away the individual is from the district headquarters (town), the less the likelihood of participating in wage and non-farm self-employment.

Finally, location of the individuals was found to determine participation in different activities. Individuals in the Eastern and Northern regions are less likely to access wage employment compared to those from the Western region. The Western region is the second wealthiest region, after the Central region in Uganda and household members are able to acquire higher education levels. These two regions have more fertile soils compared to the Eastern and Northern regions and supply food and livestock products such as beef and milk to Uganda's capital city. About 80 percent of the herds in Uganda are in the Western region.

For income diversification, 7,691 households were considered with four income sources: farm income, wage employment income, non-farm self-employment income and non-labour income (mostly remittances and income from property). The household was the unit of analysis. This is because in the rural areas of Uganda, one typical or undisputed characteristic of households is that its members share income to some extent and the household is better suited as a unit for measurement purposes given the fact that all rural incomes from whatever source sooner or later end up in household wallets. Farming is the major income source for rural households in Uganda accounting for 59 percent, followed by non-labour income (12 percent). The data show that the shares of wage employment and self-employment are relatively low in all the four regions. This is explained by lack of the pre-requisites for wage employment and self-employment such as start-up capital for self-employment and lack of credit facilities. The education levels in rural Uganda are low with the majority having primary education. Yet, many wage employment activities require at least secondary education level. The distribution of income by source is generally consistent for all regions.

The inverse of the Herfindahl index was used to measure overall income diversification. The ordinary least squares approach was used to understand the determinants of overall diversification. A Tobit approach and censored least absolute deviation (CLAD) were used to estimate a reduced form equation for the determinants of the shares of different income sources. The shares of four income sources namely; farm income, non-farm wage income, non-farm self-employment income and non-labour income to total income were considered in both the Tobit and CLAD estimations against household, community and location variables. Although farm income is still a principal income source of rural households in Uganda, the results show that non-farm income also plays a significant role. A significant number of rural households engage in various forms of wage employment with low entry requirements plus self-employment in informal sector activities.

Estimation of the models using the two approaches reveals that the CLAD performs better against the Tobit model for two income sources: Farm share and non labour income. While the coefficients have mostly the same sign and almost equal in magnitude, the standards errors of the CLAD are generally smaller than those

produced through Tobit (MLE) which is not surprising given that the former estimates are robust to heteroskedasticity (potentially caused by the continuous variables) while the latter are not. This suggests that the CLAD model is superior for the farm share and non-labour model. The estimates for the remaining two models are run using Tobit approach due to limited observations with non zero values.

Age, sex and marital status of the household head influence diversification and the income shares from different sources. In addition, household size, education level of adult household members, ownership of assets, access to public services (electricity and markets) and geographical location determine overall household income diversification and the shares of income sources. At early stages of life, household heads engage in self-employment up to a certain age (when they grow older) and begin to get less involved in self-employment and resort to farm income, confirming a life cycle pattern. In addition, older household heads earn more income from non-labour source (remittances and property incomes) as compared to wage employment and self-employment. Household size is another factor influencing the share of income from farm employment and non-labour income source. Larger households add to the share of farm income but on the contrary, larger household size reduces the share of non-labour income.

The results show there is a gender bias in income diversification strategies of rural household heads in rural Uganda. Sex of the household head determines over all diversification and the income shares from farm, wage and non-labour sources. Male-headed households are less likely to diversify their income sources as compared to female-headed households. Looking at the income shares, male-headed households receive more income from wage employment and farm employment and less from non-labour income compared to female-headed households. Married household heads increase income shares from farm employment and non-labour income source but reduce the share from wage employment. As was the case with employment, education plays an important role for households in obtaining income from wage employment and self-employment where returns are said to be high. Higher education increases wage share, self-employment share and the likelihood of the household to diversify income sources while reducing farm share.

Ownership of assets (non-agricultural, transport assets, livestock and a house) determines income shares and diversification. Ownership of non-agricultural assets increases diversification and the share from self-employment while reducing the share from farm and wage employment. Ownership of a house increases income diversification, farm income share and non-labour share but reduces wage employment share and self-employment income share. Ownership of transport assets such as bicycles, motorcycles and cars reduces diversification, share of wage employment income and non-labour income but increases non-farm self-employment. This could be because these transport assets can be used in the transportation of non-farm enterprise commodities. Ownership of livestock increases farm share but reduces wage employment share. This could be because earnings from livestock are part of farm employment income and livestock can increase crop production through the provision of manure and therefore increasing farm income.

A long distance from the nearest district headquarters reduces incomes from wage employment and self-employment but increases shares from farm employment. The longer the distance from the nearest town (district headquarters), the less the level of income diversification. Access to services such as electricity is important in explaining why some households have better income sources in rural Uganda. Access to electricity reduces the income share from non-labour sources. Regional location is also important in determining the extent to which a household will diversify income sources and the level of income shares from farming, non-labour income and self-employment.

7.2 Policy Implications

The findings of this study suggest implications for policies and rural development programs. Any rural development strategy that aims to improve the welfare of rural Ugandans needs to include a focus on participation in non-farm activities, particularly for households in the poorest quintile, with little access to land and limited education.

The results have shown, on the basis of decomposition of inequality by income source, that a rise in non-farm incomes (from wage employment and self-employment) is associated with an increase in inequality. This is a similar finding

when the analysis is done at regional level. Based on these findings, policies that aim at the expansion of high productivity non-farm activities may help reduce poverty and inequality if the poor get involved in non-farm activities. This is a similar finding by Lanjouw (2007). It will increase inequality if the rich who are already participating in them benefit. This implies that strategies aimed at increasing incomes of the rural population in Uganda should not ignore the finding that income generated from non-farm activities is more unequally distributed in favour of the richer households. This could explain the worsening income distribution discussed in Chapter Two in spite of increasing income levels for the rural population.

The results demonstrate that individuals with limited education are in a disadvantaged position in terms of obtaining additional income from non-farm wage activities and self-employment because they do not have adequate control of other assets needed for these activities. To ensure the pro-poor development of the non-farm sector in rural areas, it is critical to develop policies that increase the capability of the less educated poor individuals by improving their access to primary and secondary education and stimulate their participation in these programs. However, not all non-farm employment activities require formal schooling. It may well be that people without formal schooling are simply unaware of the opportunities available in the non-farm employment sector or lack the confidence and the labour-market information to access these jobs. It is important to note that targeted educational and informational programs could perhaps help uneducated individuals access non-farm employment activities. A rural development policy that addresses the development of non-farm activities must seek to promote not only formal education, but also make people aware of the benefits of non-farm employment activities and develop institutional resources which have the capacities to initiate, develop and even conduct new types of activities in the non-farm sector.

It is important to improve rural infrastructure in terms of provision of electricity and access to markets (towns or district headquarters) to enhance participation in and the profitability of non-farm income generating activities. In vast rural areas of Uganda, relying solely on agricultural development may imply condemning the poor to persistent poverty and stagnation. Policies are required which promote both public and private investment in infrastructure (especially roads, telecommunications,

irrigation, electrification) in order to reduce transaction costs faced by agents seeking to develop rural areas and rural individuals or households seeking to participate in non-farm activities. Other policies aimed at developing the capacity of rural household to participate in a broader range of better paying non-farm activities (such as activation of land and better farm product) may also be welfare enhancing. Similarly, the development and spread of microfinance institutions may also enable better performance of the poor in non-farm wage and self-employment activities.

Policies that help local institutions to identify investments that contribute to the strengthening of linkages among agriculture, commerce and other services may be of great benefit in areas with a high potential for agricultural development. Modernization and increased competitiveness of farming activities can be achieved through the development of primary production, commerce and other services that are essential to agriculture. Technology promotion policies (research, technical assistance and transfer of technology), skill building and training of human resources, land reform and financing are essential for rural development.

Policies and programs to support rural women must give greater attention to facilitating their access to wage-earning job markets in agro-industry, trade and other enterprises given that women are less likely to participate in non-farm wage employment and self-employment than men. Targeted programs such as education, skills development, day care centres to take care of young children and the improvement of infrastructure that allow women to easily commute to their places of work are essential. There is also need to revise the labour and social security policies and create special financing arrangements that will enable women in particular to gain access and participate in wage employment and self-employment activities. On the supply side, rural development strategies should ideally be part of the efforts aimed at creating balanced regional development in order to accelerate the growth of underdeveloped regions and promote the availability of non-farm income opportunities for rural households in all the regions of Uganda.

In terms of income diversification, the results suggest that to enable the growth of the non-farm sector, policies that enhance the growth of both the farm and non-farm sectors are essential. To maximise the impacts of diversification on rural welfare, the

government should aim at improving the asset endowments of the poor and improving the functioning of land and credit markets. Investments in public services (electricity, credit and markets) may also help maximize the benefits of diversification by enabling households to make full use of the opportunities inherent in development of the non-farm sector. For example, more developed public infrastructure can help increase the size of rural towns, drive down transaction costs and boost investment in both the agricultural and the non-agricultural sectors. Broadly, the government should create an environment with relatively equitable distribution of income, well functioning factor markets and a strong emphasis on educational expansion and improvement.

It is important to note that female-headed households mainly rely on farm and non-labour income sources than their male counterparts. Therefore, policy makers should encourage female headed households to as well involve in wage and non-farm self-employment activities as income diversifying strategies.

Finally, some limitations of the analysis are worth mentioning. This thesis has carefully not attributed a strong causal link between the non-farm sector and poverty. Although it is possible that the non-farm sector is critical in poverty reduction, the empirical analysis did not establish this conclusively. This study considered wage employment regardless of whether it was agricultural or non-agricultural wage employment. This was due to the way the data were collected. It is however important to separate the two in order to understand how rural households in Uganda participate in these activities and their contribution to income inequality. Specifically, the agricultural sector may also act as a driving force behind changes in non-farm employment and welfare in Uganda. This has also not been clearly investigated and confirmed in this study.

7.3 Areas for Further Research

In terms of future research it would be important to analyze and compare changes overtime in the patterns of employment and incomes in rural areas of Uganda. An analysis of the determinants by agro-ecological zone would also be interesting in order to derive system (zone) specific interventions and policies. Future research, in

which agricultural performance is controlled for, is necessary to build up the story of an expanding non-farm sector driving poverty reduction in rural areas. More comprehensive and detailed studies on the potential advantages of this methodology and other empirical issues raised in the study would probably give information that is more helpful to policymakers in terms of understanding the behavior of rural peasants and the role of the non-farm sector.

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References

- Abdulai, A. and A. Crolerees (2001). Determinants of Income Diversification amongst Rural Households in Southern Mali. *Food Policy*, Vol. 26: 437-452.
- Abdulai, A and C.L. Delgado (1999). Determinants of Nonfarm Earnings of Farm Based Husbands and Wives in Northern Ghana. *American Journal of Agricultural Economics*, Vol. 81 No.1: 117-130.
- Adams, Jr. R.H. (1995). Agricultural Income, Cash Crops and Inequality in Rural Pakistan, *Economic Development and Cultural Change*, Vol.43, No.3: 467-491.
- Adams, Jr. R.H. (1996). Remittances, Income Distribution and Rural Asset Accumulation. Food Consumption and Nutrition Division, *International Food Policy Research Institute*. FDCN Discussion Paper No. 17.
- Adams, Jr. R.H. (1999). Non-Farm Income, Inequality and Land in Rural Egypt. *World Bank Policy Research Working Paper*, No.2178, Washington, D.C.
- Adams, Jr. R.H. and J.J. He (1995). Sources of Income Inequality and Poverty in Rural Pakistan, *International Food Policy Research Institute*. Research Report, No.102.
- Adger, W.N. (1999). Exploring Income Inequality in Rural Coastal Vietnam. *The Journal of Development Studies*, Vol. 35, No.5: 96-119.
- Adhikari, B., S. Di Falco and J.C. Lovett (2004). Household characteristics and forest dependency: Evidence from common property forest management in Nepal. *Ecological Economics*, Vol.48: 245-257.
- Amemiya, T. (1997). The Estimation of a Simultaneous-Equation Tobit model. Stanford University, *Institute of Mathematical Studies in the Social Sciences*, Technical Report, 236.
- Anand, S. (1983). *Inequality and Poverty in Malaysia: Measurement and Decomposition*. London: Oxford University Press.
- Anderson, D. and M. Leiserson (1980). Rural Non-Farm Employment in Developing Countries. *Economic Development and Cultural Change*, Vol.28, No.2: 227-48.
- Appleton, S. and S. Ssewanyana (2003). Poverty Analysis in Uganda, 2002/03, Economic Policy Research Centre, *Mimeo*.
- Appleton, S. (2001a). Poverty in Uganda, 1999/2000. Preliminary Estimates from the Uganda National Household Survey, University of Nottingham, *Mimeo*.

- Appleton, S. (2001b). Changes in Poverty and Inequality. In R. Reinikka and P. Collier (eds), “*Uganda’s Recovery: The Role of Farms, Firms and Government*”, World Bank: Regional and Sectoral Studies. pp. 83-121.
- Appleton, S., T. Emwanu, J. Kagugube, and J. Muwonge (1999). Changes in Poverty in Uganda, 1992-97. Centre for the Study of African Economies, University of Oxford, *Mimeo*.
- Ashenfelter, O. and J.J. Heckman (1974). The Estimation of Income and Substitution Effects in a Model of Family Labour Supply. *Econometrica*, Vol. 42: 73-84.
- Ashley, C and S. Maxwell (2001). Rethinking Rural Development. *Development Policy Review*. Vol.19, No.4: 395-425.
- Atkinson, A.B. (1970). On the Measurement of Inequality. *Journal of Economic Theory*, Vol.2: 244-268
- Bagachwa, M.D. and F. Stewart (1992). Rural Industries and Rural Linkages. In *Alternative Development Strategies in Sub Saharan Africa*, ed. F. Stewart, S. Lall, and S. Wangwe. London: Macmillan Press.
- Banks, J.S. and J. Duggan (1999). A Bargaining Model of Collective Choice. Division of Humanities and Social Sciences, California Institute of Technology, Pasadena.
- Bardhan, P. and C. Udry (1999). Development Microeconomics. Oxford: Oxford University Press.
- Barnum, H. N. and L. Squire (1979). An Economic Application of the Theory of the Farm Household. *Journal of Development Economics*, Vol. 6: 79-102.
- Barrett, C.B., M. Bezuneh and A. Abound (2001). Income Diversification, Poverty Traps and Policy Shocks in Côte d'Ivoire and Kenya. *Food Policy*, Vol. 26, No.4: 367-384.
- Barrett, C.B., M. Bezuneh, D. Clay and T. Reardon (2005). Heterogeneous Constraints, Incentives and Income Diversification Strategies in Rural Africa. *Quarterly Journal of International Agriculture*, Vol. 44, No.1: 37-60.
- Barrett, C.B. and T. Reardon (2000). Asset, Activity and Income Diversification among Africa Agriculturalists: Some Practical Issues. In *Income Diversification and Livelihoods in Rural Africa: Cause and Consequence of Change*. Special Edition of Food Policy.
- Barrett, C.B. T. Reardon and P. Webb (2001). Non-Farm Income Diversification and Household Livelihood Strategies in Rural Africa: Concepts, Dynamics and Policy Implications. *Food Policy*, Vol.26: 315-331.
- Beijuka, J. (1999). Micro-finance in Post Conflict Countries. In: The Case Study of Uganda, Paper presented at the joint ILO/UNHCR Workshop: Micro-finance in Post Conflict Countries, 15-17 September 1999. Geneva: ILO

- Benjamin, D. (1992). Household Composition, Labour Markets and Labour Demand: Testing for Separation in Agricultural Household Models. *Econometrica*, Vol.60: 287-322.
- Berdegue, J.A., E. Ramirez, T. Reardon and G. Escobar (2001). Rural Non-Farm Employment and Incomes in Chile. *World Development*, Vol. 29, No. 3: 411-425.
- Becker, G.S. (1965). A Theory of the Allocation of Time. *Economic Journal*, Vol.75: 493-517.
- Becker, G.S. (1981). A Treatise on Family. Cambridge, MA: Harvard University Press. pp 93-112.
- Bhaumik, S.K., R. Dimova, and J. Nugent (2006). Pulls, Pushes and Entitlement Failures in Labour Market: Does the State of Development Matter? *IZA Discussion Paper*, No. 2258. Bonn: Institute for the Study of Labour (IZA).
- Bigsten, A. and S. Kayizzi-Mugerwa (1995). Rural Sector Responses to Economic Crisis in Uganda. *Journal of International Development*, Vol.7, No.2: 181-209.
- Bigsten, A. and S. Horton (1999). Labour Markets in Sub-Saharan Africa. *University of Gothenburg. Mimeo.*
- Binswanger, H.P. (1983). Agricultural Growth and Rural Non-farm Activities. *Finance and Development*, (June), pp. 38-40
- Binswanger, H.P. (1986). Risk Aversion, Collateral Requirements, and the Market for Credit and Insurance in Rural Areas. In: Hazell P., C. Pomareda and A. Valdes (eds), *Crop Insurance for Agricultural Development*, Baltimore, MD: Johns Hopkins University Press.
- Binswanger, H.P., S. Khandker and M. Rosenzweig (1989). How Infrastructure and Financial Institutions affect Agricultural Output and Investment in India. *Working Paper*, No. 163. Washington D.C: World Bank.
- Blau, M.P., J.W. Gustad, R. Jessor, H.S. Parnes and R.C. Wilcock (1956). Occupational Choice: A Conceptual Framework. *Industrial and Labour Relations Review*, Vol.9, No.4 (July): 531-543.
- Block, S. (1999). Agriculture and Economic Growth in Ethiopia: Growth Multipliers from a Four Sector Simulation Model. *Agricultural Economics*, Vol.20, No.3: 241-252.
- Block, S. and P. Webb (2001). The Dynamics of Livelihood Diversification in Post-Famine Ethiopia. *Food Policy*, Vol. 26, No. 4: 333-350.
- Bourguignon, F. (1979). Decomposable Income Inequality Measures. *Econometrica*, Vol.47, No4: 901-920.

- Bright, H., J. Davis, M. Janowski, A. Low and D. Pearce (2000). Rural Non-Farm Livelihoods in Central and Eastern Europe and Central Asia and the Reform Process: A Literature Review. *NRI Report*, No.2633. Chatham Maritime UK: Natural Resources Institute.
- Bromley, D. W. and Chavas, J.P. (1989). On Risk, Transactions, and Economic Development in the Semi-arid Tropics. *Economic Development and Cultural Change*, Vol. 37:719-36
- Brown, D., E. Stephens, J.O. Ouma, F. Murithi and C. Barrett (2006). Livelihood Strategies in the Rural Kenya Highlands. *African Journal of Agricultural and Resource Economics*, Vol. 1, No.1: 21-36.
- Brown, S., T.R.L. Fry and M.N. Haris (2005). Occupational Choice: A Simultaneous Supply and Demand Approach. Department of Econometrics and Business Statistics, *Monash University*, Australia.
- Bryceson, D. (1999). African Rural Labour, Income Diversification and Livelihood Approaches: A Long-term Development Perspective. *Review of African Political Economy*, Vol.26, No.80: 171-189.
- Byerlee, D. (1973). Indirect Employment and Income Distribution Effects of Agricultural Development Strategies: A Simulation Approach Applied to Nigeria. *African Rural Employment Paper No. 9*. East Lansing: Michigan State University, Department of Agricultural Economics.
- Byerlee, D. and C.K. Eicher (1974). Rural Employment, Migration and Economic Development: Theoretical Issues and Empirical Evidence from Africa. in *Agricultural Policy in Developing Countries*. N. Islam, ed. New York: Macmillan, pp. 273-313.
- Byerlee, D., C.K. Eicher, C. Liedholm and D. Spencer (1977). Rural Employment in Tropical Africa: Summary of Findings. *African Rural Economy Working Paper No.20*. East Lansing, MI: Michigan State University.
- Caillavet, F., H. Guyomard and R. Lifrán (eds) (1994). *Agricultural Household Modeling and Family Economics*. Developments in Agricultural Economics: Elsevier.
- Canagarajah, S, and T. Saji (1997). Ghana's Labour Market, 1987-92. Policy Research Paper 1752. Washington D.C.: World Bank.
- Canagarajah, S., D. Mazumdar and X. Ye (1998). The Structure and Determinants of Inequality and Poverty Reduction in Ghana 1988-92. Washington, D.C: *World Bank*.
- Canagarajah, S., C. Newman and R. Bhattamishra (2001). Non-Farm Income, Gender and Inequality: Evidence from Rural Ghana and Uganda. *Food Policy*, Vol.26, No.4.

- Carney, D. (1998). Implementing the Sustainable rural livelihoods approach, pp. 3-23. In *Sustainable Rural livelihoods: What Contributions Can We Make?* Carney, D. (ed.) London: Department for International Development.
- Carter, M. and J. May (1999). Poverty, Livelihood and Class in Rural South Africa. *World Development*, Vol. 27, No. 1: 1-20.
- Castagnini, R., M. Menon and F. Perali (2004). Extended and Full Incomes at the Household and Individual Level: An Application to Farm Households. *American Journal of Agricultural Economics*, Vol.86, No.3, (August):730-736.
- Chay, Y.K. and L.J. Powell (2001). Semi-Parametric Censored Models. *Journal of Economic Perspectives*, Vol. 15, No. 4: 29-42
- Chayanov, A.V. (1925). *Peasant Farm Organization*. Moscow: Cooperative Publishing House. Translated in Thorner, D., B. Kerblay, and R.E.F. Smith. eds. (1966) *A.V Chayanov: The Theory of Peasant Economy*. Homewood, III: Richard Irwin.
- Chikwama, C. (2004). Rural Off-farm Employment and Farm Investment: An Analytical Framework and Evidence from Zimbabwe. *Centre for Economic Reform and Transformation*. School of Management and Languages, UK: Heriot-Watt University.
- Chinn, D.L. (1979). Rural Poverty and the structure of Farm Household Income in Developing Countries: Evidence from Taiwan. *Economic Development and Cultural Change*, Vol. 27, No.2: 283-301.
- Christiadi, C. and B. Cushing (2006). The Interaction between Individuals' Destination Choice and Occupational Choice: A Simultaneous Equation Approach. JEL Classification: R23, J61, J62.
- Chuta, E. and C. Liedholm. (1979). Rural Non-Farm Employment: A Review of the State of the Art. *MSU Rural Development Paper No.4*. East Lansing, Michigan: Department of Agricultural Economics, Michigan State University.
- Collier, P. and L. Deepak (1986). *Labour and Poverty in Kenya 1900-1980*. Oxford: Clarendon Press.
- Collier, P., S. Radwan and S. Wangwe and A. Wagner (1986). *Labour and Poverty in Rural Tanzania: Ujamaa and Rural Development in the United Republic of Tanzania*. Oxford: Clarendon Press.
- Connolly, S., J. Micklewright and S. Nickell (1992). The Occupational Success of Young Men who left School at Sixteen. *Oxford Economic Papers*, No.44: 460-79.
- Cooke A.P. (1998a). Intra-household Labour Allocation Responses to Environmental Good Scarcity: A Case Study from the Hills of Nepal. *Economic Development and Cultural Change*, Vol.46, No.4: 807-830.

- Cooke A.P. (1998b). The Effect of Environmental Good Scarcity on Own-farm Labour allocation: The Case of Agricultural Households in Rural Nepal. *Environment and Development Economics*, Vol.3: 443-469.
- Cooke A.P. (2000). Changes in Intra-Household Labour Allocation to Environmental Goods Collection: A Case Study from Rural Nepal, 1982 and 1987. FCND Discussion Paper No.87, Washington, DC: International Food Policy Research Institute.
- Corral, L. and T. Reardon (2001). Rural Non-farm Incomes in Nicaragua. *World Development*, Vol. 29, No. 3: 427-442.
- Cowell, F.A. (1995). *Measuring Inequality*. 2nd Edition. Harvester Wheatsheaf, Hemel Hempstead.
- Da Silva, J.G and M. del Grossi (2001). Rural Non-Farm Incomes in Brazil: Patterns and Evolution. *World Development*, Vol.29 No. 3, pp. 443-453.
- Datt, G., D. Joliffe and M. Sharma (1998). A Profile of Poverty in Egypt: 1997. Washington, DC: *International Food Policy Research Institute*.
- Davies, S. (1993). *Versatile Livelihoods: A Strategic Adaptation to Food Insecurity in the Malian Sahel*. Sussex: Institute of Development Studies.
- Davis, J. (2001). Conceptual Issues in Analysing the Rural Non-farm Economy in Transition Economies. *Natural Resources Institute Report No. 2635*. Chatham Maratime, UK: Natural Resources Institute.
- Davis, J.R. and D.J. Bezemer (2004). The Development of the Rural Non-farm Economy in Developing Countries and Transition Economies: Key Emerging and Conceptual Issues. Chatham, UK: *Natural Resources Institute*.
- Davis, J. and A. Cristoiu (2002). Patterns of Rural Non-farm Diversification and Employment in Romania: A Country Level Analysis. *Natural Resource Institute Report No.2639*. Chatham Maratime, UK: Natural Resources Institute.
- Davis, J. and A.Gaburici (2001). Non-farm Employment in Small Scale Enterprises in Romania: Policy and Development Issues. *Natural Resource Institute Report No.2637*. Chatham Maratime, UK: Natural Resources Institute.
- Davis, J. and D. Pearce (2001). The Non-agricultural Rural Sector in Central and Eastern Europe. *Natural Resources Institute Paper No.2630*. Chatham Maratime, UK: Natural Resources Institute.
- Davis, J. and E. Robinson, E. (2000). Participation of the Poor in the Rural Non-Farm Economy: Conceptual and Practical Considerations, *Natural Resources Institute Report*. Chatham Maratime, UK: Natural Resources Institute

- Deaton, A. (1997). *The Analysis of Household Surveys: A Micro econometric Approach to Development Policy*. Baltimore, MD: Johns Hopkins University Press.
- Delgado, C. and L. Siamwalla (1999). Rural Economy and Farm Diversification in Developing Countries. In G.H. Peters and J. von Braun (eds) *Food Security, Diversification and Resource management: Refocusing the Role of Agriculture*, Brookfield: International Associations of Agricultural Economists.
- De Brauw, A., J. Huang, S. Rozelle, L. Zhang, Y. Zhang (2002). The Evolution of China's Rural Labor Markets during the Reforms. *Journal of Comparative Economics*, Vol. 30: 329-353.
- De Gregorio, J. and J.W. Lee (2002). Education and Income Inequality: New Evidence from Cross-Country Data. *Review of Income and Wealth*, Series 48, No.3: 395-416.
- De Hoyos, R.E. (2006). Structural Modelling of Female Labour Participation and Occupational Decisions. CWPE 0611.
- De Janvry, A., M. Fafchamps and E. Sadoulet (1991). Peasant Household Behaviour with Missing Markets: Some Paradoxes Explained. *Economic Journal*, Vol. 409, No. 101: 1400-1417.
- De Janvry, A. and E. Sadoulet. (1996). Household Modelling for the Design of Poverty Alleviation Strategies. Working Paper 787, Department of Agricultural and Resource Economics, University of California, Berkeley.
- De Janvry, A. and E. Sadoulet (2000). Rural Poverty in Latin America: Determinants and Exit Paths. *Food Policy*, Vol.25: 389-409.
- De Janvry, A. and E. Sadoulet (2001). Income Strategies among Rural Households in Mexico: The Role of Off-farm Activities. *World Development*, Vol. 29, No. 3: 467-480.
- De Janvry, A., E. Sadoulet and N. Zhu (2005). The Role of Non-Farm Incomes in Reducing Rural Poverty and Inequality in China. *Mimeo*.
- Deininger K. and J. Okidi (2001). Rural Households: Incomes, Productivity, and Non-farm Enterprises. In eds. By R. Reinikka and P. Collier, "*Uganda's Recovery: The Role of Farms, Firms and Government*", World Bank; Regional and Sectoral Studies. pp. 123-175.
- Deininger K. and J. Okidi (2003). Growth and Poverty Reduction in Uganda 1999-2000, Panel Data Evidence. *Development Policy Review*, Vol.21, No. No.4: 481-509.
- Deininger, K. and P. Olinto (2001). Rural Non-Farm Employment and Income Diversification in Colombia. *World Development*, Vol. 29, No. 3: 455-466.

- Dercon, S. (1998). Wealth, Risk and Activity Choice: Cattle in Western Tanzania. *Journal of Development Economics*, Vol.55, No.1:1-42
- Dercon, S. and P. Krishnan (1996). Income portfolios in rural Ethiopia and Tanzania: Choices and Constraints. *Journal of Development Studies*, Vol.32, No. 6: 850-875.
- Desai, S. and D. Jain, (1994). Maternal Employment and Changes in Family Dynamics: The Social Context of Women's Work in Rural South India. *Population and Development Review*, Vol. 20, No.1: 115-136.
- Destre, G. and V. Henrard (2004). The Determinants of Occupational Choice in Colombia: An Empirical Analysis. Universite de Paris I and CNRS, France.
- Elbers, C. and P. Lanjouw (2001). Intersectional Transfers, Growth and Inequality in Rural Ecuador. *World Development*, Vol. 29, No. 3: 481-496.
- Ellis, F. (1993), *Peasant Economics: Farm Households and Agrarian Development*. Second Edition. Cambridge: Cambridge University Press.
- Ellis, F. (1998). Household Strategies and Rural Livelihood Diversification. *Journal of Development Studies*, Vol.35, No.1: 1-38.
- Ellis, F. (2000a). The Determinants of Rural Livelihood Diversification in Developing Countries. *Journal of Agricultural Economics*, Vol. 51, No. 2: 289-302.
- Ellis, F. (2000b). *Rural Livelihoods and Diversity in Developing Countries*. Oxford: Oxford University Press.
- EPRC (2004). International Trade and Gender in East Africa: The case of Uganda. *Mimeo, Economic Policy Research Centre, Kampala*
- Ersado, L. (2006). Income Diversification in Zimbabwe: Welfare Implications from Urban and Rural Areas. *World Bank Policy Research Working Paper* No.3964, July. Washington, DC: The World Bank.
- Escobal, J. (2001). The Determinants of Non-farm Income Diversification in Rural Peru. *World Development*, Vol. 29, No. 3: 497-508.
- Eswaran, M., and A. Kotwal (1986). Access to Capital and Agrarian Production Organisation, *Economic Journal*, Vol. 96, No. 382:482-498.
- Evans, H.E. (1992). A Virtuous Circle Model of Rural-Urban Development: Evidence from Kenya. *The Journal of Development Studies*, Vol.28, No.4: 640-667.

- Evans, H.E. and P. Ngau (1991). Rural –Urban Relations, Households Income Diversification and Agricultural Productivity. *Development and Change* Vol.22: 519-545.
- Fafchamps, M. (1993). Sequential Labour Decisions under Uncertainty: An Estimable Household Model of West African Farmers. *Econometrica*, Vol. 61, No.5: 1173-1198.
- Fafchamps, M. (1997). Introduction: Markets in Sub-Saharan Africa. *World Development* Vol.25, No.5: 733-734.
- Falabella, R. (1985). “Rural Non-farm Activities in the Philippines: Composition, Growth and Seasonality”, in Mukhopadhyay S. and P. L. Chee (eds.) *Development and Diversification of Rural Industries in Asia*. Kuala Lumpur : Asian and Pacific Development Centre.
- Fan, Shenggen; Zhang, Xiaobo; and Rao, Neetha. 2004. “Public Expenditure, Growth and Poverty Reduction in Rural Uganda.” *Development Strategy and Governance Division Discussion Paper No.4*. Washington, DC: International Food Policy Research Institute.
- Fei, J.C.H. and Ranis, G. (1964). Development of the Labour Surplus Economy: Theory and Policy. Illinois: Richard D. Irwin, Inc.
- Fei, J.C.M., G. Ranis and S. Kuo (1978). Growth and the Family Distribution of Income by Factor Components. *Quarterly Journal of Economics*, Vol. 92:17-53.
- Ferreira, F.H.G. and P. Lanjouw (2001). Rural Non-farm Activities and Poverty in the Brazilian Northeast. *World Development*, Vol.29, No.3: 509-528.
- Fields, G.S. (1979). Income Inequality in Urban Colombia: A Decomposition Analysis. *Review of Income and Wealth*. Vol.25: 327-341.
- Fields, G.S. (1980). *Poverty, Inequality and Development*. New York: Cambridge University Press.
- Fields, G. S. (2000). Poverty, Inequality and Economic Well-being: African Economic Growth in Comparative Perspective. *Journal of African Economies*, AERC Supplement.
- Fields, G.S. (2002). Accounting for Income Inequality and its Change: A New Method with Application to the Distribution of Earnings in the United States. School of Industrial Relations, Cornell University, *Mimeo*.
- Fields, G.S., S. Gary and Y. Gyeongioon (1995). Analysing the Sources of Korea’s Falling Labour Income inequality. *Mimeo*, Cornell University, November 1995.

- Finkelshtain, I. and J.A. Chalfant (1991). Marketed Surplus Under Risk: Do Peasants Agree with Sandmo? *American Journal of Agricultural Economics*, Vol.73, No.3: 558-67.
- Fisher, M., G. Shively, and S. Buccola (2002). *An Empirical Investigation of Activity Choice, Labour Allocation, and Forest use in Malawi*. A paper prepared for the 2nd World Congress of Environmental and Resource Economists, Monterey California.
- Fofack, H. (2002). The Nature and Dynamics of Poverty Determinants in Burkina Faso in the 1990s. *World Bank Policy Research Working Paper*, Washington D.C.
- Fofack, H., C. Monga and H. Tuluy (2001). Household Welfare and Poverty Dynamics in Burkina Faso: Empirical Evidence from Household Surveys. *World Bank Policy Research Working Paper*, Washington, D.C.
- Fofack, H. and A. Zeufak (1999). Dynamics of Income Inequality in Thailand: Evidence from Household Pseudo-Panel Data. Washington, D.C: The World Bank.
- Foster, J. (1985). Inequality Measurement. In Proceedings of *Symposia in Applied Mathematics*, Vol. 33, Ed. H.P. Young. Providence, RI: American Mathematical Society.
- Francis, E. and J. Hoddinott (1993). Migration and Differentiation in Western Kenya: A Tale of Two Sub-locations. *Journal of Development Studies*, Vol. 30, No.1:115-145.
- Freeman, D.B. and G.B. Norcliffe (1985). Rural Enterprise in Kenya: Development and Spatial Organisation of the Non-farm Sector. University of Chicago, Department of Geography. Research Paper No.214.
- Gavian, S. and M. Fafchamps (1996). Land Tenure and Allocative Efficiency. *American Journal of Agricultural Economics*, Vol. 78, No.2: 460-471.
- Glick, P. (1999). Simultaneous Determination of Home Work and Market work of Women in Urban West Africa. *Oxford Bulletin of Economics and Statistics* Vol.61, No.1: 57-84.
- Glick, P. and D. E. Sahn (1997). Gender and Education Impacts on Employment and Earnings in West Africa: Evidence from Guinea. *Economic Development and Cultural Change*, Vol. 45, No.4: 794-823.
- Goodwin, B.K. and A.K. Mishra (2004). Farming Efficiency and the Determinants of Multiple Job Holding by Farm Operators. *American Journal of Agricultural Economics*, Vol. 86, No.3: 722-729.
- Goodwin, B.K. and A.M. Featherstone (2003). Farm Households' Wealth and Off-farm Supply of Labour. University of California, Berkeley. *Mimeo*.

- Gordon, A. (1999). Non-Farm Rural Livelihoods. *Policy Series 4*. Chatham, UK: Natural Resources Institute.
- Gordon, A and C. Craig (2001). Rural Non-Farm Activities and Poverty Alleviation in Sub-Saharan Africa. *Policy Series 14*. Chatham, UK: Natural Resources Institute.
- Government of Uganda (GOU) (1996). Plan for Modernisation of Agriculture: MAAIF and MFPED, Kampala, Uganda.
- Government of Uganda (GOU) (1997). Poverty Eradication Action Plan (PEAP), Ministry of Finance, Planning and Economic Development, Kampala.
- Government of Uganda (GOU) (1999). Ministry of Health (MOH) STD/ACP Surveillance Report 1999.
- Government of Uganda (GOU) (2000a). Plan for Modernisation of Agriculture: Eradicating Poverty in Uganda. MAAIF and MFPED, Kampala, Uganda.
- Government of Uganda (GOU) (2000b). Uganda Participatory Poverty Assessment project (UPPAP). Ministry of Finance, Planning and Economic Development. Kampala, Uganda.
- Government of Uganda (GOU) (2001). Medium Term Competitive Strategy for the Private Sector -MTCS (2000-2005): Making Institution Support Private Growth. Ministry of Finance, Planning and Economic Development, Kampala.
- Government of Uganda (GOU) (2003a). Uganda Poverty Status Report, 2003. Ministry of Finance, Planning and Economic Development, Kampala.
- Government of Uganda (GOU) (2003b). Ministry of Health (MOH) STD/ACP Surveillance Report 2003.
- Government of Uganda (GOU) (2004a). Background to the Budget for Financial Year 2004/05. Ministry of Finance, Planning and Economic Development, Kampala.
- Government of Uganda (GOU) (2004b). Poverty Eradication Action Plan (PEAP), Ministry of Finance, Planning and Economic Development, Kampala.
- Government of Uganda (GOU) (2004c). Employment, Labour markets and Poverty in Uganda. Draft Report
- Government of Uganda (GOU) (2005). Background to the Budget for Financial Year 2005/06. Ministry of Finance, Planning and Economic Development, Kampala.
- Government of Uganda (GOU) (2006a). Labour Market Information Status Report for Uganda. Ministry of Gender, Labour and Social Development, Kampala.

- Government of Uganda (GOU) (2006b). Background to the Budget for Financial Year 2006/07. Ministry of Finance, Planning and Economic Development, Kampala.
- Greene, W.H. (2000). *Econometric Analysis* New York: Macmillan Publishing Company.
- Greene, W.H. (2003). *Econometric Analysis*. London: Prentice Hall International.
- Greenhalgh, C.A. and M.B. Stewart (1985). The Occupational Status and Mobility of British Men and Women. *Oxford Economic Papers*, No.37: 40-71.
- Gregorio J.D. and J.W. Lee (2002). Education and Income Inequality: New Evidence from Cross-Country Data. *Review of Income and Wealth*, Series 48, No. 3 (September).
- Griffiths, W.E, R.C. Hill and G.G. Judge (1993). *Learning and Practicing Econometrics*, New York: John Wiley & Sons Inc.
- Gronau, R. (1973). The Intra-family Allocation of Time: The Value of the Housewives' Time. *American Economic Review*, Vol. 63: 634-651.
- Gronau, R. (1977). Leisure, Home Production and Work - The Theory of the Allocation of Time Revisited. *Journal of Political Economy*, Vol. 85, No.6: 1099-1123.
- Gronau, R. (1980). Home Production – A Forgotten Industry. *Review of Economics and Statistics*, Vol. 62: 408-16.
- Gustman, A.L. (1979). The Impact of the Market and the Family on Youth Enrolment and Labour Market. *Working Paper No. 415*, Massachusetts Avenue, Cambridge.
- Haggblade, S. (2005). The Rural Non-farm Economy: Pathway Out of Poverty or Pathway In? Paper prepared for the research workshop “The Future of Small Farms”. Withersdane Conference Centre, Wye, Kent, UK (26-29 June 2005). IFPRI, ODI, Imperial College.
- Haggblade, S. (2007). Alternative Perceptions of the Rural Non-farm Economy. In Haggblade, S., P. Hazell and T. Reardon (eds). *Transforming the Rural Non-farm Economy*. Baltimore: Johns Hopkins University Press
- Haggblade, S., P. Hazell and J. Brown (1989). Farm-Non-farm Linkages in Rural Sub-Saharan Africa. *World Development*, Vol. 17, No.8: 1173-1201.
- Haggblade, S., P. Hazell and T. Reardon (2002). Strategies for Stimulating Growth in the Rural Non-farm Economy in Developing Countries. EPDT Discussion Paper No. 92. Washington, DC: *FPRI and The World Bank*.

- Haggblade, S., P. Hazell and T. Reardon (2007). Introduction. In Haggblade, S., P. Hazell and T. Reardon (eds.). *Transforming the Rural Non-farm Economy*. Baltimore: Johns Hopkins University Press.
- Hammer, J.S. (1986). Subsistence First: Farm Allocation Decisions in Senegal. *Journal of Development Economics*, Vol.23: 355-369.
- Hanmer, Lucia, G. Pyatt and H. White (1999). Poverty in Sub-Saharan Africa: What do we learn from World Bank Poverty Assessments? *Development and Change*.
- Hannah, L. and J.A. Kay (1977). *Concentration in Modern Industry*. London: Macmillan.
- Harper, B. and M. Hag (1997). Occupational Attainment of Men in Britain. *Oxford Economic Papers*, No. 49: 638-50.
- Harris, J.R and P.M. Todaro (1970). Migration, Unemployment and Development: A Two Sector Analysis. *American Economic Review*, Vol.60, No.1: 126-142.
- Hausman, J. and D. McFadden (1984). Specification tests for the Multinomial Logit Model. *Econometric Society*, Vol. 52 No. 5: 1219-40.
- Hazell, P. and S. Haggblade (1993). Farm-nonfarm Growth Linkages and the Welfare of the Poor. In *Including the poor*, ed. M. Limpton, and J. Van der Gaag, Washington, D.C: World Bank.
- Hazell, P. and B. Hojjati (1995). Farm-Nonfarm Growth Linkages in Zambia. *Journal of African Economics*, No.4, Vol.3: 406-435.
- Hazell, P. and Roell, A. (1983). Rural Growth Linkages: Household Expenditure Patterns in Malaysia and Nigeria. Research Report No.41. Washington, D.C: *International Food Policy Research Institute*.
- Heckman, J.J. (1979). Sample Selection Bias as a Specification Error. *Econometrica*, Vol. 47, No.1: 153-161.
- Heckman, J.J. (1980). Sample Selection Bias as a Specification Error with an Application to the Estimation of Labour Supply Functions. In: J.P Smith, ed., *Female Labour Supply*. Princeton NJ: Princeton University Press.
- Heckman, J.J. and D. MaCurdy (1980). A Life Cycle Model of Female Labour Supply. *Review of Economic Studies*, Vol. 47: 47-74.
- Hill, B. (1999). Farm Household Incomes: Perceptions and Statistics. *Journal of Rural Studies*, Vol. 15, No.3: 345-358.
- Hoddinott, J. (1992). Modelling Remittance Flows in Kenya. *Journal of African Economies*. Vol.1, No.2: 206-232.
- Howes, S. and J.O. Lanjouw (1998). Does Sample Design Matter for Poverty Comparisons? *Review of Income and Wealth*, Vol.44, No.1: 99-109.

- House, W.J. (1991). The Nature and Determinants of Socioeconomic Inequality Among Peasant Households in Southern Sudan. *World Development*, Vol. 19, No.7: 867-884.
- Hubbard, M., P. Jackson and F. Golooba-Mutebi (2001). Local Government and the Rural Non-farm Economy in Uganda. Report for Rural Non-farm Economy project, DFID/WB funded, UK: Natural Resources Institute.
- Huffman, W.E. (1980). Farm and Off-farm Work Decisions: The Role of Human Capital. *Review of Economics and Statistics*, Vol. 62, No.1: 14-23.
- Huffman, W.E. (1991). Agricultural Household Models: Survey and Critique. In M.C. Hallberg, J.L. Findeis, and D.A. Lass (eds.) *Multiple Job-holding among Farm Families in North America*. Iowa: Iowa State University Press, pp.79-111.
- Huffman, W.E. (2001). Human Capital: Education and Agriculture. In Bruce L. Gardner and Gordon C. Rausser, eds., *Handbook of Agricultural Economics*, Vol. 1a. Amsterdam: Elsevier Science/North-Holland, pp 333-381.
- Hussain, A., P. Lanjouw and N. Stern (1994). Income inequalities in China: Evidence from Household Survey Data. *World Development*, Vol.22, No.12: 1947-57.
- Hymer, S. and Resnick, S. (1969). A Model of an Agrarian Economy with Non-Agricultural Activities. *American Economic Review*, Vol. 59, No.4: 493-506.
- Ilahi, N. (2000). The Intra-Household Allocation of Time and Tasks: What have we Learnt from the Empirical Literature? World Bank, Gender and Development: *Working Paper Series*, No.13.
- Imbs, J. and R. Wacziarg (2000). Stages of Diversification. *NBER Working Paper*, No. 2642.
- Islam, N. (1997). The Non-farm Sector and Rural Development. Food, Agriculture and Environment Discussion Paper, No. 22. Washington, DC: *International Food Policy Research Institute*.
- Jacoby, H. (1992). Productivity of Men and Women and the Sexual Division of Labour in Peasant Agriculture of the Peruvian Sierra. *Journal of Development Economics*, Vol.37: 265-287.
- Jacoby, H. (1993). Shadow Wages and Peasant Family Labour Supply: An Econometric Application to the Peruvian Sierra. *Review of Economic Studies*, Vol. 60, No.4: 903-921.
- Jamal, H. (1995). Explanation of Off-farm Work Participation in Rural Pakistan. *Pakistan Development Review*, No.34, Vol.2: 139-149.
- Jonasson, E. (2005). Non-farm Employment as Rural Poverty Exit Path? Evidence from Peru. Draft. Department of Economics, Lund University, Sweden.

- Jorgenson, D.W. (1967). Surplus Agricultural Labour and the Development of a Dual Economy. *Oxford Economic Papers*, New Series, Vol. 19, No.3.
- Judge, G.G., W.E. Hill, H. Griffiths, Lutkepohl and T.C. Lee (1985). *Theory and Practice of Econometrics*, 2nd Edition, New York: John Wiley & Sons.
- Kakwani, N. (1980). *Income Inequality and Poverty: Methods of estimation and Policy Applications*. Oxford: Oxford University Press.
- Kennedy, P. (2003). *A Guide to Econometrics*. 5th Edition. London: The MIT Press
- Kevane, M. (1994). Village Labour Markets in Sheikan District, Sudan. *World Development*, Vol. 22, No. 6: 1-19.
- Khrishna, R. (1969). Comment: Models of the Family farm. In: *C.R. Wharton, Jr., ed. Subsistence Agriculture and Economic Development*. Aldine, Chicago.
- Kimalu P.K., G. Mwabu and W. Masai (2002) Non-Farm Activities and Households' Welfare in Kenya: A Case Study. *African Journal of Economic Policy*. Vol. 7, No.2: 57 – 70.
- Kimhi, A. (1996). Demographic Composition of Farm Households and its Effects on Time Allocation. *Journal of Population Economics*, Vol. 9, pp. 429-439.
- Kimhi, A. (2004). Family Composition and Off-farm Participation Decisions in Israeli Farm Households. *American Journal of Agricultural Economics*, Vol. 86, Issue 2: 502-12.
- Kimhi, A. and E. Rapaport (2004). Time Allocation between Farm and Off-farm Activities in Israeli Farm Households. *American Journal of Agricultural Economics*, Vol.86, Issue3: 716-721.
- Kirunga, C. (1997). Socio-economic Determinants of HIV Sero Status: A Study of Rakai District. MA Dissertation in Demography, Makerere University Institute of Statistics and Applied Economics, Kampala.
- Kooreman, P. and S. Wunderink (1996). *The Economics of Household Behaviour*. London: Macmillan Press Ltd.
- Kurosaki, T. (2001). Effects of Human Capital on Farm and Non-farm Productivity in Rural Pakistan. *Institute of Economic Research*, Hitotsubashi University, 2-1 Naka Kunitachi, Tokyo, Japan
- Lanjouw, J.O. and P. Lanjouw (1995). Rural Non-farm Employment: A survey. *Policy Research Working Paper*, 1463. Washington, DC: The World Bank
- Lanjouw, P. (1998). Ecuador's Rural Non-farm Sector as a Route out of Poverty. *Policy Research Working*, 1094. Washington, DC: The World Bank.

- Lanjouw, P. (1999). Policy Options for Employment in Rural Non-farm Sector. Rural Development Note, No.4. Washington DC: The World Bank.
- Lanjouw, P. (2001). Non-Farm Employment and Poverty in Rural El Salvador. *World Development*, Vol. 29, No.3: 529-547.
- Lanjouw, P. and F. Ferreira (2000). Rural Non-Agricultural Activities and Poverty in the Brazilian Northeast. *Economics Department of PUC-Rio Discussion Paper*, No. 428.
- Lanjouw, J.O. and P. Lanjouw (2001). The Rural Non-farm Sector: Issues and Evidence from Developing Countries. *Journal of Agricultural Economics*, Vol.26:1-23.
- Lanjouw, P., J. Quizon and R. Sparrow (2001). Non-Agricultural Earnings in Peri Urban areas of Tanzania: Evidence from household survey data. *Food Policy*, Vol. 26, No. 4: 385-403.
- Lanjouw, P. and A. Shariff (2004). Rural Non-farm Employment in India: Access, Income and Poverty Impacts. *Economic and Political Weekly* Vol.39, No. 40, pp. 4429-4446
- Lanjouw, P. (2007). "Does the Rural Non-farm Economy Contribute to Poverty Alleviation?". Chapter 3 in Haggblade S, P. Hazell and T. Reardon (eds.), *Transforming the Rural Non-farm Economy*. Baltimore: Johns Hopkins University Press.
- Larson, D. and K. Deininger (2001). Crop Markets and Household Participation. In eds. By R. Reinikka and P. Collier, "*Uganda's Recovery: The Role of Farms, Firms and Government*", World Bank; Regional and Sectoral Studies. pp. 177-205.
- Leavy, J. and White, H. (1999). Rural Labour Markets and Poverty in Sub-Saharan Africa. Mimeo. Institute of Development Studies: University of Sussex.
- Lee, J.E. (1965). Allocating Farm Resources between Farm and Non-farm uses. *Journal of Farm Economics*, Vol. 47:83-92.
- Leibbrandt, M.V., H. Bhorat and I.D. Woolard (2001). Household Inequality and the Labour Market in South Africa, *Contemporary Economic Policy*, Vol. 19, No.1.
- Leibbrandt, M.V., C.D. Woolard. and I.D. Woolard (2000). The Contribution of Income Components to Income Inequality in the Rural Homelands of South Africa: A Decomposable Gini Analysis. *Journal of African Economies*, Vol.9, No.1: 79-99.

- Lerman, R. and Yitzhaki, S. (1985). Income Inequality Effects by Income Sources: A New Approach and Applications to the United States. *Review of Economics and Statistics*, Vol.67, No.1: 151-156.
- Lewis, W.A. (1954). Economic Development with Unlimited Supplies of Labour. *Manchester School of Economics and Social Studies*, Vol.22, pp. 139-191
- Li, H. and Zou, H. (1998). Income Inequality is not Harmful for Growth: Theory and Evidence, *Review of Development Economics*, Vol.2, No. 3: 318-334.
- Liao, T. F. (1994). Interpreting Probability Models: Logit, Probit and other Generalized Linear Models. Sage University Paper Series on Quantitative Applications in the Social Sciences, Series Number 07-101. Thousand Oaks, CA: Sage Publications
- Liedholm, C. and L. Kilby (1989). The Role of Non-farm Activities in the Rural Economy. In *The Balance between Industry and Agriculture in Economic Development*. Proceedings of the Eighth World Congress of the International Economic Association, Delhi, India, London: Macmillan Press.
- Little, P.D., B.A. Cellarius, C.B. Barrett and D.L. Coppock (1999). Economic Diversification and Risk Management Among East African Herders: A Preliminary Assessment and Literature Review. GL -CRSP Pastoral Risk Management Project Technical Report 02/99.
- Little, P.D., K. Smith, B.A. Cellarius and D. L. Coppock (2001). Avoiding Disaster: Diversification and Risk Management among East African Herders. *Development and Change*. Vol. 32, No.3: 401-433.
- Lofgren, H. and S. Robinson (1999). To Trade or Not to Trade: Non-separable Farm Household Models in Partial and General Equilibrium. IFPRI, TMD Discussion paper No. 37. Washington, DC: IFPRI.
- Lopez, R. (1982). Applications of Duality Theory to Agriculture. *Western Journal of Agricultural Economics*, Vol. 7: 353-66.
- Lopez, R. (1984). Estimating Labour Supply and Production Decisions of Self-Employed Farm Producers. *European Economic Review*, Vol.24, No.1: 61 -82.
- Lopez, R. (1986). Structural Models of the Farm Household that Allow for Interdependent Utility and Profit Maximizing Decisions. In I. Singh, L. Squire, & J. Strauss (Eds), *Agricultural Household Models, Extensions, Applications and Policy* (pp. 306-325). Baltimore: World Bank and Johns Hopkins University Press.
- Low, A. (1982). A Comparative Advantage Theory of the Subsistence Farm-Household: Applications to Swazi Farming. *South African Journal of Economics*, Vol.50, No.2: 136-57.
- Low, A. (1986). *Agricultural Development in Southern Africa: Farm Household Economies and the Food Crisis*. London: James Curry

- Loxley, J. (1995). Rural Labour Markets in an Adjusting Mineral Economy: Zambia. In V. Jamal *Structural Adjustment and Rural Labour Markets in Africa*. London: St Martins Press.
- MaCurdy, T.E. (1981). An Empirical Model of Labour Supply in a Life-cycle Setting. *Journal of Political Economy*, Vol. 89: 1059-1085.
- Maddala, G.S. (1983). *Limited-Dependent and Qualitative Variables in Econometrics*. Cambridge University Press. Econometric Society Monographs.
- Mahmood, M. (1993). *Employment, Income and Productivity in the Rural Non-Farm Sector in Pakistan*. Geneva: International Labour Organisation, Asian Regional Team for Employment Promotion.
- Malchow-Møller, N. and Svarer, M. (2004). Wage Labour Activities by Agricultural Households in Nicaragua. Centre for Economic and Business Research. Discussion Paper number 11.
- Marter, A. (2002). The Rural Non-Farm Economy in Uganda: A review of Policy. NRI Report. No. 2702.
- Matlon, P. (1979). Income Distribution among Farmers in Northern Nigeria: Empirical Results and Policy Implications. *African Rural Economy Paper No.18*, Michigan State University.
- Matshe, I. and T. Young (2004). Off-farm Labour Allocation Decisions in Small Scale Rural Households in Zimbabwe. *Agricultural Economics*, Vol.30, No. 3: 175-186.
- McDonald, J.F. and R.A. Moffit (1980). The uses of Tobit Analysis. *The Review of Economics and Statistics*, Vol. 62, No.2: 318-321.
- Mecharla P.R. (2002). The Determinants of Rural Non-Farm Employment in Two Villages of Andhra and Pradesh (India). *PRUS Working Paper No. 12, Poverty Research Unit*, University of Sussex.
- Mekonnen, A. (1998). *Rural Energy and Afforestation: Case Studies from Ethiopia*, Unpublished Ph.D. Dissertation, Gothenburg University, Sweden.
- Mellor, J.W. (1976). *The New Economics of Growth: A Strategy for India and the Developing World*. Ithaca, NY: Cornell University Press.
- Miller, P.W. and P.A. Volker (1985). Economic Progress in Australia: An analysis of Occupational Mobility. *Economic Record*, No.61: 463-75.
- Mishra, A.K. and Goodwin, B.K. (1997). Farm Income Variability and the Supply of off-farm labour. *American Journal of Agricultural Economics*, Vol.79: 880-887.
- Mueller, C. and Lanot, G. (1997). Dualistic Sector Choice and Female Labour Supply: Evidence from the Formal and Informal sectors in Cameroon. CSAE Working Paper 979. Oxford: CSAE, University of Oxford.

- Muth, R.F. (1966). Household Production and Demand Functions. *Econometrica*, Vol. 34: 699-708.
- Mwabu, G. and E. Thorbecke (2004). Rural Development, Economic Growth and Poverty Reduction in sub-Saharan Africa. *Journal of African Economies*, Vol.13, AERC Supplement.
- Nakajima, C. (1970). Subsistence and Commercial Family Farm: Some Theoretical Models of Subjective Equilibrium. In Wharton, C.R., ed., *Subsistence Agriculture and Economic Development*, London: Frank Cass.
- Nakajima, C. (1986). *Subjective Equilibrium Theory of the Farm Household*. Amsterdam: Elsevier Press.
- Neitzert, M. (1994). A Woman's Place: Household Labour Allocation in Rural Kenya. *Canadian Journal of Development Studies*, Vol. 15, No.3: 401-27.
- NEMA (2002). National Environmental Management Authority. *State of the Environment Report*, Uganda.
- Nankhuni, F.J. and J.L. Findeis (2003). Natural Resource Collection and Children's Schooling in Malawi. A paper presented at the 25th International Conference of Agricultural Economists, August 16-22, Durban, South Africa.
- Nerlove, M. (1974). Toward a New Theory of Population and Economic Growth. In: T. Schultz, ed., *Economics of the Family* (University of Chicago Press, Chicago, 1974), pp. 527-545.
- Newbery, D. and J. Stiglitz (1981). *The Theory of Commodity Price Stabilization: A Study in the Economics of Risk*. Oxford: Clarendon Press.
- Newman, C. and S. Canagarajah (2000). Gender, Poverty and Non-farm Employment in Ghana and Uganda. *Policy Research Working Paper*, No. 2367. Washington, DC: The World Bank.
- Newman, J. and P. Gertler (1994). Family Productivity, Labour Supply and Welfare in a Low Income Country. *Journal of Human Resources*, Vol.29, No.4: 989-1026.
- Nickell, S. (1982). The Determinants of Occupational Success in Britain. *Review of Economic Studies*, Vol.1, No.1: 43-53.
- Nieuwoudt W.L. and N. Vink (1989). The Effects of Increased Earnings from Traditional Agriculture in Southern Africa. *South African Journal of Economics*, Vol. 57, No. 3: 257-269.
- Norman, D.W. (1973). Economic Analysis of Agricultural Production and Labour Utilisation Among the Hausa in the North of Nigeria. *African Rural Development Paper No. 4*, Department of Agricultural Economics, Michigan State University.

- Okwi, P.O. and D. Kaija (2000). The Distribution of Welfare in Uganda. *East and Southern Africa Social Science Research Review*, Vol. 16, No.2: 71-94.
- Okwi, P.O. (2005). Natural Resource Degradation and Household Time Allocation among Rural Activities: Empirical Evidence from Uganda. PhD Thesis (Unpublished), University of Cape Town.
- Omamo, S. W. (1998). Farm-to-market Transaction Costs and Specialization in Small-scale Agriculture: Explorations with a Non-separable Household Model. *The Journal of Development Studies*, Vol.35, No.2: 152-163.
- Oostendorp, R.H., T.Q. Trung and N.T. Tung (2006). The Changing Role of Non-farm Household Enterprises in Vietnam. Free University of Amsterdam.
- Paul, S. (2004). Income Sources Effects on Inequality. *Journal of Development Economics*. Vol.73, No.1: 435-451.
- Patil, G.P. and C. Taillie (1982). Diversity as a Concept and its Measurement. *Journal of the American Statistical Association*, Vol.77, No. 379 (September): 548-561.
- Persson, T. and G. Tabellini (1994). Is Inequality Harmful for Growth? Theory and Evidence, *American Economic Review*, Vol. 84: 600-621.
- Pindyck, R.S. and D.L. Rubinfeld (1991). *Econometric Models and Economic Forecasts*. New York: McGraw-Hill.
- Powell, J. (1984). "Least Absolute Deviations Estimation for the Censored Regression Model." *Journal of Econometrics* Vol. 25, No. 3: 303-325.
- Powell, J. (1994). "Estimation of Semiparametric Models." In Engle, R. and McFadden, D. Eds., *Handbook of Econometrics*, Vol. 4 (North Holland)
- Pudney, S. (1989). *Modelling Individual Choice: The Econometrics of Corners, Kinks and Holes*. Basil Blackwell Inc, 3 Cambridge Centre, Cambridge, Massachusetts 02142, USA.
- Pyatt, G., C. Chen. and J. Fei (1980). The Distribution of Income by Factor Components. *Quarterly Journal of Economics* Vol. 95 (November): 451-473.
- Quintano, C., R. Castellano and A. Regoli (2005). The Contribution of Self-Employment to Income Inequality. A Decomposition Analysis of Inequality Measures by sources and sub-groups for Italy, 1998-2002. A paper presented at the international conference in memory of two eminent social scientists: C. Gini and M.O. Lorenz. Draft. Siena, May 23-26th 2005.
- Ranis, G. and L. Fei (1961). A Theory of Economic Development. *American Economic Review*, Vol. 51: 533-565.
- Ranis, G. and F. Stewart (1993). Rural Non-agricultural Activities in Development: Theory and Application. *Journal of Development Economics*, Vol.40: 75-101.

- Reardon, T. (1990). Agricultural Development and Policy Issues Raised by Rural Household Income Diversification in the West African Semi-Arid Tropics. IFPRI, *Mimeo*, Washington, DC.
- Reardon, T. (1997). Using Evidence of Household Income Diversification to Inform Study of the Rural Non-farm Labour Market in Africa. *World Development*, Vol.25, No.5: 735-748.
- Reardon, T., J.A. Berdegue and G. Escobar (2001). Rural Non-farm Employment and Incomes in Latin America: Overview and Policy Implications. *World Development*, Vol.29, No. 3: 395-409.
- Reardon, T., C. Delgado and P. Matlon (1992). Determinants and Effects of Income Diversification amongst Farm households in Burkina Faso. *Journal of Development Studies*, Vol. 28: 264-296.
- Reardon, T., K. Stamoulis, M.E. Cruz, A. Balisacan, J.A. Berdegue and B. Banks (1998). Rural Non-farm Income in Developing Countries. Special chapter in *The State of Food and Agriculture 1998*. Part III, Rome: Food and Agriculture Organisation of the United Nations. pp. 283-356.
- Reardon, T. and J.E. Taylor (1996). Agro-climatic Shocks, Income inequality and Poverty: Evidence from Burkina Faso. *World Development*, Vol.24, No.5: 901-14.
- Reardon, T., J.E. Taylor, K. Stamoulis, P. Lanjouw and A. Balisacan (2000). Effects of Non-farm Employment on Rural Income Inequality in Developing Countries: An Investment Perspective. *Journal of Agricultural Economics*, Vol. 51, No. 2: 266-288.
- Reinert, K. (1998). Rural Non-farm Development: A Trade-Theoretic View. *Journal of International Trade and Economic Development*, Vol.7, No.4: 425-437.
- Resnick, S. (1970). The Decline of Rural Industry under Export Expansion. A Comparison among Burma, Philippines and Thailand, 1870-1938. *Journal of Economic History*, Vol.30: 51-73.
- Robertson, D. and J. Symons (1990). The Occupational Choice of British Children. *Economic Journal*, Vol.100, No.402: 828-41.
- Robinson, L.J. and P.J. Barry (1987). *The Competitive Firm's Response to Risk*. New York: Macmillan Publishing.
- Ruitenbeek, H.J. (1996). Distribution of Ecological Entitlements: Implications for Economic Security and Population Movement. *Ecological Economics*, Vol.17, No.1: 49-64.
- Rosenzweig, M.R. (1988). Labour Markets in Low Income Countries. In H. Chenery and T.N. Srinivasan (eds.). *Handbook of Development Economics*, Vol.1. Amsterdam: North-Holland.

- Rosenzweig, M.R. and K.I Wolpin (1993). Credit Market Constraints, Consumption Smoothing, and the Accumulation of Durable Production Assets in Low-income Countries: Investments in Bullocks in India. *Journal of Political Economy*, Vol. 101 No. 2: 223–244
- Rozelle, S., J.E. Taylor and A. de Brauw, A. (1999). Migration, Remittances, and Productivity in China. *American Economic Review*, Vol. 89 No. 2: 287-91.
- Sadoulet, E. and de Janvry, A. (1995). *Quantitative Development Policy Analysis*. Baltimore: Johns Hopkins University Press.
- Sadoulet, E., A. de Janvry and C. Benjamin (1998). Household Behaviour with Imperfect Labour Markets. *Industrial Relations*, Vol.37: 85-108.
- Sahn, David (1994). “Contribution of Income to Improved Nutrition on Côte d’Ivoire. *Journal of African Economies* Vol.3: 29-61
- Saito, A.K., H. Mekonnen and D. Spurling (1994). Raising the Productivity of Women Farmers in Sub-Saharan Africa. *World Bank Discussion Papers*, No. 230. Washington D.C.
- Seppala, P. (1996). The Politics of Economic Diversification: Reconceptualizing the Rural Informal Sector in South-East Tanzania. *Development and Change*, Vol.27, No. 3: 557-578.
- Sarr, L. (2004). The Impact of Family Literacy on the Earnings of Illiterates: Evidence from Senegal. Cornell Food and Nutrition Policy Program (CFNPP) *Working Paper* No. 159. Cornell University: Ithaca, New York.
- Serumaga-Zake, A.E. and W. Naude (2003). Private Rates of Return of Education of Africans in South Africa for 1995: A Double Hurdle Model. *Development Southern African*, Vol.20, No.4: 515-527.
- Schmidt, P. and R. Strauss (1975). Estimations of Models with Jointly Dependent Qualitative Variables: A Simultaneous Approach. *Econometrica*, Vol.43: 745-755.
- Schoones, I. (1998). Sustainable Rural Livelihoods: A Framework for Analysis. *Working Paper*, No. 72. Brighton: Institute of Development Studies.
- Schwarze, S. (2004). Determinants of Income Generating Activities of Rural Households: A Quantitative Study in the Vicinity of the Lore-Lindu National Park in Central Sulawesi, Indonesia. A PhD Thesis (Unpublished), Institute of Rural Development, University of Göttingen.
- Shapiro, D. (1990). Farm Size, Household Size and Composition, and Women’s Contribution to Agricultural Production: Evidence from Zaire. *Journal of Development Studies*, Vo.27, No.1: 1-21.
- Shorrocks, A. F. (1982). Inequality Decomposition by Factor Components. *Econometrica*, Vol. 50, No.1: 193-211.

- Shorrocks, A.F. (1983). The Impact of Income Components on the Distribution of Family Incomes. *Quarterly Journal of Economics*, Vol. 98: 311-326.
- Silber, J. (1989). Factor Components, Population Sub-groups and the Computation of the Gini Index of Inequality. *The Review of Economics and Statistics*, Vol.71: 107-115.
- Silber, J. (1993). Inequality Decomposition by Income Source: A note. *The Review of Economics and Statistics*, Vol.75: 545-547.
- Singh, I. J. and S. Janakiram, (1986). Agricultural Modelling in a Multi-crop Environment. In Singh, I., L. Squire and J. Strauss (eds.), *Agricultural Household Models-Extensions, Applications and Policy*. (Johns Hopkins University Press-Baltimore) pp. 233-254.
- Singh, I., L. Squire and J. Strauss (1986). A Survey of Agricultural Household Models: Recent Findings and Policy Implications. *World Bank Economic Review*, Vol. 1, No. 1: 149-179.
- Skoufias, E. (1994). Using Shadow Wages to Estimate Labour Supply of Agricultural Households. *American Journal of Agricultural Economics*, Vol.76, No.2: 215-227.
- Smith, D.R. (2001). Gender and the Rural Non-Farm Economy in Uganda. *Natural Resources Institute Report No. 2657*. Chatam, UK: Natural Resources Institute.
- Smith, D.R. (2003). The Spatial Dimension of the Non-Farm Economy in Uganda. *Natural Resources Institute Report No. 2673(March)*. Chatam, UK: Natural Resources Institute.
- Smith, D.R., A. Gordon, K. Meadows and K. Zwick (2001). Livelihood Diversification in Rural Uganda: Determinants of Difference. In *Income Diversification and Livelihoods in Rural Africa: Cause and Consequence of Change*. Special Edition of *Food Policy*.
- Ssewanyana, S., J. Okidi, D. Angemi and V. Barungi (2004). Understanding the Determinants of Income Inequality in Uganda. *Centre for the Study of African Economies*, Working Paper Series 2004-29.
- Shylendra, H.S. and P. Thomas (1995). Non-farm Employment: Nature, Magnitude and Determinants in a Semi-Arid Village of Western India. *Indian Journal of Agricultural Economics*, Vol.4, No. 3: 410-421.
- Stark, O., J. Taylor and S.Yitzhaki. (1986). Remittances and Inequality. *Economic Journal*, Vol.96, No.383: 722-40.
- Start, D. (2001). The Rise and Fall of the Rural Non-farm Economy: Poverty Impacts and Policy Options. *Development Policy Review*, Vol.19, No.4: 491-505.

- Stifel, D. (2007). Labour Markets, the Non-Farm Economy and Household Livelihood Strategies in Rural Madagascar. Labour Market Work Program, Washington D.C: The World Bank.
- Stifel, D. and B. Minten (2004). Isolation, Welfare and Agricultural Productivity. *Mimeo*. Laffayette College: Easton, PA.
- Sumner, D.A. (1982). The Off-farm Labour Supply of Farmers. *American Journal of Agricultural Economics*, Vol.64, No.3: 499-510.
- Strauss, J. (1986), "Appendix: The Theory and Comparative Statics of Agricultural Household Models: A General Approach. In Singh, I., L. Squire and J. Strauss (eds), *Agricultural Household Models-Extensions, Applications and Policy*. Baltimore: Johns Hopkins University Press.
- Strauss, J. (1984). Joint Determination of Food Consumption and Production in Rural Sierra Leone: Estimates of a Household-firm Model. *Journal of Development Economics*, Vol. 14, No.1: 77-103.
- Strauss, J. (1982). Socio-Economic Determinants of Food Consumption and Production in Rural Sierra Leone: Application of an Agricultural Household Model with Several Commodities. MSU International Development Paper: Michigan State University, East Lansing.
- Tauer, L.W. (1992). Diversification of Production Activities Across Individual States. *Journal of Production Agriculture*, Vol.5, No. 2: 210-14
- Taylor, J.E. (1992). Remittances and Inequality Reconsidered: Direct, Indirect and Intertemporal. *Journal of Policy Modelling*, Vol.14, No.2: 187-208.
- Taylor, J.E. and I. Adelman (2003). Agricultural Household Models: Genesis, Evolution and Extensions. *Review of Economics of the Household*, Vol.1, No.1: 33-58.
- Taylor, J.E. and A. Yunez-Naude (2000). The Returns from Schooling in a Diversified Rural Economy. *American Journal of Agricultural Economics*, Vol.82: 287-297.
- Timmer, C.P. (1988). The Agricultural Transformation. In Hollis Chenery and T.N. Srinivasan, *Handbook of Development Economics*, Vol.1. Amsterdam: North Holland.
- Tobin, J. (1958). Estimation of Relationships for Limited Dependent Variables. *Econometrica*, Vol. 26, No. 1: 24–36.
- Udry, C. (1996). "Efficiency and Market Structure: Testing for Profit Maximisation in African Agriculture" *Mimeo* (Illinois: North Western University Evanston).
- Udry, C. (1995). Gender, Agricultural Production and the Theory of the Household. Department of Economics, Northwestern University, Evanston.

- Uganda Bureau of Statistics (UBOS) (2001). Uganda National Household Survey 1999/2000. Report on the Socio-Economic survey. Government of Uganda.
- Uganda Bureau of Statistics (UBOS) (2003a). Compendium of Statistical Concepts and Definitions used in the Uganda Statistical System and Services. Government of Uganda (April)
- Uganda Bureau of Statistics (UBOS) (2003b). *Statistical Abstract*. Government of Uganda.
- Uganda Bureau of Statistics (UBOS) (2003c). Labour Force Survey Report, 2002/03, Government of Uganda.
- Uganda Bureau of Statistics (UBOS) (2003d). *Population and Housing Census Report*, Government of Uganda.
- Uganda Bureau of Statistics (UBOS) (2004). *Statistical Abstract*. Government of Uganda.
- Uganda Bureau of Statistics (UBOS) (2005a). *Statistical Abstract*. Government of Uganda.
- Uganda Bureau of Statistics (UBOS) (2005b). The Permanent Agricultural Statistical System (PASS). Government of Uganda.
- Uganda Bureau of Statistics (UBOS) (2006a). *Statistical Abstract*. Government of Uganda.
- Uganda Bureau of Statistics (UBOS) (2006b). Uganda National Household Survey 2005/06. Report on the Socio-Economic survey. Government of Uganda.
- Uganda Bureau of Statistics (UBOS) and International Livestock Research Institute (ILRI) (2007). Nature, Distribution and Evolution of Poverty and Inequality in Uganda, 1992-2002. Regal Press, Nairobi
- United Nations Development programme (UNDP) (2006). *Human Development Report*. New York: United Nations.
- UNAIDS (2006). Report on the Global AIDS Epidemic 2006. New York: United Nations
- Valentine, T.R. (1993). Drought, Transfer Entitlements and Income Distribution: The Botswana Experience. *World Development*, Vol.21, No. 1: 109-126.
- Verma, S. and P. Kumar (1996). Rural Non-Farm Employment in Bangladesh. Paper Prepared for the World Bank and Bangladesh Institute of Development Studies Workshop, July.
- Verma, B.N and N. Verma (1995). Distress Diversification from Farm to Non-Farm Rural Employment Sector in the Eastern Region. *Indian Journal of Agricultural Economics* Vol.4, No.3: 422-429.

- Vijverberg, W.P.M. (1995). Returns to Schooling in Non-Farm Self-employment: An Econometric Case Study of Ghana. *World Development*, Vol. 23 (July): 1215-1227.
- Weeks, J. (1995). Adjustment, Rural Labour and Inequality: Sierra Leone. In V. Jamal (ed) *Structural Adjustment and Rural Labour Markets in Africa*. London: St. Martins Press.
- Woldenhanna, T. and A. Oskam (2001) "Income Diversification and Entry Barriers: Evidence from the Tigray Region of Northern Ethiopia". *Food Policy*, Vol. 26: 351-365.
- World Bank (1990). *World Development Report: Poverty*. Washington D.C: World Bank.
- World Bank (1995). Country Assistance Strategy for Workers in an Integrating World. *World Bank Development Report*. Washington, D.C
- World Bank, (1997). Bangladesh: The Non-Farm Sector in a Diversifying Rural Economy. Report No. 16740-BD.
- World Bank (2000). The Rural Non-farm Economy: Report on Presentations and Discussions at World Bank.
<http://www.worldbank.org/research/rural/workshop/may2000/RNFEmay.pdf>
 (Assessed August 2005)
- World Bank (2003). *World Development report*. New York: Oxford University Press
- World Bank (2006). *World Development report*. New York: Oxford University Press
- Wooldridge, J.M. (2002). *Econometric Analysis of Cross Section and Panel Data*. London: The MIT Press.
- Wooldridge, J.M. (2003). *Introductory Econometrics: A Modern Approach*. Cincinnati, Ohio: South Western College Publications
- White, B. (1991). Economic Diversification and Agrarian Change in Rural Java, 1900-1990. In *the Shadow of Agriculture – Non-farm Activities in the Javanese Economy: Past and present*. Amsterdam: Royal Tropical Institute.
- White, H. (1980). A Heteroscedasticity-consistent Covariance Matrix Estimator and Direct Test for Heteroscedasticity. *Econometrica*, Vol.48, No.4: 817-838.
- White, H. (1982). Maximum Likelihood Estimation of Mis-specified Models. *Econometrica*, Vol.50, No.1: 1-25.
- Wiggins, S. and J.R. Davis (2003). Types of RNFE Activities and their Returns: Framework and Findings. *Natural Resources Institute report No.2754*. Chatham Maritime, UK: Natural Resources Institute.

- Yunez, A. and J.E. Taylor (2001). The Determinants of Non-farm Activities and Incomes of Rural Households in Mexico, with Emphasis on Education. *World Development*, Vol. 29, No. 3: 561-572.
- Zhu, N. and X. Luo (2006). Non-Farm Activity and Rural Income Inequality: A Case Study of Two Provinces in China. World Bank Policy Research Working Paper No. 3811. Washington, DC: The World Bank.
- Zwick, K. (2001). Access to Rural Non-Farm Livelihoods: Report on Household Interviews in Rakai and Kumi Districts, Uganda. DFID/WB funded project, UK: Natural Resource Institute.

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Appendices

Appendix 1 Population Share, Poverty Rate and Contribution to Poverty overtime

	1992/93			1997			1999/00			2002/03			2005/06		
	Pop.	Poverty	Contr.	Pop.	Poverty	Contr.	Pop.	Poverty	Contr.	Pop.	Poverty	Contr.	Pop.	Poverty	Contr.
National	100	55.7	100	100	44.4	100	100	33.8	100	100	38.8	100	100	31.1	100
Rural	87.6	59.7	93.8	86.7	48.7	95.0	86.9	37.4	96.3	86.2	42.7	94.6	84.6	34.2	93.2
Urban	12.4	27.8	6.2	13.3	16.7	5.0	13.1	9.6	3.7	13.8	14.4	5.1	15.4	13.7	6.8
Central	30.6	46.0	25.1	30.0	28.0	18.9	29.0	19.7	16.9	29.6	22.3	17.0	29.2	16.4	15.4
Eastern	27.9	59.0	24.4	28.5	54.0	34.9	26.6	35.0	27.5	27.4	46.0	32.5	25.2	35.9	29.0
Northern	17.3	72.0	22.4	16.5	60.0	22.2	19.0	63.7	35.9	18.3	63.0	29.5	19.7	60.7	38.6
Western	24.2	53.0	23.0	25.0	43.0	24.0	25.4	26.2	19.7	24.8	32.9	21.0	25.9	20.5	17.0

Source: UNHS Reports (1999/2000, 2002/ 2003 and 2005/2006)

Appendix 2 Tests of Reliability of Income Data

	Number	Mean	Linearized Standard error	Coefficient of variation
Total Income	7691	1281369	23779	1.2986
Farm income	7057	719045	12482	1.3615
Wage income	2172	173009	9155	3.4827
Self income	2279	203573	13395	4.3188
Non-labour income	6086	185742	6296	2.4802

Source: Author's own computations using the 1999/2000 UNHS

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Appendix 3 Stratum-wise Sistribution of rural sample: First stage sampling units

Stratum (District)	District Code	No. of Units (fsu)	No. of Observations (Households)	No. of Observations per unit		
				min	mean	max
CENTRAL REGION						
KALANGALA	101	6	59	9	9.8	10
KIBOGA	103	8	78	9	9.8	10
LUWERO	104	33	320	7	9.7	10
MASAKA	105	37	367	9	9.9	10
MPIGI	106	40	397	9	9.9	10
MUBENDE	107	36	357	9	9.9	10
MUKONO	108	36	353	9	9.8	10
NAKASONGOLA	109	6	58	8	9.7	10
RAKAI	110	12	116	8	9.7	10
SEMBABULE	111	7	69	9	9.9	10
EASTERN REGION						
BUGIRI	201	10	99	9	9.9	10
BUSIA	202	6	59	9	9.8	10
IGANGA	203	37	366	9	9.9	10
JINJA	204	12	118	9	9.8	10
KAMULI	205	36	354	9	9.8	10
KAPCHORWA	206	6	58	9	9.7	10
KATAKWI	207	12	115	9	9.6	10
KUMI	208	13	128	8	9.8	10
MBALE	209	37	366	9	9.9	10
PALLISA	210	16	158	9	9.9	10
SOROTI	211	12	120	10	10	10
TORORO	212	34	334	9	9.8	10
NORTHERN REGION						
ADJUMANI	301	6	57	9	9.5	10
APAC	302	38	369	7	9.7	10
ARUA	303	32	317	9	9.9	10
KOTIDO	306	12	114	8	9.5	10
LIRA	307	35	339	8	9.7	10
MOROTO	308	10	100	10	10	10
MOYO	309	6	60	10	10	10
NEBBI	310	10	98	9	9.8	10
WESTERN REGION						
BUSHENYI	402	40	397	9	9.9	10
HOIMA	403	20	200	10	10	10
KABALE	404	30	298	9	9.9	10
KABAROLE	405	39	381	5	9.8	10
KIBAALE	407	16	150	5	9.4	10
KISORO	408	14	140	10	10	10
MASINDI	409	16	157	9	9.8	10
MBARARA	410	37	369	9	10	10
NTUNGAMO	411	13	130	10	10	10
RUKUNGIRI	412	22	219	9	10.0	10
	40	848	8344	5	9.8	10

Source: Researcher's own computations from 1999/00 survey and Manual of Instructions for the 1999/2000 UNHS

Appendix 4 Decomposition of Income inequality by source (Coefficient of variation)

Variable	Concept	Farm	Wage	Self-employment	Non-Labour	Total
Weight of income source	w_i	0.561	0.135	0.159	0.145	
Coefficient of Variation	Cv_i	1.362	3.483	4.319	2.480	1.299
Relative variation	CV_i/CV	1.048	2.682	3.326	1.910	
Correlation (y_i, y)	r_i	0.710	0.429	0.601	0.436	
Relative concentration coefficient	$c_i = r_i * CV_i / CV$	0.744	1.151	2.000	0.833	
Decomposition of the CV	$w_i * c_i$	0.418	0.155	0.318	0.121	1
Households with income from the source		7,057	2,172	2,279	6,086	7,691
Mean income from the source among households with income from that source		719,045	173,009	203,573	185,742	1,281,369
Linearized standard error		12482	9155	13395	6296	23779

Source: Author's own computations using the 1999/2000 UNHS

Appendix 5 Determinants of Income Shares in rural Uganda: A Comparative

Table for CLAD and Tobit estimation

	Farm share		Non labour income	
	CLAD	Tobit	CLAD	Tobit
Age of household head	0.002*** [0.000]	0.002*** [0.000]	0.002*** [0.000]	0.002*** [0.000]
Sex of household head	0.017* [0.010]	-0.002 [0.011]	-0.099*** [0.004]	-0.104*** [0.008]
Marital status of household head	0.021** [0.010]	0.031*** [0.011]	0.020*** [0.004]	0.013 [0.008]
Household size	0.014*** [0.001]	0.009*** [0.002]	-0.006*** [0.001]	-0.005*** [0.001]
Female adults -primary education	-0.010** [0.005]	-0.008 [0.005]	0 [0.002]	-0.002 [0.004]
Female adults -secondary & tertiary education	-0.036*** [0.008]	-0.058*** [0.008]	-0.002 [0.003]	0.004 [0.006]
Male adults primary education	-0.018*** [0.005]	-0.014*** [0.005]	-0.009*** [0.002]	-0.002 [0.004]
Male adults -secondary & tertiary education	-0.055*** [0.007]	-0.041*** [0.008]	-0.021*** [0.003]	-0.017*** [0.006]
Head has primary education	0.028*** [0.007]	0.005 [0.008]	0.009*** [0.003]	0.004 [0.006]
Head has secondary & tertiary education	-0.025* [0.013]	-0.037** [0.015]	0.002 [0.005]	-0.008 [0.011]
Community's access to credit	-0.01 [0.007]	-0.001 [0.007]	-0.004 [0.003]	-0.007 [0.006]
Community has electricity	-0.01 [0.010]	-0.008 [0.011]	-0.020*** [0.004]	-0.021*** [0.008]
Distance to district headquarters	0.018*** [0.004]	0.020*** [0.004]	0.001 [0.002]	0.002 [0.003]
Central region	-0.044*** [0.009]	-0.033*** [0.010]	0.004 [0.004]	0.027*** [0.007]
Eastern region	-0.194*** [0.009]	-0.136*** [0.010]	0.048*** [0.003]	0.102*** [0.007]
Northern region	-0.063*** [0.011]	-0.056*** [0.011]	-0.012*** [0.004]	-0.003 [0.009]
Household owns a house	0.376*** [0.013]	0.302*** [0.014]	0.016*** [0.005]	-0.024** [0.010]
Household has transport asset	0.009 [0.007]	0.009 [0.008]	-0.009*** [0.003]	-0.030*** [0.006]
Household has livestock assets	0.054*** [0.007]	0.060*** [0.008]	0.001 [0.003]	-0.008 [0.006]
Household owns non-agricultural assets	-0.081*** [0.016]	-0.087*** [0.019]	-0.01 [0.007]	-0.014 [0.014]
Land size	0.056*** [0.004]	0.055*** [0.005]	-0.005*** [0.002]	-0.002 [0.004]
Constant	0.024 [0.023]zw	0.084*** [0.025]	0.135*** [0.009]	0.174*** [0.018]
Initial sample size	7691		7691	
Final sample size	7630		7676	
Pseudo R2	0.11		0.06	
Standard errors in brackets	* significant at 10%; ** significant at 5%; *** significant at 1%			

Source: Author's own computations using the 1999/2000 UNHS

**Appendix 6 Determinants of Income Diversification considering Farm, Wage
and Non-Farm Self-Employment only**

	Coefficient	Linearized Std. Err.	t	P>t
Age of household head	-0.003	0.000	-9.660	0.000
Sex of household head	0.055	0.015	3.570	0.000
Marital status of household head	0.010	0.015	0.690	0.490
Household size	0.001	0.002	0.580	0.564
Female adults -primary education	0.033	0.007	4.500	0.000
Female adults sec & tertiary education	0.062	0.013	4.990	0.000
Male adults primary education	0.026	0.008	3.530	0.000
Male adults –sec and tertiary education	0.049	0.012	4.100	0.000
Head has primary education	-0.018	0.011	-1.700	0.089
Head has sec & tertiary education	-0.047	0.022	-2.130	0.033
Community's access to credit	0.007	0.012	0.560	0.575
Community has electricity	-0.020	0.017	-1.140	0.256
Distance to district headquarters	-0.017	0.007	-2.500	0.013
Central region	0.022	0.014	1.590	0.112
Eastern region	0.080	0.015	5.370	0.000
Northern region	0.063	0.020	3.180	0.002
Household owns a house	0.063	0.019	3.340	0.001
Household has transport asset	0.012	0.012	1.010	0.313
Households has livestock assets	-0.005	0.011	-0.470	0.636
Household owns non-agric assets	0.191	0.037	5.210	0.000
Land size	-0.012	0.007	-1.700	0.089
Constant	1.302	0.036	36.480	0.000
Observations	7620.000			
R-squared	0.064			

Source: Author's own computations using the 1999/2000 UNHS

Appendix 7 Do files used to generate variables, descriptive statistics and empirical estimations

Appendix 7A Generating individual, household, community and location variables

```
set matsize 500
clear
*#delimit;
set mem 500m
program drop _all
set more off
capture log close
```

```
log using "C:\Darlison\Thesis\Analysis07\variables\variables.log", replace
```

```
*The 1999/2000 UNHS data was divided into rural and urban by Simon Appleton
*at the time of data cleaning and computing poverty levels for Uganda
```

```
use "C:\Darlison\Thesis\Analysis07\data\socio\hh.dta", clear
```

```
*Taking care of survey design (weights, stratification and clustering)
```

```
svyset ea [pweight=rmult], strata (dist)
```

```
svyset
```

```
svydes
```

```
tab urban
```

```
*Note: Survey covered 10,696 households and 8344 households are rural
```

```
* Dropping urban. Analysis considers only rural households
```

```
drop if urban ==1
```

```
rename urban rural
```

```
replace rural=1 if rural==0
```

```
tab rural
```

```
rename household hh
```

```
destring hh, gen (hh2)
```

```
drop hh
```

```
rename hh2 hh
```

```
sort hh
```

```
save "C:\Darlison\Thesis\Analysis07\variables\ruralhh.dta", replace
```

```
*Merging rural with Appleton Simon's poverty file to get rural households according to quintile
```

```
use "C:\Darlison\Thesis\Analysis07\Data\socio\poverty.dta", clear
```

```
rename household hh
```

```
destring hh, gen (hh2)
```

```
drop hh
```

```
rename hh2 hh
```

```
tab urban
```

```
sort hh
```

```
save "C:\Darlison\Thesis\Analysis07\variables\poverty.dta", replace
```

```
use "C:\Darlison\Thesis\Analysis07\variables\ruralhh.dta", clear
```

```
sort hh
```

```
merge hh using "C:\Darlison\Thesis\Analysis07\variables\poverty.dta"
```

```
tab _m
```

```
drop if _m <3
```

```
*all urban households dropped
```

```

drop _m
keep hh ea dist region rural rmultl xtotpc

*generating quintiles for rural sample only
xtile quint_rural = xtotpc, nq(5)
tab quint_rural
gen quint1=(quint_rural==1)
gen quint2=(quint_rural==2)
gen quint3=(quint_rural==3)
gen quint4=(quint_rural==4)
gen quint5=(quint_rural==5)

tab region quint_rural
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\ruralhhfinal.dta", replace

*merging section 2 which has hh and individual characteristics with rural file (ruralhhfinal).

use "C:\Darlison\Thesis\Analysis07\data\socio\sec2.dta", clear
sort hh
merge hh using "C:\Darlison\Thesis\Analysis07\variables\ruralhhfinal.dta"
tab _m
*There are 45,891 individuals in rural sample
drop if _m<3
drop _m
sum
sort hh pid
save "C:\Darlison\Thesis\Analysis07\variables\ruralsec2.dta", replace

*seperating individuals participating in gainful activities according to usual activity and usual
industry
tab usualact
count if usualact==.
drop if usualact==.

*drop those involved in non gainful activities (activities without pay, profit or family gain)
*i.e too young or old, disabled, attending to domestic duties, full time students, voluntary
political, social and religious workers
drop if usualact==1 | usualact==2 | usualact==3 | usualact==9 | usualact==10 | usualact==11 |
usualact==19

tab usualind
count if usualind==.
drop if usualind==.
*drop those who indicated not applicable on usual industry
drop if usualind==0
tab usualact
tab usualind

*The data considers only usual and regular members. visitors and former usual members who
have stayed abroad
*for six or more months were excluded.
*data on duration was collected for only usual and regular members
count if duration==.
drop if duration==.
drop duration survival
sum
*drop those with missing age and those <15 years. According to the Uganda rural systems
and ILO,

```

```

*children of age=>15 usually begin to participate in gainful work on the farm and non-farm
*In some cases the girls get married off while the boys begin searching for employment or
taking care of themselves;
count if age==.
drop if age<15|age==.
*according to UBoS, all those aged 95 and above should be considered as 95 years.
list pid if age >95
count if age >95
replace age=95 if age>95
sum
sort pid

*we create major categories of farm employment & non-farm employment categories using
industry codes
gen farmactiv=(usualind==1| usualind==2| usualind==3| usualind==4| usualind==5)
gen nonfarm = (usualind>5)
tab farm nonfarm

*Move government and private employees who work on farming and livestock sectors from
farm to non-farm category
replace farmactiv=0 if usualact==7|usualact ==8
replace nonfarm=1 if farm==0 & usualact==7|usualact==8
tab farmactiv nonfarm

*categorising nonfarm into wage employment and self employment
gen nonfarmwage= (usualact==7 |usualact==8) if nonfarm==1
replace nonfarmwage=0 if nonfarmwage==.
gen nonfarmself=(usualact==4| usualact==5 | usualact==6 ) if nonfarm==1
replace nonfarmself=0 if nonfarmself==.
tab nonfarmwage nonfarmself

*checking secondary activity status
tab secactiv
count if secactiv==4|secactiv==5|secactiv==6|secactiv==7|secactiv==8
*secondary activity can not be used in this study since the observation are few (4,675
individuals)
*compared to main activity (16,730 individuals)
drop relation usualocc secactiv secindus secoccup curracti currindu curroccu
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\participation_variables.dta",replace

*Generating individual variables

use "C:\Darlison\Thesis\Analysis07\variables\participation_variables.dta",clear
gen gender =(sex==1)
*male=1
gen agesq=age*age
gen men_bel35=(age<35 & gender==1)
gen women_bel35=(age<35 & gender==0)
gen men_35above=(age>34 & gender==1)
gen women_35above=(age>34 & gender==0)
tab farmactiv nonfarm if age==95
list if maritals==.
*3 missing maritals. All are males aged 27, 29 and 31. They all indicated children under
relation.
replace maritals=1 if maritals==.
sum
tab gender farmactiv
tab gender usualact

```



```

sort hh pid
save "C:\Darlison\Thesis\Analysis07\variables\partisexage_variables.dta",replace

*generating individual variables on education

use "C:\Darlison\Thesis\Analysis07\data\socio\sec3.dta", clear
sort hh
merge hh using "C:\Darlison\Thesis\Analysis07\variables\ruralhhfinal.dta"
tab _m
drop if _m<3
drop _m
gen literate=(literacy==4)
tab higheste
count if higheste==.
*(294 observations missing higheste)
drop if higheste==.
gen noeduc=(higheste==0|higheste==1|higheste==99)
gen
prieduc=(higheste==11|higheste==12|higheste==13|higheste==14|higheste==15|higheste==16|higheste==17|higheste==21|higheste==22|higheste==23)
gen
seceduc=(higheste==31|higheste==32|higheste==33|higheste==34|higheste==35|higheste==36|higheste==41)
gen terteduc=(higheste==51|higheste==61)
gen education = (noeduc==1)
replace education =2 if education ==0 & prieduc==1
replace education =3 if education ==0 & seceduc==1
replace education =4 if education ==0 & terteduc==1
duplicates list
keep hh pid ea dist region rural quint_rural quint1 quint2 quint3 quint4 rmultl noeduc prieduc
seceduc terteduc education literate
sum
sort hh pid
save "C:\Darlison\Thesis\Analysis07\variables\education_variables.dta", replace

*merging education_variables to partisexage_variables

merge hh pid using "C:\Darlison\Thesis\Analysis07\variables\partisexage_variables.dta"
tab _m
drop if _m<3
drop _m
duplicates list
duplicates drop
drop sex usualact usualind
sum
svydes
sort hh pid
save "C:\Darlison\Thesis\Analysis07\variables\partindividual_variables.dta", replace

**Generate household variables

*generating from section 2 (for household head)

use "C:\Darlison\Thesis\Analysis07\variables\ruralsec2.dta", clear
gen hhead=(relation==1)
keep if hhead==1
gen sexhh=(sex==1)
list if maritals==.
drop if maritals==.
gen mar_head = (maritals==2|maritals==3)

```

```

sum
count if age==.
*2 household heads have missing age. Drop them
drop if age==.
count if age<15
count if age<15 & hhead==1
*2 household heads are less than 15 years. These should be dropped
drop if age <15
replace age =95 if age > 95
gen agehh=age
gen agehhsq=agehh*agehh
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\sec2head_variables.dta", replace

*Generating variables for education of the household head

use "C:\Darlison\Thesis\Analysis07\data\socio\sec3.dta", clear
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\sec3.dta", replace
use "C:\Darlison\Thesis\Analysis07\data\socio\sec2.dta", clear
sort hh
merge hh using "C:\Darlison\Thesis\Analysis07\variables\sec3.dta"
tab _m
drop if _m<3
drop _m
gen hhead = (relation==1)
sort hh
merge hh using "C:\Darlison\Thesis\Analysis07\variables\ruralhhfinal.dta"
tab _m
drop if _<3
drop _m
keep if hhead==1
sum
gen hhliterate=(literacy==4)
tab higheste
count if higheste==.
*(52 heads missing higheste)
drop if higheste==.
gen hhnoeduc=(higheste==0|higheste==1|higheste==99)
gen
hhprieduc=(higheste==11|higheste==12|higheste==13|higheste==14|higheste==15|higheste==16|higheste==17|higheste==21|higheste==22|higheste==23)
gen
hhseceduc=(higheste==31|higheste==32|higheste==33|higheste==34|higheste==35|higheste==36|higheste==41)
gen hhterteduc=(higheste==51|higheste==61)
gen hhsectert = hhseceduc + hhterteduc
replace hhsectert = 0 if hhsectert==.

sort hh
merge hh using "C:\Darlison\Thesis\Analysis07\variables\sec2head_variables.dta"
tab _m
drop if _m<3
drop _m
sum
keep hh pid hhead ea- agehhsq
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\sec23head_variables.dta", replace

```

```

*generating household size
use "C:\Darlison\Thesis\Analysis07\variables\ruralsec2.dta", clear
sort hh
qui by hh: gen byte hsize = _N
collapse hsize ea dist region rural rmultl quint_rural , by (hh)
sum
* Household size greater than 30 is termed as institution by UBOS and is dropped.
list hh if hsize>30
drop if hsize>30
*(3 observations deleted)
tab hsize
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\hsize_variable.dta", replace

*merging hsize_variable with sec23head_variables

merge hh using "C:\Darlison\Thesis\Analysis07\variables\sec23head_variables.dta"
tab _m
drop if _m<3
drop _m
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\sec23headhsize.dta", replace

**Household composition

use "C:\Darlison\Thesis\Analysis07\variables\ruralsec2.dta", clear

gen children= (age<6)
label variable children "number of children aged less than 6 in hh"

gen boys = ((age>5) & (age<15) & (sex==1))
label variable boys "number of boys in hh of age 6 but less than 15"

gen girls = ((age>5) & (age<15) & (sex==2))
label variable girls "number of girls in hh of age 6 but less than 15"

gen maleadults =((age>=15)& age<60 & (sex==1))
label variable maleadults "Number of males of age 15 & above"

gen femadults =((age>=15)& age<60 & (sex==2))
label variable femadults "number of females of age 15 & above"

gen elders =age>=60
label variable elders "persons aged 60+"

gen adults =age>=15
label variable adults "persons aged 15+"

sum
merge hh using "C:\Darlison\Thesis\Analysis07\variables\partindividual_variables.dta"
tab _m
drop if _m<3
drop _m

*generating education by gender and age

```

```

gen madultnoeduc = (noeduc==1) if maleadults==1
replace madultnoeduc =0 if madultnoeduc ==.
gen madultpri = (prieduc==1) if maleadults==1
replace madultpri = 0 if madultpri==.
gen madultseduc = (seceduc==1) if maleadults==1
replace madultseduc = 0 if madultseduc==.

gen madulterteduc = (terteduc==1) if maleadults==1
replace madulterteduc = 0 if madulterteduc==.

gen feadultnoeduc = (noeduc==1) if femadults==1
replace feadultnoeduc = 0 if feadultnoeduc==.

gen fedultpri = (prieduc==1) if femadults==1
replace fedultpri = 0 if fedultpri==.

gen fedultseduc = (seceduc==1) if femadults==1
replace fedultseduc =0 if fedultseduc==.

gen fedulterteduc = (terteduc==1) if femadults==1
replace fedulterteduc =0 if fedulterteduc==.

gen femalesectert = fedultseduc + fedulterteduc
replace femalesectert = 0 if femalesectert==.

gen malesectert = madultseduc + madulterteduc
replace malesectert = 0 if malesectert==.

collapse (sum) children girls boys femadults maleadults adults elders femalesectert
malesectert madultnoeduc madultpri madultseduc madulterteduc feadultnoeduc fedultpri
fedultseduc fedulterteduc, by (hh)
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\hhcomposition.dta", replace

*merging household composition with householdhead_variables

merge hh using "C:\Darlison\Thesis\Analysis07\variables\sec23headhsize.dta"
tab _m
drop if _m<3
drop _m
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\hhxteristics1.dta", replace

*generating proportions of age groups in household by gender

gen pchildren = children/hsize
label variable pchildren "proportion of children in hh"

gen pgirls =girls/hsize
label variable pgirls "proportion of girls in hh"

gen pboys =boys/hsize
label variable pboys "proportion of boys in hh"

gen pmaleadults =maleadults/hsize
label variable pmaleadults "proportion of male adults in hh"

gen pfemadults =femadults/hsize

```

```

label variable pboys "proportion of female adults in hh"

gen pelders = elders/hsize
label variable pelders "proportion of elders in a hh"

sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\hhxteristics2.dta", replace

*generate household assets variables using section 10a

use "C:\Darlison\Thesis\Analysis07\data\socio\sec10a.dta", clear
gen hseasset=(assetcod==1|assetcod==2 & nowvalue>0)
gen transpasset=(assetcod==7|assetcod==8|assetcod==207 & nowvalue>0)
gen livestockasset=( assetcod==101| assetcod==102| assetcod==103| assetcod==104|
assetcod==105| assetcod==109 & nowvalue>0)
gen landasset=(assetcod==201 & nowvalue>0)
gen landsize=nowquant if assetcod==201
count if landsize==.
replace landsize=0 if landsize==.
*count if landsize==0
tab landsize

*removing outliers
drop if landsize>500
spikeplot landsize
gen lnlandsize = ln(landsize+1)

* generate different land sizes

gen landcategory = (landsize==0)
replace landcategory=2 if landsize>0 & landsize<2 & landcat==0
replace landcategory = 3 if landsize>=2 & landsize<5 & landcat==0
replace landcategory = 4 if landsize>=5 & landsize<20 & landcat==0
replace landcategory =5 if landsize>=20 & landsize<50 & landcat==0
replace landcategory=6 if landsize>=50 & landcat ==0
tab landcategory
sum
gen agricasset=(assetcod==202| assetcod==203| assetcod==204| assetcod==205|
assetcod==206)
gen nonagricasset=(assetcod==209)
duplicates list
collapse (max)landsize lnlandsize hseasset transpasset livestockasset landasset agricasset
nonagricasset landcategory, by (hh)
sum
sort hh

*getting land per capita

merge hh using "C:\Darlison\Thesis\Analysis07\variables\hhxteristics2.dta"
tab _m
drop if _m<3
drop _m
gen landpercapita =(landsize/hsize)
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\hhxteristics3.dta", replace

*Getting land per adult

```

```

*there is a household with 1 person but having 415 acres (outlier - drop it)
drop if landsize==415
gen landperadult=(landsize/adults)
spikeplot landperadult
tab landperadult
gen lnlandperadult = ln(landperadult+1)
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\household_variables.dta", replace

**generating locational variables

use "C:\Darlison\Thesis\Analysis07\variables\ruralhhfinal.dta", clear
tab region
gen centralregion=(region==1)
gen eastregion=(region==2)
gen northregion=(region==3)
gen westregion=(region==4)
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\location_variables.dta", replace

*merging household and location xteristics

merge hh using "C:\Darlison\Thesis\Analysis07\variables\household_variables.dta"
tab _m
drop if _m<3
drop _m
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\hhlocation_variables.dta", replace

*generating community variables.

*generating electricity from section 9

use "C:\Darlison\Thesis\Analysis07\Data\comm\sec9.dta", clear
keep househol hhelectr haveelec
rename househol hh
destring hh, gen (hh2)
drop hh
rename hh2 hh
sum
tab haveelec
gen electricom = (haveelec==1)
tab electricom
drop haveelec hhelectr
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\electricom.dta", replace

*generating access to credit from section 7b

use "C:\Darlison\Thesis\Analysis07\Data\comm\sec7b.dta", clear
keep househol s7bq1 s7bq3
rename househol hh
sum s7bq1 s7bq3
rename s7bq1 creditsource

```

```

count if creditsource==.
count if s7bq3==.
drop if s7bq3==.
sum creditsource s7bq3
tab creditsource s7bq3
gen formalcredit=((creditsource==1|creditsource==2|creditsource==3|creditsource==4) &
(s7bq3==1))
collapse (max) formalcredit, by (hh)
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\creditcomm.dta", replace

```

* merging electricom and creditcomm

```

merge hh using "C:\Darlison\Thesis\Analysis07\variables\electricom.dta"
tab _m
drop if _m<3
drop _m
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\elecreditcomm.dta", replace

```

```

*Distance from community to district headquarters
use "C:\Darlison\Thesis\Analysis07\Data\comm\sec1.dta", clear
keep household ea mult distdist
rename household hh
tab distdist
spikeplot distdist
tab distdist if distdist>200
*Drop distdist=800 since it is an outlier.
drop if distdist==800
sum distdist
drop if distdist>200
gen lndistdist=ln(distdist+1)
sort hh

```

```

merge hh using "C:\Darlison\Thesis\Analysis07\variables\elecreditcomm.dta"
tab _m
drop if _m<3
drop _m
sum
sort ea
save "C:\Darlison\Thesis\Analysis07\variables\community_variables.dta", replace

```

*merging community_variables and hhlocation_variables(household & location variables)

```

use "C:\Darlison\Thesis\Analysis07\variables\hhlocation_variables.dta", clear
sort ea
merge ea using "C:\Darlison\Thesis\Analysis07\variables\community_variables.dta"
tab _m
drop if _m<3
drop _m
sum
sort ea
save "C:\Darlison\Thesis\Analysis07\variables\hhcomloc_variables.dta", replace

```

*merging household, location and community variables (hhlocatcomm_variables) with individual and participation variables (partindividual_variables)

```

use "C:\Darlison\Thesis\Analysis07\variables\partindividual_variables.dta", clear
sort ea
merge ea using "C:\Darlison\Thesis\Analysis07\variables\hhcomloc_variables.dta"
tab _m
drop if _m<3
drop _m
sum
svydes
sort hh pid
save "C:\Darlison\Thesis\Analysis07\variables\indhhcomloc_variables.dta", replace

```

*labelling variables

```

label variable eastregion "household located in eastern region"
label variable centralregion "household located in central region"
label variable northregion "household located in northern region"
label variable westregion "household located in western region"
label variable noeduc "individual has no education"
label variable prieduc "individual has primary education"
label variable seceduc "individual has secondary education"
label variable terteduc "individual has tertiary education "
label variable education "noeduc-primary-secondary-tertiary"
label variable literate "individual can read and write"
label variable age "individual's age"
label variable gender "individual's sex"
label variable agesq "age squared"
label variable hhead "household head"
label variable agehh "age of household head"
label variable agehhsq "age of household head squared"
label variable hsize "household size"
label variable sexhh "sex of household head"
label variable mar_head "marital status of household head"
label variable hhnoeduc "household head has no education"
label variable hhprieduc "household head has primary education"
label variable hhseceduc "household head has secondary education"
label variable hhterteduc "household head has tertiary education "
label variable hhliterate "household head can read and write"
label variable landsize "quantity of land owned by household"
label variable agricasset "household owns agricultural assets"
label variable nonagricasset "household owns nonagricultural assets"
label variable landpercapita "land asset per capita"
label variable marital "marital status"
label variable farmactiv "crop or noncrop activity by individuals"
label variable nonfarm "nonfarm activity by individuals"
label variable nonfarmwage "nonfarm wage activity by individuals"
label variable nonfarmself "nonfarm self employment by individuals"
label variable electricom "community has electricity"
label variable rural "household located in rural area"
label variable quint_rural "poverty quintiles"
label variable formalcredit "community's access to formal credit"
label variable landperadult "land size per adult in a household"
label variable dist "district"
label variable men_bel35 "men below 35 years in a household"
label variable women_bel35 "women below 35 years in a household"
label variable men_35above "men equal or above 35 years in a household"
label variable women_35above "women equal or above 35 years in a household"
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\variables\independent_variables.dta", replace

```


Appendix 7B Deriving shadow wages for males and females

```
set matsize 500
clear
*#delimiter;
set mem 500m
program drop _all
set more off
capture log close

log using "C:\Darlison\Thesis\Analysis07\shadow wage\shadwage_july07.log", replace

*generating inputs used in crop farming in season 1

*soil preparation, planting and weeding in season 1
use "C:\Darlison\Thesis\Analysis07\data\crop\sec3a.dta", clear
sum
rename househol hh
destring hh, gen (hh2)
drop hh
rename hh2 hh
sort hh
collapse (sum) itemnumb - children, by (hh)
gen malehired1s= malenumb if (itemnumb==2|itemnumb==3)
replace malehired1s=0 if malehired1s==.
gen malefamily1s =malenumb if (itemnumb==1|itemnumb==4|itemnumb==5)
replace malefamily1s=0 if malefamily1s==.
gen femahired1s= femalenu if (itemnumb==2|itemnumb==3)
replace femahired1s=0 if femahired1s==.
gen femalefamily1s = femalenu if (itemnumb==1|itemnumb==4|itemnumb==5)
replace femalefamily1s=0 if femalefamily1s==.
gen malepay1s = (malecash + malekind)
replace malepay1s = 0 if malepay1s==.
gen femalepay1s = (femaleca + femaleki)
replace femalepay1s = 0 if femalepay1s==.
rename children childcrop
sum

*Dropping outliers who spend millions of shillings
replace malepay1s=520000 if malepay1s>520000
replace femalepay1s=280000 if femalepay1s>280000
sum if malepay1s>0| femalepay1s>0
replace femalepay1s=350 if femalepay1s==80
spikeplot malepay1s
spikeplot femalepay1s
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\soilprep_season1.dta", replace

*Harvesting in season 1
use "C:\Darlison\Thesis\Analysis07\data\crop\sec3b.dta", clear
sum
rename househol hh
destring hh, gen (hh2)
drop hh
rename hh2 hh
sort hh
collapse (sum) itemnumb - children, by (hh)
gen malehired1h= malenumb if (itemnumb==2|itemnumb==3)
```

```

replace malehired1h=0 if malehired1h==.
gen malefamily1h =malenumb if (itemnumb==1|itemnumb==4|itemnumb==5)
replace malefamily1h=0 if malefamily1h==.
gen femahired1h= femalenu if (itemnumb==2|itemnumb==3)
replace femahired1h=0 if femahired1h==.
gen femalefamily1h = femalenu if (itemnumb==1|itemnumb==4|itemnumb==5)
replace femalefamily1h=0 if femalefamily1h==.
gen malepay1h = (malecash + malekind)
replace malepay1h = 0 if malepay1h==.
gen femalepay1h = (femaleca + femaleki)
replace femalepay1h = 0 if femalepay1h==.
rename children childcrop
sum if malepay1h>0| femalepay1h>0
spikeplot malepay1h
spikeplot femalepay1h
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\harvest_season1.dta", replace

*merge with soilprep_season1
merge hh using "C:\Darlison\Thesis\Analysis07\shadow wage\soilprep_season1.dta"
tab _m
drop if _m<3
drop _m

*generating hired and family labour/ money spent for season 1 by gender

gen malehired1 = malehired1s + malehired1h
gen femalehired1 = femahired1s + femahired1h
gen malefamily1 = malefamily1s + malefamily1h
gen femalefamily1 = femalefamily1s + femalefamily1h
gen malepay1 =malepay1s + malepay1h
gen femalepay1 =femalepay1s + femalepay1h
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\labour_season1.dta", replace

*soil preparation, planting and weeding in season 2
use "C:\Darlison\Thesis\Analysis07\data\crop\sec3c.dta", clear
sum
rename househol hh
destring hh, gen (hh2)
drop hh
rename hh2 hh
sort hh
collapse (sum) itemnumb - children, by (hh)
gen malehired2s= malenumb if (itemnumb==2|itemnumb==3)
replace malehired2s=0 if malehired2s==.
gen malefamily2s =malenumb if (itemnumb==1|itemnumb==4|itemnumb==5)
replace malefamily2s=0 if malefamily2s==.
gen femahired2s= femalenu if (itemnumb==2|itemnumb==3)
replace femahired2s=0 if femahired2s==.
gen femalefamily2s = femalenu if (itemnumb==1|itemnumb==4|itemnumb==5)
replace femalefamily2s=0 if femalefamily2s==.
gen malepay2s = (malecash + malekind)
replace malepay2s = 0 if malepay2s==.
gen femalepay2s = (femaleca + femaleki)
replace femalepay2s = 0 if femalepay2s==.
rename children childcrop

```

```

sum if malepay2s>0|femalepay2s>0
spikeplot malepay2s
spikeplot femalepay2s
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\soilprep_season2.dta", replace

```

*Harvesting in season 2

```

use "C:\Darlison\Thesis\Analysis07\data\crop\sec3d.dta", clear
sum
rename household hh
destring hh, gen (hh2)
drop hh
rename hh2 hh
sort hh
collapse (sum) itemnumb - children, by (hh)
gen malehired2h= malenumb if (itemnumb==2|itemnumb==3)
replace malehired2h=0 if malehired2h==.
gen malefamily2h =malenumb if (itemnumb==1|itemnumb==4|itemnumb==5)
replace malefamily2h=0 if malefamily2h==.
gen femahired2h= femalenu if (itemnumb==2|itemnumb==3)
replace femahired2h=0 if femahired2h==.
gen femalefamily2h = femalenu if (itemnumb==1|itemnumb==4|itemnumb==5)
replace femalefamily2h=0 if femalefamily2h==.
gen malepay2h = (malecash + malekind)
replace malepay2h = 0 if malepay2h==.
gen femalepay2h = (femaleca + femaleki)
replace femalepay2h = 0 if femalepay2h==.
rename children childcrop
sum if malepay2h>0|femalepay2h>0
spikeplot malepay2h
spikeplot femalepay2h
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\harvest_season2.dta", replace

```

*merge with soilprep_season2

```

merge hh using "C:\Darlison\Thesis\Analysis07\shadow wage\soilprep_season2.dta"
tab _m
drop if _m<3
drop _m

```

*generating hired and family labour for season 2 by gender

```

gen malehired2 = malehired2s + malehired2h
gen femalehired2 = femahired2s + femahired2h
gen malefamily2 = malefamily2s + malefamily2h
gen femalefamily2 = femalefamily2s + femalefamily2h
gen malepay2 =malepay2s + malepay2h
gen femalepay2 =femalepay2s + femalepay2h
sum
sort hh
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\labour_season2.dta", replace

```

* merging labour input for season 1 and 2

```

merge hh using "C:\Darlison\Thesis\Analysis07\shadow wage\labour_season1.dta"
tab _m
drop if _m<3

```

```

drop _m
sum

*generate annual variables to match the annual income
* take either 3c or 3d bcse they are similar
gen malehiredyr = (malehired1 + malehired2s)
gen femahiredyr = (femalehired1 + femahired2s)
gen malefamilyr = (malefamily1 + malefamily2s)
gen femafamilyr = (femalefamily1 + femalefamily2)
gen malepayr = malepay1 + malepay2s
gen femalepayr = femalepay1 + femalepay2s
sum
sum malepayr femalepayr if malepayr>0|femalepayr>0
gen malehiredum = (malepayr>0)
gen femahiredum = (femalepayr>0)
sum femahiredum malehiredum
keep hh femahiredum malehiredum femalepayr malepayr femafamilyr malefamilyr childcrop
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\labour_input12.dta", replace

* generating non-labour inputs (seeds and other)for season 1 & 2

use "C:\Darlison\Thesis\Analysis07\data\crop\sec3e.dta", clear
sum
rename househol hh
destring hh, gen (hh2)
drop hh
rename hh2 hh
sort hh
replace firstvis=0 if firstvis==.
replace secondvi=0 if secondvi==.
sum
gen seedcostyr = (firstvis + secondvi) if (serialnu==4|serialnu==5|serialnu==6|serialnu==7)
replace seedcostyr =0 if seedcostyr==.
gen otherinputstyr = (firstvis + secondvi) if
(serialnu==1|serialnu==2|serialnu==3|serialnu==8|serialnu==9)
replace otherinputstyr=0 if otherinputstyr==.
collapse (sum) seedcostyr otherinputstyr, by (hh)
*seed cost can not be 3 sillings. replace with 100
replace seedcostyr=100 if seedcostyr==3
gen totnonlbryr = seedcostyr + otherinputstyr
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\nonlbr_seasons12.dta", replace

*Cropped area (cultivated land)
use "C:\Darlison\Thesis\Analysis07\data\crop\sec3f.dta", clear
sum
sort hh
replace s3fq3=0 if s3fq3==.
replace s3fq5=0 if s3fq5==.
gen croplandyr = (s3fq3 + s3fq5) if s3fq1==3|s3fq1==5
gen totlandyr = s3fq3 if s3fq1==1
collapse (sum) croplandyr totlandyr, by (hh)
drop if croplandyr>500
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\croparea_season12.dta", replace

```

```

*merge crop area with non-labour inputs
merge hh using "C:\Darlison\Thesis\Analysis07\shadow wage\nonlbr_seasons12.dta"
tab _m
drop if _m<3
drop _m
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\croparea_nonlbrinputs.dta", replace

```

```

*generating crop income
use "C:\Darlison\Thesis\Analysis07\data\socio\sec9a.dta", clear
sum
replace cash=0 if cash==.
replace kind =0 if kind ==.
gen cropfarminc = cash + kind if code==11
replace cropfarminc = 0 if cropfarminc==.
collapse (sum) cropfarminc, by (hh)
sum
gen lncropinc = ln(cropfarminc+1)
sort hh

```

```

*merge with household variables
merge hh using "C:\Darlison\Thesis\Analysis07\variables\household_variables.dta"
tab _m
drop if _m<3
drop _m
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\cropincome.dta", replace

```

```

*Merging croparea_nonlbrinputs and income data
merge hh using "C:\Darlison\Thesis\Analysis07\shadow wage\croparea_nonlbrinputs.dta"
tab _m
drop if _m<3
drop _m
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\landincome_nlbrinputs.dta", replace

```

```

*merging crop area, income and non-labour inputs (landincome_nlbrinputs) with labour_input
for season 1 and 2
merge hh using "C:\Darlison\Thesis\Analysis07\shadow wage\labour_input12.dta"
tab _m
drop if _m<3
drop _m
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\income_allinputs.dta", replace

```

```

*Computing shadow wages for males and females within a household
*STEPS

```

```

*Run cobb douglas production function using a tobit model with log farm income as the
dependent variable against farm inputs, hh and regional variables.
*Predict log farm income for men and women
*Compute marginal product of male and female labour by multiplying parameter estimates for
farm family men and farm family women, and the ratio of the predicted value of output to
family male/female labour respectively
*Compute shadow wages for males and females by multiplying marginal product(which is the
shadow wage rate) by the regional market wage for males and females respectively

```

*Obtain shadow wages for non participating households by using the maximum shadow wage (marginal product) for male and females respectively.

*Note: using cobb douglas production function requires logs for all the continuous right hand side variables

```
use "C:\Darlison\Thesis\Analysis07\shadow wage\income_allinputs.dta", clear
gen lnmalefamilyr = ln(malefamilyr+1)
gen lnfemafamilyr = ln(femafamilyr+1)
gen lnmalepayr = ln(malepayr+1)
gen lnfemalepayr = ln(femalepayr+1)
gen lnchildcrop = ln(childcrop+1)
gen lnotherinputsyr = ln(otherinputsyr+1)
gen lnseedcostyr = ln(seedcostyr+1)
gen lnCroplandyr = ln(croplandyr +1)
g reg1=(region==1)
g reg2=(region==2)
g reg3=(region==3)
g reg4=(region==4)
svydes
```

** There is a stratum with one sampling unit therefore it cannot obtain standard errors in the analysis.

**This is in dist 306 (Kotido) and ea 5705. Drop it

```
list ea if dist ==306
count if ea ==5705
drop if ea==5705
svydes
sort hh
merge hh using "C:\Darlison\Thesis\Analysis07\variables\poverty.dta"
tab _m
drop if _m<3
drop _m
sum
```

*estimating shadow wage for male (SWm)

*Using theory expectation in chapter 5 to run Tobit

*The model includes labour and non-labour inputs, hh level and regional variables.

```
tobit lnCropinc lnmalefamilyr lnfemafamilyr lnchildcrop lnotherinputsyr lnseedcostyr
lnCroplandyr reg4 reg2 reg3 sexhh transpasset hseasset malehiredum femahiredum
livestckasset hhnoeduc hhseceduc hhtertedu, ll
```

predict residuals

```
predict lnCropincmale if lnmalefamilyr!=0 & lnCropinc!=0
```

```
sum lnCropincmale
```

*generate M1 which is the ratio of predicted male income per male participating in farm

```
gen M1= lnCropincmale/lnmalefamilyr if lnCropinc!=0 & lnmalefamilyr!=0
```

*generating MP of males in the hh

```
gen MPm = M1 * 0.0110566
```

```
sum MPm
```

```
replace MPm = 0.242744 if lnmalefamilyr!=0 & MPm==.
```

```
replace MPm=0 if MPm==.
```

```
sum MPm
```

*estimating shadow wage for female (SWf)

tobit Incropinc Inmalefamilyr Infemafamilyr Inchildcrop Inotherinputsyr Inseedcostyr
 Incroplandyr reg4 reg2 reg3 sexhh transpasset hseasset malehiredum femahiredum
 livestckasset hhnoeduc hhseceduc hhtertedu, ll

predict Incropincfemale if Infemafamilyr!=0 & Incropinc!=0

sum Incropincfemale

*generate M2 which is the ratio of predicted female income per female participating in farm

gen M2= Incropincfemale/Infemafamilyr if Incropinc!=0 & Infemafamilyr!=0

*generating MP of females in the hh

gen MPf = M2 * 0.0925453

sum MPf

replace MPf = 1.989258 if Infemafamilyr!=0 & MPf==.

replace MPf=0 if MPf==.

sum MPf MPm

* MPm and MPf are marginal products for men and women respectively

* Estimate the shadow wages. The mean for MPf > the mean for Mpm implying that

* women have higher Marginal productivity on own farms than men. This explains why women stay back to work on own farms

*while the men go to work for money.

*To get the shadow wage, multiply MPm and MPf by UBOS' labour market survey average by region and gender

*NOTE: wages vary by region and gender in Uganda

* Reference: Labour market information status for Uganda (GOU, 2006:32)-Table 3.14 and UBOS, 2003c.

gen SWm=MPm*24522 if reg1==1

replace SWm = MPm* 22627 if reg2==1

replace SWm=MPm*25894 if reg3==1

replace SWm=MPm*22537 if reg4==1

gen SWf=MPf*11507 if reg1==1

replace SWf=MPf*5464 if reg2==1

replace SWf=MPf*30797 if reg3==1

replace SWf=MPf*7601 if reg4==1

sum SWm SWf

sort region

by region: sum SWm SWf

*t-test for equality with male and female rural market wages (Male = 22582 & Female = 15734)

ttest SWm = SWf

ttest SWm = 22582

ttest SWf = 15734

*Ideally the shadow wage should be less than the market wage for hired labour for respective gender. This is the case with these results

*Descriptive statistics

*Table 5.5

svy: mean Incropinc Inmalefamilyr Infemafamilyr Inchildcrop Inotherinputsyr Inseedcostyr
 Incroplandyr reg4 reg2 reg3 sexhh transpasset hseasset malehiredum femahiredum
 livestckasset hhnoeduc hhseceduc hhtertedu

*Table 5.6

svy: mean SWm SWf, over(region)

keep hh SWm SWf MPm MPf residuals

spikeplot SWm

spikeplot SWf

gen lnSWm=ln(SWm+1)

```
gen lnSWf=ln(SWf+1)

label variable SWm " shadow wage for men in a household"
label variable SWf " shadow wage for females in a household"
label variable lnSWm "log shadow wage for men in a household"
label variable lnSWf "log shadow wage for females in a household"
label variable MPm " marginal product for males in a hh"
label variable MPf " marginal product for females in a hh"
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\shadow wage\shadowages_MF.dta", replace
```

University of Cape Town

Appendix 7C Determinants of Participation (Multinomial Logit)

```
set matsize 500
clear
*#delimit;
set mem 500m
program drop _all
set more off
capture log close

log using "C:\Darlison\Thesis\Analysis07\multinomial\logitresults.log", replace

*participation, individual, household, community and location variables
use "C:\Darlison\Thesis\Analysis07\variables\independent_variables.dta", clear
sort hh
sum
svydes
sort hh

*merging with the shadow wage for male and female

use "C:\Darlison\Thesis\Analysis07\shadow wage\shadowages_MF.dta", clear
sort hh
merge hh using "C:\Darlison\Thesis\Analysis07\variables\independent_variables.dta"
tab _m
drop if _m<3
drop _m
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\multinomial\indhhcomlocshadow.dta", replace

*generating dependent variable (participation)

gen participate=(farmactiv==1)
replace participate=2 if participate==0 & nonfarmwage==1
replace participate=3 if participate==0 & nonfarmself==1
label variable participate "farm-nonfarmwage-nonfarmself"
tab participate
sum

**generating quintiles for analysis sample only

xtile quint_sample = xtotpc, nq(5)
tab quint_sample
gen quints1=(quint_sample==1)
gen quints2=(quint_sample==2)
gen quints3=(quint_sample==3)
gen quints4=(quint_sample==4)
gen quints5=(quint_sample==5)

sort hh
save "C:\Darlison\Thesis\Analysis07\multinomial\partindhhcomlocshadow.dta", replace

*Descriptives - general tabulation of usual activity and usual industry
*before dropping any observations
use "C:\Darlison\Thesis\Analysis07\variables\ruralsec2.dta", clear
tab usualact
```

```

*26 individuals have missing information about usual activity
tab usualind
*23 individuals have missing information about usual industry
count if (usualact==4|usualact==5|usualact==6|usualact==7|usualact==8) & usualind>0
tab secactiv
count if (secactiv==4|secactiv==5|secactiv==6|secactiv==7|secactiv==8) & usualind>0
*secondary activity can not be used in this study since the observation are very few (4736
individuals)
*compared to main activity. drop secactiv
drop secactiv

*Descriptives of dependent variable
use "C:\Darlison\Thesis\Analysis07\multinomial\partindhhcomlocshadow.dta", clear
tabstat farmactiv nonfarmwage nonfarmself , stats(mean sum)
tabstat farmactiv nonfarmwage nonfarmself, by (quint_sample)
tabstat farmactiv nonfarmwage nonfarmself, by (region)
tab region
tab quint_sample

* regional summary statistics by activity and quintile
tab quint_sample participate if region ==1
tab quint_sample participate if region ==2
tab quint_sample participate if region ==3
tab quint_sample participate if region ==4

* summary statistics of activity by gender and sex of head

tabstat farmactiv nonfarmwage nonfarmself, by (gender)
tabstat farmactiv nonfarmwage nonfarmself, by (sexhh)

tabstat men_bel35 women_bel35 men_35above women_35above, by (participate)
tabstat landsize, by (participate)
tabstat landperadult, by (participate)
tabstat noeduc prieduc seceduc terteduc, by (participate)
tabstat hhnoeduc hhprieduc hhseceduc hhterteduc, by (participate)

*participation, by region and quintile
table quint_sample, by (region) c(mean farmactiv)
table quint_sample, by (region) c(mean nonfarmself)
table quint_sample, by (region) c(mean nonfarmwage)

*Running a multinomial model (participate is the dependent variable)
*Note: Participate =1 (farm activity); participate =2 (non-farm wage) and participate =3(non-
farm self)

svy: mlogit participate age agesq gender mar_head men_bel35 women_bel35
women_35above lnlandperadult noeduc seceduc terteduc agricasset transpasset
livestckasset electricom formalcredit lnSWm lnSWf Indistdist centralregion eastregion
northregion residuals, basecategory (1)
sort hh pid
save "C:\Darlison\Thesis\Analysis07\multinomial\logit.dta", replace

*Marginal effects

mfx, predict(outcome(2))
mfx, predict(outcome(3))
outreg using "C:\Darlison\Thesis\Analysis07\multinomial\auto", ctitle(Non-farm wage, Non-
farm self) se 3aster bdec(3) bracket
sort hh pid
save "C:\Darlison\Thesis\Analysis07\multinomial\marginal effects.dta", replace

```

Appendix 7D Determinants of Diversification and Income Shares

(OLS, Tobit and CLAD)

```
set matsize 500
clear
*#delimit;
set mem 500m
program drop _all
set more off
capture log close

log using "C:\Darlison\Thesis\Analysis07\diversification\diversiresults.log", replace

*generating household annual income according to categories.

use "C:\Darlison\Thesis\Analysis07\data\socio\sec9a.dta", clear
gen farminc= cash + kind if code==11|code==12
gen selfinc = cash + kind if code==13|code==14
gen nonlbrinc = cash + kind if
code==21|code==22|code==23|code==24|code==25|code==26|code==31|code==32|code==
33|code==34
collapse (sum) farminc selfinc nonlbrinc, by (hh)
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\diversification\sec9a.dta", replace

*merging 9a with rural file to get rural households
merge hh using "C:\Darlison\Thesis\Analysis07\variables\ruralhhfinal.dta"
tab _m
drop if _m<3
drop _m
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\diversification\ruralsec9a.dta", replace

*using section 9b to generate employment (wage) income

use "C:\Darlison\Thesis\Analysis07\data\socio\sec9b.dta", clear
collapse (sum) grandtot, by (hh)
sort hh
rename grandtot employinc
sum employinc
sort hh
save "C:\Darlison\Thesis\Analysis07\diversification\emplincsec9b.dta", replace

*Attaching analytical weights on hhwageemployinc

use "C:\Darlison\Thesis\Analysis07\variables\ruralhhfinal.dta", clear
sort hh
merge hh using "C:\Darlison\Thesis\Analysis07\diversification\emplincsec9b.dta"
tab _m
drop _m
sum employinc
replace employinc=0 if employinc==.
sum employinc [weight= rmult]
```

```

sort hh
save "C:\Darlison\Thesis\Analysis07\diversification\wagemplincsec9brmultlth.dta", replace

*merging 9a and 9b

merge hh using "C:\Darlison\Thesis\Analysis07\diversification\ruralsec9a.dta"
tab _m
drop if _m<3
drop _m
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\diversification\ruralsec9ab.dta", replace

* Computing total income and share of each income source

gen totalinc = farminc + employinc + nonlbrinc + selfinc

*Total income must be >0 in order to compute share of income source.
count if totalinc==0
*114 households have zero total income despite their participation in both farm and nonfarm
activities.
*It could be that they did not declare their income
drop if totalinc==0

gen farmshare = farminc/totalinc
gen wageshare = employinc/totalinc
gen selfshare = selfinc/totalinc
gen nonlbrshare = nonlbrinc/totalinc
gen nonfarmshare = (employinc + selfinc + nonlbrinc)/totalinc

*Take logs for income
sum totalinc
*Total income does not have any zero values and therefore there is no need of adding one
when taking log
gen lntotalinc=ln(totalinc)
gen lnemployinc=ln(employinc+1)
gen lnfarminc=ln(farminc+1)
gen lnselfinc=ln(selfinc+1)
gen lnnonlbrinc=ln(nonlbrinc+1)
sum
sort hh
save "C:\Darlison\Thesis\Analysis07\diversification\totalshareinc.dta", replace

*merging totalshareinc with household, location and community independent variables

use "C:\Darlison\Thesis\Analysis07\variables\hhcomloc_variables.dta", clear
sort hh
merge hh using "C:\Darlison\Thesis\Analysis07\diversification\totalshareinc.dta"
tab _m
drop if _m<3
drop _m
sum
svydes
*drop Kotido and Moroto districts because of inconcistences (they have one psu)
drop if dist ==306|dist==308
sort hh
save "C:\Darlison\Thesis\Analysis07\diversification\divers_allvariables.dta", replace

** labelling variables;

```

```

label variable farminc "agricultural income"
label variable selfinc "nonfarm self employment income"
label variable employinc "wage employment income"
label variable nonlbrinc " property/transfers/other benefits"
label variable totalinc "total household income"
label variable selfshare "prop of hh income from nonfarm self employment"
label variable farmshare "prop of hh income from farming activities"
label variable wageshare "prop of hh income from wage employment"
label variable nonlbrshare "prop of hh income from property/transfers/other benefits"
label variable nonfarmshare "prop of hh income from nonfarm activities"

```

*generating quintiles for diversification sample

```

xtile quint_divers = xtotpc, nq(5)
tab quint_divers
gen quintd1=(quint_divers==1)
gen quintd2=(quint_divers==2)
gen quintd3=(quint_divers==3)
gen quintd4=(quint_divers==4)
gen quintd5=(quint_divers==5)
sum
svydes

```

*Diversification index (inverse of the Herfindahl index)

```

gen herfindahl= (farmshare*farmshare)+
(wageshare*wageshare)+(nonlbrshare*nonlbrshare)+(selfshare*selfshare)
gen diversindex = (1/ herfindahl)
sum diversindex
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\diversification\diversindexd.dta", replace

```

*** Descriptive statistics

*share of income source by quintile, region, income earners

```

svy:mean farmshare wageshare nonlbrshare selfshare
svy:mean farmshare wageshare nonlbrshare selfshare, over(region)
tab region
svy:mean farmshare wageshare nonlbrshare selfshare, over (quint_divers)
tab quint_divers
svy: mean diversindex, over (region)
svy: mean diversindex, over (quint_divers)
svy: mean diversindex

```

*correlation

```

pwcorr totalinc farmshare wageshare selfshare nonlbrshare, star(.01)
lowess farminc employinc if employinc<5000000 & farminc<1500000, adjust msize(small)
rlopts(lwidth(thick)) graphregion(fcolor(white) lcolor(white) ifcolor(white) ilcolor(white))title(Fig
6.2a. Farm income versus wage employment income)
lowess farminc selfinc if selfinc<3000000 & farminc<1500000, adjust msize(small)
rlopts(lwidth(thick)) graphregion(fcolor(white) lcolor(white) ifcolor(white) ilcolor(white)) title(Fig
6.2b. Farm income versus non-farm self-employment income)

```

* counting those with zero income share

```

count if farmshare==0
count if selfshare==0
count if wageshare==0
count if nonlbrshare==0
sort hh

```

save, replace

*Determinants of diversification (OLS)

use "C:\Darlison\Thesis\Analysis07\diversification\diversindexd.dta", clear

```
svy: reg diversindex agehh sexhh mar_head hsize fedultpri femalesectert madultpri  
malesectert hhprieduc hhsectert formalcredit electricom Indistd centralregion eastregion  
northregion hseasset transpasset livestckasset nonagricasset Inlandsize  
predict xb  
correlate xb diversindex  
drop xb  
outreg using "C:\Darlison\Thesis\Analysis07\diversification\diversi1", se bdec (3) coefastr  
bracket title (Table 6.3 Determinants of Income Diversification and Shares in rural Uganda)  
ctitle(Diversification Index) 3aster r2 replace
```

*Determinants of income shares

*TOBIT ESTIMATION

```
tobit farmshare agehh sexhh mar_head hsize fedultpri femalesectert madultpri malesectert  
hhprieduc hhsectert formalcredit electricom Indistd centralregion eastregion northregion  
hseasset transpasset livestckasset nonagricasset Inlandsize ,ll(0)  
outreg using "C:\Darlison\Thesis\Analysis07\diversification\tobit", se bdec (3) coefastr bracket  
title (Table 6.4 Determinants of Income Shares in rural Uganda (Tobit estimation)) ctitle(Farm  
share) 3aster addstat (Left censored observations, 636, Uncensored observations, 7057, Log  
likelihood, -2387.9356, Chi-Squared, -2387.9356) replace
```

```
tobit wageshare agehh sexhh mar_head hsize fedultpri femalesectert madultpri malesectert  
hhprieduc hhsectert formalcredit electricom Indistd centralregion eastregion northregion  
hseasset transpasset livestckasset nonagricasset Inlandsize ,ll(0)  
outreg using "C:\Darlison\Thesis\Analysis07\diversification\tobit", se bdec (3) coefastr bracket  
ctitle(Wage Share) 3aster addstat (Left censored observations, 5520, Uncensored  
observations, 2173, Log likelihood, -4343.0847, Chi-Squared, 828.81) append
```

```
tobit nonlbrshare agehh sexhh mar_head hsize fedultpri femalesectert madultpri  
malesectert hhprieduc hhsectert formalcredit electricom Indistd centralregion eastregion  
northregion hseasset transpasset livestckasset nonagricasset Inlandsize ,ll(0)  
outreg using "C:\Darlison\Thesis\Analysis07\diversification\tobit", se bdec (3) coefastr bracket  
ctitle(Non-labour Share) 3aster addstat (Left censored observations, 1611, Uncensored  
observations, 6082, Log likelihood, -1044.1993, Chi-Squared, 863.20) append
```

```
tobit selfshare agehh sexhh mar_head hsize fedultpri femalesectert madultpri malesectert  
hhprieduc hhsectert formalcredit electricom Indistd centralregion eastregion northregion  
hseasset transpasset livestckasset nonagricasset Inlandsize ,ll(0)  
outreg using "C:\Darlison\Thesis\Analysis07\diversification\tobit", se bdec (3) coefastr bracket  
ctitle(self-employment share) 3aster addstat (Left censored observations, 5417, Uncensored  
observations, 2276, Log likelihood, -4225.3547, Chi-Squared, 682.85) append
```

*CLAD ESTIMATION

```
clad farmshare agehh sexhh mar_head hsize fedultpri femalesectert madultpri malesectert  
hhprieduc hhsectert formalcredit electricom Indistd centralregion eastregion northregion  
hseasset transpasset livestckasset nonagricasset Inlandsize ,psu(ea)ll(0)  
outreg using "C:\Darlison\Thesis\Analysis07\diversification\clad", se bdec (3) coefastr bracket  
title (Table 6.4 Determinants of Income Shares in rural Uganda (Tobit estimation)) ctitle(Farm  
share) 3aster addstat (Left censored observations, 636, Uncensored observations, 7057, Log  
likelihood, -2387.9356, Chi-Squared, -2387.9356) replace
```

```
clad nonlbrshare agehh sexhh mar_head hsize fedultpri femalesectert madultpri
malesectert hhprieduc hhsectert formalcredit electricom Indistd centralregion eastregion
northregion hseasset transpasset livestckasset nonagricasset Inlandsize ,psu(ea)ll(0)
outreg using "C:\Darlison\Thesis\Analysis07\diversification\clad", se bdec (3) coefastr bracket
ctitle(Non labour) 3aster append
```

```
clad wageshare agehh sexhh mar_head hsize fedultpri femalesectert madultpri malesectert
hhprieduc hhsectert formalcredit electricom Indistd centralregion eastregion northregion
hseasset transpasset livestckasset nonagricasset Inlandsize ,psu(ea)ll(0)
outreg using "C:\Darlison\Thesis\Analysis07\diversification\clad", se bdec (3) coefastr bracket
title (Table 6.4 Determinants of Income Shares in rural Uganda (Tobit estimation)) ctitle(Farm
share) 3aster addstat (Left censored observations, 636, Uncensored observations, 7057, Log
likelihood, -2387.9356, Chi-Squared, -2387.9356) append
```

```
clad selfshare agehh sexhh mar_head hsize fedultpri femalesectert madultpri malesectert
hhprieduc hhsectert formalcredit electricom Indistd centralregion eastregion northregion
hseasset transpasset livestckasset nonagricasset Inlandsize ,psu(ea)ll(0)
outreg using "C:\Darlison\Thesis\Analysis07\diversification\clad", se bdec (3) coefastr bracket
title (Table 6.4 Determinants of Income Shares in rural Uganda (Tobit estimation)) ctitle(Farm
share) 3aster addstat (Left censored observations, 636, Uncensored observations, 7057, Log
likelihood, -2387.9356, Chi-Squared, -2387.9356) append
```

```
sum
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\diversification\determdivers.dta", replace
```

Appendix 7E Gini Decomposition and Coefficient of Variation Approaches

```
set matsize 500
clear
set mem 500m
program drop _all
set more off
capture log close
```

```
log using "C:\Darlison\Thesis\Analysis07\inequality\ineqresults_weighted.log",
replace
```

```
use "C:\Darlison\Thesis\Analysis07\diversification\diversindexd.dta", clear
```

```
keep hh ea dist region rural rmult quint_divers xtotpc totalinc nonlbrinc selfinc farminc
employinc Intotalinc Inemployinc Infarminc Inselfinc Innonlbrinc farmshare wageshare
selfshare nonlbrshare
```

```
*using Lerman and Yitzhaki (1985) and Stark et al. (1986) approach to compute Gini
descogini totalinc farminc employinc selfinc nonlbrinc
```

```
*Bootstrap
bootstrap "descogini totalinc farminc employinc selfinc nonlbrinc" _b Gini=gtotal
```

```
*find mean total income/average income per source/ number of observations per *income
source
```

```
svy: mean totalinc farminc employinc selfinc nonlbrinc
count if totalinc>0
count if farminc>0
count if employinc>0
count if selfinc>0
count if nonlbrinc>0
sort hh
save "C:\Darlison\Thesis\Analysis07\inequality\gini.dta", replace
```

```
*Computing Coefficient of Variation using Pyatt, Chen and Fei (1980) approach.
```

```
*Step 1: Weight of income source ( $w_i = \frac{\mu_i}{\mu}$ ; ratio of average income from ith source *to
```

```
*Average total income - compute in excel after getting means)
```

```
svy: mean totalinc farminc employinc selfinc nonlbrinc
```

```
*Step 2: Coefficient of Variation for total source (CV) and each income source(CVi). This also
*tests reliability of income data.
```

```
rspread totalinc farminc employinc selfinc nonlbrinc
```

```
*Step 3: Relative variation (CVi/CV. Using results for step 2 to compute in excel.
```

```
*Step 4: Correlation between income by source and total income (ri)
```

```
pwcorr totalinc farminc employinc selfinc nonlbrinc
```

```
* checking correlation and significance at 1 and 5
```

```
pwcorr totalinc farminc employinc selfinc nonlbrinc, star(.01)
```

```
pwcorr totalinc farminc employinc selfinc nonlbrinc, star(.05)
```

```
*Step 5: Relative concentration coefficient (ci = ri*CVi/CV. Use results for step 3 and 4 to
compute in excel
```


*Note: sources with $ci > 1$ are inequality increasing and vice versa

*Step 6: Decomposition of coefficient of variation ($wi*ci$). Use results for steps 1 and 5.

*computing Gini by region (central, eastern, northern and western)

*Central (region=1)

```
descogini totalinc farminc employinc selfinc nonlbrinc if region==1
bootstrap "descogini totalinc farminc employinc selfinc nonlbrinc if region==1" _b Gini=gtotal
svy: mean totalinc farminc employinc selfinc nonlbrinc if region ==1
count if totalinc>0 & region ==1
count if farminc>0 & region ==1
count if employinc>0 & region ==1
count if selfinc>0 & region ==1
count if nonlbrinc>0 & region ==1
```

*Eastern region (region =2)

```
descogini totalinc farminc employinc selfinc nonlbrinc if region==2
bootstrap "descogini totalinc farminc employinc selfinc nonlbrinc if region==2" _b Gini=gtotal
svy: mean totalinc farminc employinc selfinc nonlbrinc if region ==2
count if totalinc>0 & region ==2
count if farminc>0 & region ==2
count if employinc>0 & region ==2
count if selfinc>0 & region ==2
count if nonlbrinc>0 & region ==2
```

*Northern region (region =3)

```
descogini totalinc farminc employinc selfinc nonlbrinc if region==3
bootstrap "descogini totalinc farminc employinc selfinc nonlbrinc if region==3" _b Gini=gtotal
svy: mean totalinc farminc employinc selfinc nonlbrinc if region ==3
count if totalinc>0 & region ==3
count if farminc>0 & region ==3
count if employinc>0 & region ==3
count if selfinc>0 & region ==3
count if nonlbrinc>0 & region ==3
```

*Western region (region =4)

```
descogini totalinc farminc employinc selfinc nonlbrinc if region==4
bootstrap "descogini totalinc farminc employinc selfinc nonlbrinc if region==4" _b Gini=gtotal
svy: mean totalinc farminc employinc selfinc nonlbrinc if region ==4
count if totalinc>0 & region ==4
count if farminc>0 & region ==4
count if employinc>0 & region ==4
count if selfinc>0 & region ==4
count if nonlbrinc>0 & region ==4
svydes
sort hh
save "C:\Darlison\Thesis\Analysis07\inequality\gini_cvapproaches.dta", replace
```

Appendix 7F Descriptive Statistics of the Independent Variables

```
set matsize 500
clear
*#delimit;
set mem 500m
program drop _all
set more off
capture log close
```

```
log using "C:\Darlison\Thesis\Analysis07\descriptives\descriptive.log", replace
```

```
*Finding the mean of different variables. Start with individual variables by gender
```

```
use"C:\Darlison\Thesis\Analysis07\multinomial\partindhocomlocshadow.dta", clear
svydes
svy: mean age gender literate noeduc prieduc seceduc terteduc
```

```
keep if gender ==1
svy: mean age literate noeduc prieduc seceduc terteduc
```

```
use"C:\Darlison\Thesis\Analysis07\multinomial\partindhocomlocshadow.dta", clear
```

```
keep if gender ==0
svy: mean age literate noeduc prieduc seceduc terteduc
sort hh
save"C:\Darlison\Thesis\Analysis07\descriptives\individual_describe.dta", replace
```

```
*Household, community and location variables
```

```
use "C:\Darlison\Thesis\Analysis07\diversification\diversindexd.dta", clear
```

```
svy: mean hsize mar_head agehh sexhh pchildren pgirls pboys pmaleadults pfemadults
pelders hhliterate hhnoeduc hhprieduc hhseceduc hhterteduc madultnoeduc madultpri
madultseduc madulterteduc feadultnoeduc fedultpri fedultseduc fedulterteduc quintd1 quintd2
quintd3 quintd4 quintd5 hseasset transpasset livestckasset landsize landpercapita
landperadult Inlandperadult agricasset nonagricasset electricom formalcredit distdist
```

```
* finding averages of household and community variables by region
```

```
svy: mean hsize mar_head agehh sexhh pchildren pgirls pboys pmaleadults pfemadults
pelders hhliterate hhnoeduc hhprieduc hhseceduc hhterteduc madultnoeduc madultpri
madultseduc madulterteduc feadultnoeduc fedultpri fedultseduc fedulterteduc quintd1 quintd2
quintd3 quintd4 quintd5 hseasset transpasset livestckasset landsize landpercapita
landperadult Inlandperadult agricasset nonagricasset electricom formalcredit distdist if
region==1
```

```
svy: mean hsize mar_head agehh sexhh pchildren pgirls pboys pmaleadults pfemadults
pelders hhliterate hhnoeduc hhprieduc hhseceduc hhterteduc madultnoeduc madultpri
madultseduc madulterteduc feadultnoeduc fedultpri fedultseduc fedulterteduc quintd1 quintd2
quintd3 quintd4 quintd5 hseasset transpasset livestckasset landsize landpercapita
landperadult Inlandperadult agricasset nonagricasset electricom formalcredit distdist if
region==2
```

```
svy: mean hsize mar_head agehh sexhh pchildren pgirls pboys pmaleadults pfemadults
pelders hhliterate hhnoeduc hhprieduc hhseceduc hhterteduc madultnoeduc madultpri
madultseduc madulterteduc feadultnoeduc fedultpri fedultseduc fedulterteduc quintd1 quintd2
quintd3 quintd4 quintd5 hseasset transpasset livestckasset landsize landpercapita
```

```
landperadult Inlandperadult agricasset nonagricasset electricom formalcredit distdist if  
region==3
```

```
svy: mean hsize mar_head agehh sexhh pchildren pgirls pboys pmaleadults pfemaleadults  
pelders hhliterate hhnoeduc hhpriveduc hhseceduc hhterteduc madultnoeduc madultpri  
madultseduc madulterteduc feadultnoeduc fedultpri fedultseduc fedulterteduc quintd1 quintd2  
quintd3 quintd4 quintd5 hseasset transpasset livestckasset landsize landpercapita  
landperadult Inlandperadult agricasset nonagricasset electricom formalcredit distdist if  
region==4
```

```
*distribution of household size by quintile  
svy:mean hsize, over(quint_rural)
```

```
sort hh  
save "C:\Darlison\Thesis\Analysis07\descriptives\descriptives1.dta",  
replace
```

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