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THE RESIDUALITY OF AGRICULTURE AND THE TIME DIMENSIONS OF RURAL EMPLOYMENT IN SOUTH AFRICA

A DISSERTATION SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

MASTERS OF CORMMERCE (ECONOMICS)

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I, the undersigned Sixolile Ngqwala, hereby declare that this research is my own original work and that all reference resources have been accurately reported and acknowledge and that this document has not been previously at any university for similar or any other academic qualification.

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Date: 3 September 2019

ACKNOWLEDGEMENTS

Merciful Lord, “My deepest fear is not that I am inadequate but my deepest fear is that I am powerful beyond measure because it is our light not our darkness that most frightens us, my playing small does not serve the world, there’s nothing enlightening about shrinking so that other people won’t feel insecure around me, we were all meant to shine as children do, it’s not just in some of us but it’s in every one, as we let our own light shine we unconsciously give permission to other people to the same, as we are liberated from our own fear, our presence automatically liberates others”. I thank you for your mercy that is always ready to reach out to me. I would not have made it this far without your grace.

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DEDICATION

This pierce of work is dedicated with A special feeling of gratitude to my loving parents my late father Mr Davis Zakeyi Ngqwala (Siwela, Vitsheka, matalankosi, songiwa, mnabela njengethanga, mandubungela, mpovavane, nyama ayingeni ipelela egoqweni Singa kabhovula nomlakalakana, fezani) and my mother Mrs Thandiwe Ngqwala whose words of encouragement and push for tenacity ring in my ears every day and also my brother's Khwezi Ngqwala and Zolani Ngqwala. Last but not least to Pelisa Ngcaba whom is the centre of my heart, who directly and indirectly led me to understanding my ability to thrive and helping me to go over the edge to fight any challenges in which sight we continuously live our lives. When I Look back I tend to realise I was always the centre love of my family as you have all given me the unlimited love, a love that cannot be expressed in words, I thank you. Also Thank you for the inspiration, reinforcement, guidance and motivation through the journey of grooming me to be a better person and a great future leader, I am forever grateful for that. I hope the light of GOD shines upon you, GOD bless you all.

ABSTRACT

There has been increasing recognition in the past few decades that rural households in developing countries are not limited to the agricultural sector, but also depend on other, non-agricultural activities. Rural households are understood to pursue multiple livelihood strategies which involve juggling different economic pursuits as a means of reducing risk and maintaining options. In South Africa, the importance of multiple livelihood strategies is widely appreciated, on the other hand there is a common perception in policy circles that agricultural development can become an important route out of poverty, for instance as part-time small-scale farmers become larger and more commercialised. The purpose of this dissertation is to attempt to better understand the relationship between households' participation in agriculture and non-agricultural activities. The point of departure is the observation that there is a great deal of flux into and out of agriculture in a way that is difficult to understand in terms of prevailing theories and frameworks. The study makes use of four waves of data from the National Income Dynamics Study (NIDS), and employs a variety of analytical approaches, including transition matrices, multinomial logistic regression, and panel data econometric models. The findings are mixed. In the one hand, there is evidence that households enter agriculture as other income sources become available, and leave agriculture again when those sources dry up. On the other hand, there is also evidence that participation in agriculture compensates for the absence or loss of other income sources, in which case agriculture can be thought of as a 'residual' sector that is activated when other options fail.

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NIDS – National Income Dynamics Study

STATS SA – Statistics South Africa

OLS – Ordinary Least Squares

RAM – Random Effects Model

FEM – Fixed Effects Model

HHTYPE – Household type

IA – Intentional Approach

ML – Multinomial logistic

SLA – Sustainable Livelihood Approach

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 Introduction

There has been increasing recognition in the past few decades that rural households in developing countries are not limited to the agricultural sector, but also depend on other, non-agricultural activities. Rural households are understood to pursue multiple livelihood strategies which involve continuously changing combinations of agricultural and non-agricultural activities (Davis, 2006). In South Africa, agriculture has always been part and parcel of the evolving livelihoods of rural households, and yet in policy circles, agriculture is often portrayed quite differently: the dominant perspective on agriculture is the 'ladder model', whereby, with diligence and support, subsistence producers can become small-scale commercial producers, and small-scale commercial producers may hopefully graduate to become larger-scale commercial producers (DAFF, 2013). A slightly different version of this is the 'pyramid model', which also suggests opportunity for mobility from small/subsistence-oriented to large/commercially-oriented, but recognising that only a share of producers manage to move up from one level to the next.

However, this dissertation explores the relatively unpopular notion that small-scale agriculture is to a large degree a 'residual' activity. This means that different households have different livelihood strategies which sometimes results in them needing to produce at least some of their own food, particularly when non-agricultural income declines. However, when non-agricultural income increases, the household leaves agriculture again. This hypothesis is based on the observation that in South Africa, very few rural black households seem to be able to support themselves from agriculture, and yet there is a great deal of flux of households into and out of agriculture. There is also evidence to suggest that non-farm income and agricultural practices are sometimes complementary, meaning that non-farm income is sometimes used to invest in agriculture (Neves and du Toit, 2013).

Diversifying into non-agricultural activities by households might be the result of income shortages from farming activities, or a means to reduce the vulnerability related to the unpredictable returns from farming practices, for example due to variable rainfall. Due to the high probability of weather shocks or other production risks directly affecting the returns to agriculture, individuals and households seek out non-agricultural activities, the returns to

which may be low but less risky. This results in many people from rural areas relocating to urban areas; however, although relocating to urban areas might be an effective way of fighting poverty for some people, the rural non-agricultural economy can also play a role in slowing down rural-to-urban migration, through which in any case the rural poor often just become the urban poor (Lanjouw and Lanjouw, 2001).

The work-related decisions that underlie the structural transformation process – the process of deciding on the type of work that is best accompanied by modern economic growth – play out among many households and farms in heterogeneous settings (Monteforte, 2015). Few debate the importance of farming to poor households, simply because farming is the occupation in which the rural poor participate with the highest frequency. The contribution of agriculture is mostly directed to producing food while income created from non-farm work regulates the quantity and quality of food that workers can buy for their households and the quality of life households will gain (Ellen and McCullough, 2016). It is now evident that rural economies do not consist only of agriculture, rather rural households across developing countries earn an increasing portion of personal income from non-agricultural activities (Kaur and Kulkarni, 2010).

Many if not most rural households now diversify into rural non-agricultural activities, assisted by the accessibility of infrastructure such as roads and electricity, which have contributed to the diversification of the rural economy (Conway, 2011). In some cases, however, rural diversification has the effect of widening the gap between well-off and poor households. Empirical studies reveal that, given their superior financial, human and physical capital, wealthier households are in a better position to exploit non-agricultural activities that offer higher returns (e.g. Kaur and Kulkarni, 2010). Poorer households may also diversify into off-farm and non-farm activities, but typically ones that are low return or even a sign of desperation, such as offering unskilled farm labour to other, better-off households. However, notwithstanding the increasing importance of non-farm and off-farm income sources, international comparisons suggest that while general economic growth is important for reducing rural poverty, the countries that have experienced the most significant reductions in rural poverty are those in which growth in agricultural incomes has been especially strong (Cervantes-Godoy and Dewbre, 2010).

In South Africa today rural livelihoods are characterised by both continuities with the past, and new realities. Smallholder crop and livestock production have been part of the rural landscape

since before colonisation, but are presently influenced by developments such as the growth of social state assistance and the increasing dominance of the retail sector by supermarkets (Neves and du Toit, 2013). It is still the case that people who live in rural areas rely more upon agriculture and are regarded as poorer compared to urban dwellers, which results in a continuous pull of people out of agriculture and rural communities to other sectors and urban areas. And yet, the South African government continues to express the wish to combat the country's unemployment crisis through agriculture, with particular emphasis on small-scale agriculture (National Planning Commission, 2010), even while small-scale agriculture appears to be stagnant, if not shrinking.

1.2 Statement of the problem

South Africa's rural communities are a cause of great concern as they still appear to be neglected and endure great poverty and deprivation. There has been an overall decrease in the varieties of crops and livestock produced by rural households, and over a long period of time rural households have relied less and less on agriculture for their livelihoods (Gopaul, 2006). Even so, agriculture remains part of the livelihood repertoire of approximately half of all of South Africa's rural households, most of whom reside within the former homelands. Even though it has long been accepted that in some sense agricultural and non-agricultural activities are complementary, what is not well understood in the South African context is the exact nature of the relationship between them. Over the course of history, clearly there has been a diversification out of agriculture, but at a given point in time, for example at present, there is movement both out of and into agriculture. On the one hand, there is reason to suppose that households are better able to engage in agriculture when they have non-farm income that can assist them purchase inputs and cope with risk, what we might call 'complementarity' between farm and non-farm economic activities. On the other hand, it may be that households mainly choose to engage with agriculture when other sources of sustenance decline or fail – what for purposes of this dissertation is referred to as 'residuality'. Whichever is the case, there is more flux into and out of agriculture than commonly recognised, and there is no clear understanding of what governs this flux. This dissertation therefor seeks to understand these dynamics, with a particular focus on determining whether or not one can speak of agriculture's residuality.

1.3 Objectives of Research

The main objective of the study is to better understand rural livelihoods and the role of agriculture over time. The main objective can be disaggregated into the following specific objectives:

- To identify the extent to which households move into and out of agriculture
- To identify what influences households to move into and out of agriculture
- To understand how the welfare of households changes in response to changes in their members' participation in agriculture and non-agricultural (self-)employment

1.4 Hypothesis of Research

H_0: Households move into and out of agriculture in response to countervailing changes in other income sources.

H_1: Households do not move into and out of agriculture in response to changes in other income sources.

1.5 Significance of the study

This study is intended to contribute to the growing research on 'income dynamics' in which we can include the adjustments of livelihood strategies over time. In particular, it seeks to look beyond the common supposition that rural households benefit from participating in agriculture, to examining movements into and out of agriculture over time. By making use of four waves of data from the National Income Dynamics Study, the findings of the study will be broadly applicable to South Africa. It is hoped that by contributing to a better understanding of the role of agriculture in rural livelihoods, policy interventions can be better conceptualised and implemented.

1.6 Organisation of the dissertation

This dissertation consists of six inter-related chapters. The relationships between these six chapters are summarised and depicted as follows. Following the introductory chapter, is Chapter Two, which provides an overview and trends for employment and unemployment, agriculture and poverty, over the period 2008 to 2015. Chapter Three explores both the theoretical and empirical frameworks, and brings the evidence surrounding the impact of

agriculture, employment and self-employment on chronic poverty. Chapter Four discusses the data sources, statistical methodologies used, and specific models developed and applied. Chapter Five presents and interprets the findings from the empirical analysis. Chapter Six gives the general summary of the study, major findings, policy recommendations of the study, and identifies areas for further research.

CHAPTER TWO: EMPLOYMENT TRENDS IN SOUTH AFRICA

2.1 Introduction

This chapter presents an overview of trends in employment, unemployment and agricultural employment over the period 2008 to 2015. The main purpose of this chapter is to provide an overview and understanding of the context within the sector by considering how macroeconomic indicators such as unemployment, agricultural employment and employment are trending. For this chapter, various secondary data sets are used, including those from Statistics South Africa and Trading Economics.

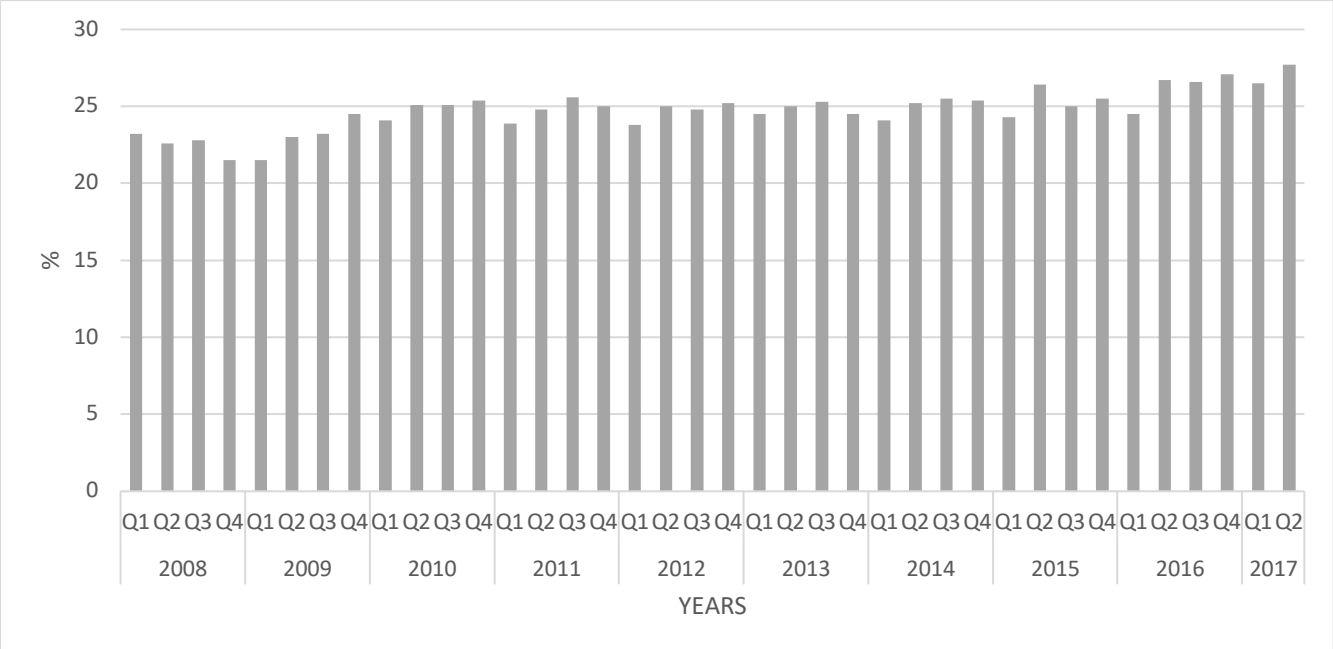
2.2 Unemployment

The unemployment rate measures the number of people actively looking for a job as a percentage of the labour force, where the labour force comprises both job seekers and those who are employed. This chapter presents the South African unemployment rate which includes the actual values, historical data and economic factors involved. The problem of unemployment in South Africa is not a recent challenge, however since the 1980s it has emerged as a national crisis. The increasing unemployment and its structural characteristics are caused by a number of factors, which include issues related to Apartheid era government policies that were initially aimed at promoting exclusive development. The labour supply to support South Africa's middle-income economy was controlled by a complementary set of policies including inferior ('Bantu') education, land dispossession (to render black people less economically independent), and population movement controls. While exclusive development occurred, there was diminishing household income among the black majority, which is one of the nation's greatest resources. On the other hand, markets were often tightly controlled in the increasingly closed economy, and legal constraints were placed on black businesses, even within the homelands. The irony is that policy that initially had the effect of creating a reservoir of cheap, black labour, were gradually replaced by policies that sought to reduce the dependence of black workers, i.e. through the promoting of capital intensity. In other words, the ultimate development direction has limited the absorption of labour by placing the economy on a rigid capital-use path (Altman, 2005).

So the number of work seekers has been growing over the years, which the economy is struggling to absorb. The context of unemployment is quite complex, there are many formal

jobs losses found in resource-based industries, both private and public sector due to technological development and policy decisions. Private sector restructuring brought about by the political transition and the opening up of the economy, may have increased jobs, but not fast enough to absorb the rapid growth of the labour force. Where job creation occurred, it was through the absorption of relatively small numbers of skilled workers, mostly in 'new' sectors, while the portion retrenched have either shifted to outsourced businesses or became unemployed. The main source of growth in employment for lower skilled labour has been the informal sector, including domestic work and street trade, however even these sectors have been declining since the early 2000's. The static number of formal sector jobs is challenged by a continuously increasing population and large net inflows into the labour market. The expansion of the labour market is on average about 600 000 net new entrants each year, and unemployment continues to rise by an average of 2% to 3% each year (Triegaardt, 2006).

Figure 2.1: Unemployment rate



Source: Trading Economics

The unemployment rate in South Africa increased to 27.7% in the first quarter of 2017 from 26.5% in the previous period. It is the highest jobless rate since the first quarter of 2004, as unemployment rose faster than employment as ever more people joined the labour force. The number of unemployed people rose by 433 000 to 620 000, the highest since at least 2001. Employment went up by 144 000 to 162 000. Job gains occurred in the formal non-agricultural sector and private households. But losses were recorded in the informal sector and agriculture.

The labour force increased by 577 000, and the 'broad', unofficial unemployment rate, which includes people who have stopped looking for work, rose to 36.4% from 35% a year earlier. However, the 'narrow', official unemployment rate in South Africa fell to 26.5% in the last three months of 2016, after reaching 27.1% in the previous period. Employment rose while the unemployment rate fell and more people continued to join the labour force, bringing the participation rate up to its highest levels since 2002 (Trading Economics, 2017).

In 2009, South Africa was hit hard by the global recession, such that real Gross Domestic Product (GDP) dropped significantly, and this had a very critical influence on job losses in South Africa. The matching of supply and demand in many countries took other directions in order to sustain the living conditions of workers. This resulted in unemployment rate in South Africa increasing from 21.9% to 25.2% between 2008 and 2011. In the last quarter of 2011 and beginning of the first quarter 2012 there is a very small movement from 23.0% to 25.2% concerning employment rate in the country which is a slight increase of 1.3%. The seasonally adjusted real GDP at market price in the first quarter of 2012 declined by 2.7% in an annualised rate compared with an increase of 3.2% in the last quarter of 2011. This decline of GDP from 2011 posed a threat to job creation (Muthethwa, 2013).

The total number of jobs by occupational group and the average of employment by type of vacancies, distribution of jobs per office captured and vacancies by industry declined by 23.1% from 2010 to 2015. The analysis of trends for Unemployment Insurance Funds which includes ordinary claims created, revealed that claims created increased by 4.5% between 2010 and 2015. Unemployment increased by 9.9% from 2010 to 2015, this shows that there were only 46 391 job opportunities recorded in 2015, a huge change from 60 345 in 2011, that is a decrease of the whole 13 954 vacancies advertised. The job opportunities captured dropped by 15 822 from 60 433 in 2012 to 44 611 in 2013 and from there the number remained almost constant until 2015. Different factors could contribute to the decrease of vacancies advertised. These factors could include limited financial resources, business closures, reduction in the volume of production and change of management at the company level (Muthethwa, 2016). However, education still remains the important tool to fight poverty and gaining access to better employment and about 66% of people with no formal education are found to be poor. Levels of poverty significantly differ across provinces while in rural areas levels of poverty were twice as high compared to urban areas and the majority of people living in poverty were observed to live in rural areas of South Africa (Lehohla, 2014).

For the past recent years there has been an increasing need in South Africa for high level of skilled labour within the economy. In 2010/11 and 2014/15 financial years show that there was an increase in youth unemployment and there is a need to equip young people with critical skills which will grow the economy. The high demand for skilled workers indicates the importance of being educated, especially with tertiary education in order to obtain top occupational positions. There has also been a high number of end of contract and high records of dismissal in UIF data which is under the Labour Relations Act. New policy implications to address the challenges of job creations by creating a collaborative partnership between all relative stakeholders which includes "institution producing skills, Government, worker-seekers and employers. A research and development still needs to be conducted that will concentrate on establishments, stabilizing and optimizing all critical sectors like agriculture, mining and manufacturing and invest more in youth employment creation who will be leading the economy in the near future (Muthethwa, 2016).

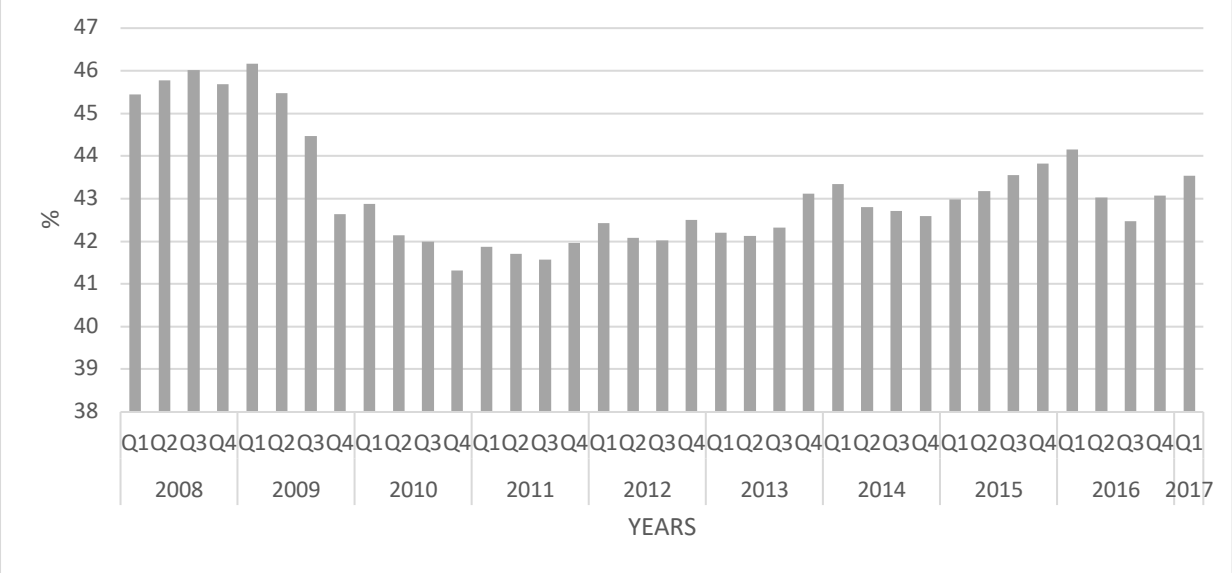
2.3 Employment trends

The employment rate measures the number of people who have job as a percentage of working age population, this chapter provides the South African employment rate which includes the actual values, historical data and economic factors involved. The population of South Africa as of 2008 had reached 48 600 000 people, having a labour force of 16 700 000 people. The labour market participation (active portion of the economy's labor force) has gradually gone up during the period of 1993 to 2005, however it slightly dropped between 2005 and 2008. By international standards, South Africa's labour market participation rate is low; it was at 55% in 2008, while the world labour force participation rate for 2008 had reached 64.1% and sub-Saharan Africa was 70.8%. During the 1980's a recommendation of full trade unions for blacks was implemented hoping for employment or labour participation to increase. However employment did not increase as it was anticipated as labour market entrants are still more vulnerable to unemployment (Malakwane, 2012).

South Africa is one of the countries in the world with the most unequal societies which includes growth and poverty. The global financial crisis between 2008 and 2009 had a massive negative influence in global employment. Even though in 2010 world economic growth had picked up, job creation had fallen behind as growth and poverty reduction requires a much faster and sustained labour absorption and recovery in the global labor markets was delayed. South Africa has experienced similar trends however domestic unemployment has its own determined

characteristics that are rooted in the structure of the economy which require attention. After a massive decline in employment in 2009, however early in 2010 signs of recovery in labor markets were observed. According to Statistics South Africa jobs were created in the formal non-agricultural sector between April and October 2010 and some of the economics Sectors had the potential of creating new jobs as the economy was slowly recovering (National Treasury, 2011).

Figure 2.2: Employment rate



Source: Trading Economics

Employment rate in South Africa increased to 43.54 % in the fourth quarter of 2016 from 43.08% in the 3rd quarter of 2016. Employment rate in south africa averaged 43.20 % from 2000 until 2016, reaching an all-time high of 46.17% in the fourth quarter of 2008 and a record of low 41% in the first of 2004 (Trading Economics, 2017). According to The Quarterly Labour Force Survey (QLFS) household-based sample survey conducted by Statistics South Africa (Stats SA), the working-age population increased by 159 000 between the last quarter 2015 and and first quarter of 2016. During this period unemployment increased by 521 000 people and employment decreased by 355 000. The number of employed people decreased in both the formal and informal sectors as well as in private households and a quarterly increase of 16 000 was observed in the agricultural sector (Trading Economics, 2017).

Compared to the first quarter of 2015, employment increased by 204 000, not economically active population increased by 249 000 and unemployed increased by 179 000. During this period, the formal and informal sector recorded increases in employment, while employment

declines were recorded in agriculture and private households (i.e. domestic employment). These changes resulted in an unemployment rate of 26.7%, an employment rate of 43.0% and a labour force participation rate of 58.7%. Quarterly changes reflect increases in unemployment rate of 2.2% and labour force participation rate of 0.2%. A quarterly decrease of 1.2% points was observed in the absorption rate. Quarterly employment gains in the formal sector were observed in three consecutive quarters (Q2: 2015 to Q4: 2015). In Q1: 2016, the number of employed people in the sector decreased by 217 000. The employment decrease observed in Q1: 2016 is the largest decrease realised by the sector since 2010. Employment gains were realised in the informal sector over the periods Q2: 2014 to Q3: 2015, with the largest gain in Q2: 2015. During Q4: 2015 and Q1: 2016, the sector recorded successive employment decreases. At 111 000 jobs, the decrease in Q1: 2016 was the largest since 2010 (Trading Economics, 2017).

Between the last the quarter of 2015 and the first of 2016, the decrease in number of employed people was observed in 6 industries, the largest decrease was in construction (88 000) followed by manufacturing (80 000) and lastly trade (40 000). During the same period employment gains were observed in community and social services and in transport industries. Changes year-on-year reflect employment gains in some industries were realised and during this period job losses were also observed in manufacturing, utilities and Constructions industries respectively (Stats SA, 2016). The conditions of labour markets continue to improve as the employment rate was expected to return to pre-crisis level in 2017, which is nearly 10 years after the global financial crisis. However, the process of recovery is not stable within different groups of the workforce, and the real wage growth has also been relatively slow since 2007 which has raised concerns about wage stagnation. Concern is more about the size of employment demand, even though what is critical is the size of the labour supply relative to employment demand, as this ultimately determines the employment rate. The aggregate employment growth is related to the economic growth of the active population which makes the crisis of labour market that is being experienced by South Africa visible (OECD, 2016).

The economy of South Africa for many years has not been able to generate sufficient opportunities of employment to absorb the labour force. There are a number of factors that contribute to the extremely poor employment creation record. These include the increased intensity of capital in various economic sectors, a mismatch of skills between what is required by employers and the available skills in the economy, and increases in wage cost versus growth of productivity Also, the apartheid era policies of education has had a huge influence in the

diverse rates of unemployment where whites are contain the lowest rate compared to black population. By the end of 2012 promising signs of renewed creation of net job were observed, however there was still significant shortfall in overall levels of employment when compared to those recorded prior the recession period 2008/2009. Between 1994 and 2012 the domestic economy was able to create about 950 000 new jobs which implies an average increase of 50 000 additional jobs per year (IDC, 2013).

Jobs that were lost during the period of the recession crisis are failing to be regained; by the end of 2012 un-employment was around 24.9% with around 4 500 000 people who are struggling to find work. The level of skills for the employed workforce has risen since the year 2000 as a result of employed people with tertiary qualification increasing from 12% in 2000 to just over 19% by the year 2012 (Bowen & Kuralbayeva, 2015). By contrast, the share of those employed with only primary education, whether completed or not, has been declining since the start of the millennium; about half of the labour force has at least finished secondary schooling. This trend where by formal sector employment increasingly depends ones education is in the context of an economy that is struggling to maintain its global competitiveness, especially in manufacturing and mining activities, due to diverse internal factors. This is worsened by an intense competition from foreign players in both internal and external markets. This has reflected in declining combined share of GDP with a proliferating financial and business services sector, and frustrating national efforts to enhance labour absorption (IDC, 2013).

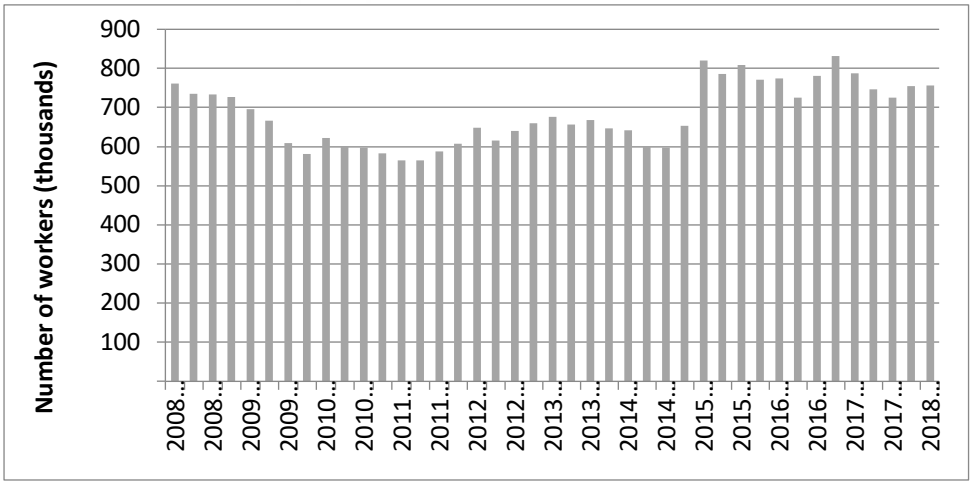
2.4 Agricultural employment

This section provides an overview of the trends in South Africa's agricultural sector. South Africa is left with less than two-thirds of the number of farms it had in the early 1990s, due to the ongoing process of farm consolidation, through which commercial farming sector continues to be characterized by fewer, larger farming units in search of economies of scale. The areas under wheat, maize and dairy have decreased significantly over the last 20 years, however production remained constant or increased, which indicates productivity growth. The remaining farms have managed to accomplish this by means of intensifying their use of inputs such as chemical fertiliser, irrigation, genetically modified seeds and mechanization. However, climate change has negative implications for both irrigated and non-irrigated agriculture as the recent drought has vividly illustrated (DuPlessis, 2011).

South Africa's agricultural sector appears to have been losing jobs consistently over time. About 1.1 million people were employed in commercial agriculture during in 1992, and approximately four million dependents were supported (Vink & van Rooyen, 2009). By the year 1996 the number of employed people in commercial agriculture had decreased to 914 000 employees, of whom 33% were employed as casual/seasonal workers and 67% were employed on a regular basis. The number of employees that are employed on regular basis decreased to 610 000 in 1996 from 724 000 when compared to 1988.

By 2010 total employment in the agricultural sector had declined to 650 000. Not only the agricultural sector, but also the mining and quarrying sector, lost significant numbers of jobs during this period. Therefore the primary sector (agriculture, forestry, fishing and hunting and mining and quarrying) has seen an actual significant decrease between the period of 2001 and 2010. In 2000 the agricultural sector accounted for 11% of total employment, however this share dropped significantly to reach 5.1% by 2010. More recent trends in agricultural employment however are more encouraging, as shown in the figure below, based on Quarterly Labour Force Survey data. Since 2011, employment in agriculture seems to have increased. However, there is some reason to doubt the integrity of the data; for instance, the massive increase between the fourth quarter of 2014 and the first quarter of 2015 (DAFF, 2010).

Figure 2.3: Agricultural employment trends



Source: Statistics South Africa (Quarterly Labour Force Survey), 2008-2018

Less than 20% of the employees in the agricultural sector are skilled workers. In 2008 the skilled workers in the agricultural sector amounted to around 124 000, which represented only 16% of agricultural workers in that year; of these 124 000 skilled workers, about 41 000 were

women and 83 000 were men. Agriculture has often been regarded as a sector with the potential to make a major contribution to employment, not least because it is supposedly characterized by having a low cost-per-job (National Planning Commission, 2010). On the other hand, for most of the past several decades, the trend in agricultural jobs has been one of decline. Which has created a need for the decline in trends to be reversed, stopped or even better to be improved and finding alternatives ways in which agriculture can be used and be coupled up for national goods. Agriculture has a potential pursuit of the national objectives for poverty reduction and job creation, despite the depressing trends agriculture still remains significantly important in being part of employment sector. This is constituted with many reasons one of them being that agriculture has been proven to assist in poverty reduction in the past especially where it is most concentrated. Literature still supports the idea that agriculture is a vital sector in promoting economic development and assist in general level of poverty reduction (Aliber, Baiphethi & Jacobs, 2007).

The main issue that is mostly considered to be directly or indirectly contributing to a decline in agricultural employment sector is the regulatory environment. The argument is developed around policies who are in support of mechanization which results in a decrease for demand of labour and this leads to substitution of labour by mechanisation. There are most two well recognised drivers of employment in the agricultural sector, one of them is the adoption of new production technology which is believed to be one of the influences that lower the demand for farm labour and the other is promotion of innovation and entrepreneurship, which is a result of new agricultural businesses and that creates the employment subject to type and labour intensity. It also discovered that wages of farm workers is lower when compared to wages received by workers in all other sectors of the economy. While still looking on average income, farm workers are actually above the minimum wage rate but it is still less compared to other sectors of the economy while working under questionable conditions in Farm working environment. Despite increasing production in agricultural sector levels of employment in this sector are fluctuating at a decreasing rate and this is contributing to the total decreasing employment rate with in the country (DAFF, 2010).

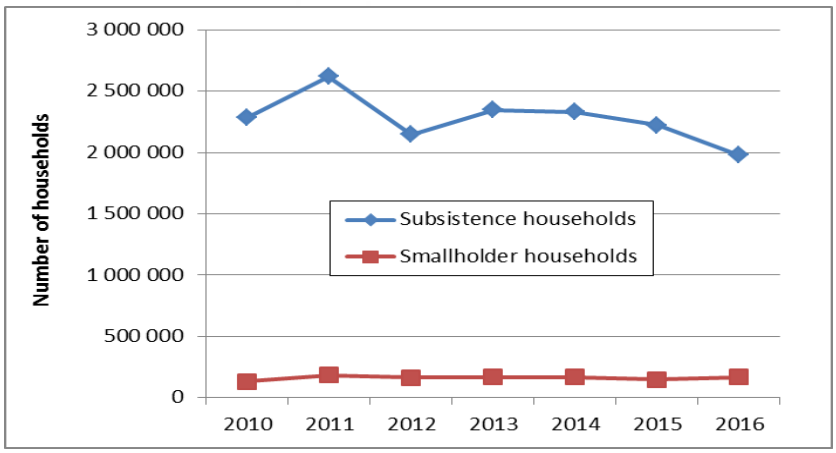
Countries which are seen as succeeding in achieving poverty reduction are highly diverse, in that they include both poorest and wealth countries (DFID, 2008). Systems of governance and economic management differ greatly in within different countries. The accumulating research reveals that successful macroeconomic performance is, if not strictly causal, an essential pre-condition to successfully fighting poverty (Cervantes-Godoy & Dewbre, 2010). While

economic growth is generally one of the most important contributors to poverty reduction, the mix of sector growth is also important in the fight against poverty (Anríquez & Stamoulis, 2007). Development and poverty reduction are bound to change as the food systems change, especially in developing countries. The role of agriculture in the structure of the economy tends to decline in the process of development, even though the agricultural sector may well continue to grow in absolute terms. The literature on agriculture reveals that the transformation process affects the labour share especially for agriculture result in a decline with time and also the share of GDP decreases (Bowen & Kuralbayeva 2015). Investments and policies which allows for more remunerative labour markets need to be implemented to assist agricultural productivity as the danger in agricultural decline still increases and accompanied by increase in poverty (Cervantes-Godoy and Dewbre, 2010).

2.5 Self-employment in small-scale agriculture

Figure 2.4 below shows the trends in numbers of black (African and Coloured) smallholder and subsistence households from 2010 through 2016. The number of subsistence producers in 2011 appears to be some kind of statistical anomaly. But even apart from this, it is difficult to discern any real trends among smallholders, either because there is too much noise in the data, or because in fact there is no real trend. For subsistence producers, however, there appears to be a significant decline over time.

Figure 2.4: Estimated number of smallholder and subsistence households, 2010-2016



Source: Stats SA, various years (GHS) and own calculations

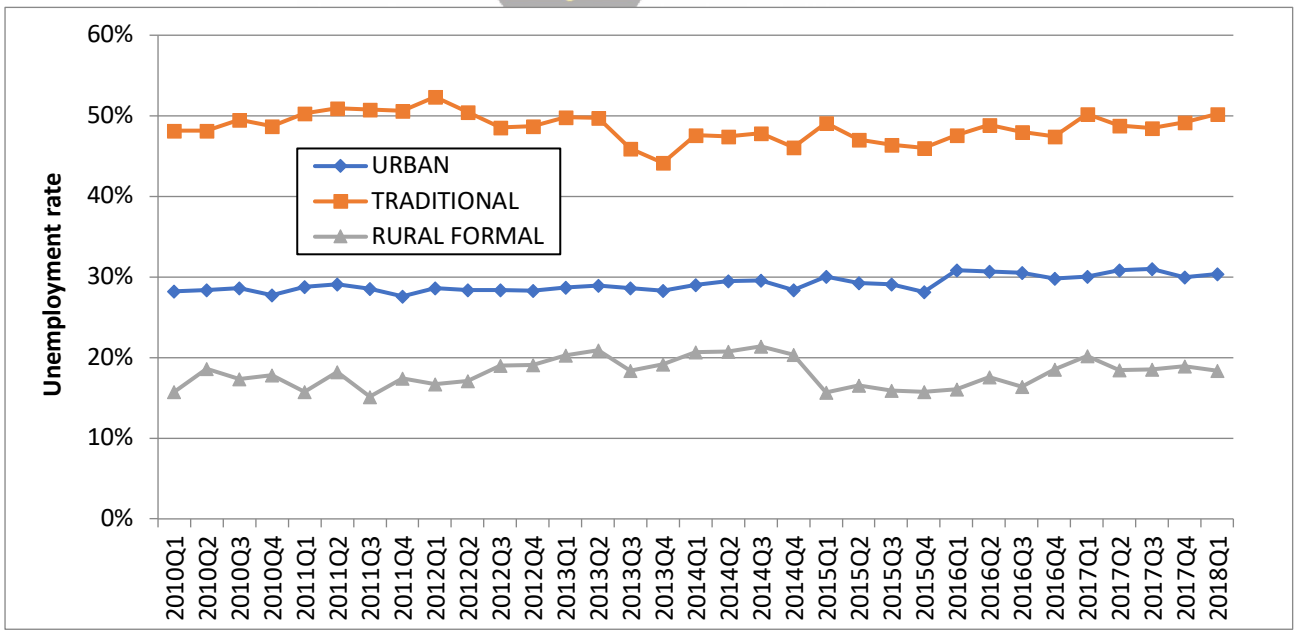
This latter trend is in keeping with the rather alarming picture revealed by a comparison of the 2011 population census (Stats SA, 2013b) and the 2016 Community Survey (Stats SA, 2016b), which suggests that over the intervening five years the number of black 'agricultural

households' (i.e. African or Coloured households involved in small-scale farming, inclusive of 'subsistence' producers) shrank by an astonishing 20%. Comparing the results of a census with those of a sample survey is normally a perilous enterprise. However, the Community Survey serves as Stats SA's primary inter-census information tool regarding the state of households, not least because it typically has an extremely large sample size – the 2016 Community Survey covered over 800 000 households. On the other hand, it could be that the figure for 2016 is relatively low because of the drought that affected much of South Africa during 2015 and 2016.

2.6 Unemployment rate by 'geotype'

There are three different states which South African workers are found in: employment, self-employment and unemployment. After the global financial crisis, that triggered and caused the collapse of world markets and a major recession locally, South Africa has been struggling to return to normal sustainable economic growth. The weak economic environment has resulted in significant difficulties faced by the labour force (Padayachee, 2015). Figure 2.5 below looks at the rate of unemployment in different geographical types ('geotype') of areas within South Africa which includes urban, rural formal and traditional areas.

Figure 2.5: Unemployment rate by geotype



There is a high number of unemployed South Africans, however this depends on how one defines unemployment as there are many different definitions to it. Looking at unemployment rate according to geotype, where we have urban areas, traditional areas and rural formal. There is a huge difference observed between the geotypes areas. Urban areas have an unemployment

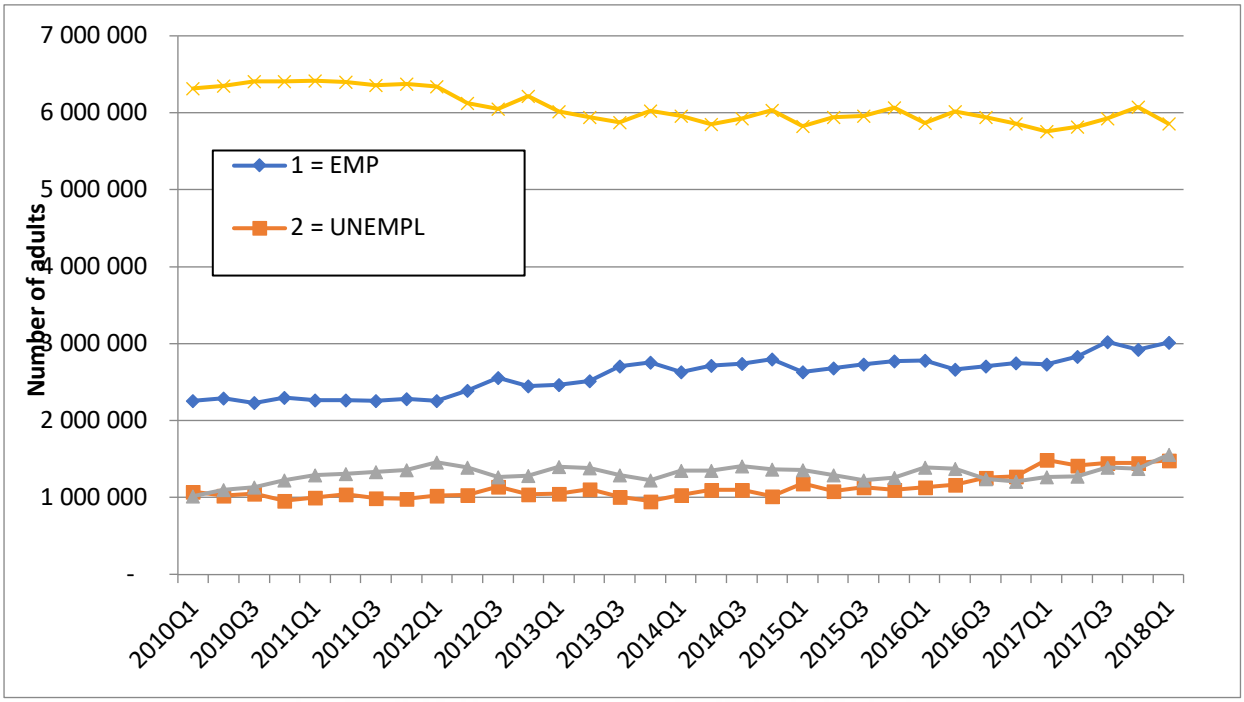
rate between 20% and 30%, which is the second highest rate when compared to other areas. Rural formal unemployment rate is between 10% and 20%, this is one of the lowest rate compared to other areas and the traditional areas is between 30% and 55% which is the highest rate of unemployment rate when compared to other areas.

People's experiences in rural areas are very much different from those of their urban counterpart. There is a difference between rural and urban labour market patterns when assessing the integration and exclusion among people live around these areas (Pateman, 2011). People living in urban areas are more advantaged than people living in traditional areas in terms of resources to gaining access to employment. The duration of unemployment maybe shorter for urban areas especially on the process of transition from unemployment to employment. This is due to the fact that people who live around urban areas have easier access to jobs especially informal jobs when compared to traditional areas. This one of the possible explanation of why traditional areas tend to have a higher unemployment rate when compared to other areas (UNCTAD, 2017).

In comparison to the different geotypes or different areas, the situation of unemployment seems to be more complex due to the nature of traditional areas labour market when compared to other areas. The concern of the high unemployment is that it wastes and reduces the output together with production and it erodes human capital. Unemployment result in the depreciation of unused skills that leads to social exclusion that can cause suffering and deterioration of livelihood lifestyles. There is a lack of productive activities available to traditional areas than in urban areas, as the assumption is that people in traditional areas used to depend more on agriculture than commercialised agriculture. However, the times have changed now people are looking for jobs to make a living but the availability is limited compared to urban areas as the there is less industrialisation within traditional areas (OECD, 2010).

The challenge of unemployment in South Africa is not a recent issue but a continuous problem affecting all spheres of South African economy including traditional areas. The falling rate of employment has been caused by several factors however; it differs according to type of areas due their local economies. There is an overall increase of unemployed people who are becoming part of the economy from all different types of areas (Altman, 2005). As the study is focusing on traditional areas or rural areas, Figure 2.6 will show trends of the number of people who are employed / unemployed in traditional areas.

Figure 2.6: Traditional area employment and unemployment trends



The trend is showing the rate of unemployment and employment rate specifically with in traditional areas. The number of adults that have employment within traditional areas falls between 2 000 000 and 3 000 000 while unemployment is between 1 000 000 to 2 000 000. The number of people who are not working is aggravated by the informal sector in most rural areas as there is limited access to employment. It cannot be clearly pointed out, to actually distinguish if unemployment for rural areas is the result of low employment growth rather than the labour and relative costs to capital. The unavailability of employment has a significant portion of the working age in rural areas which has resulted in many being discouraged to proceed with seeking employment. The slow economic growth of rural areas has been majorly accompanied by a faster rate of population growth (Bhorat *et al.,* 2016).

The economies of rural areas have smaller production base for labour market which is meant to support a large portion of rural population. Rural communities tend to have weak economic performance as the total output for labour market does not meet the potential level of rural population. Large part of traditional areas have limited access to resources of sustainable production activities of employment. The most critical challenge that is facing these types of areas is a mismatch of skills. Where people that have certain skills cannot apply their skills in traditional areas while those who don't have the skills are available but don't have the required skills for local jobs. It has also been found that people who lived around rural areas their level

of education is not much advanced to be actually regarded as a skill which mostly falls between grade 1 to grade 12 (Campbell and Ahmed, 2012).

2.7 Summary

The unemployment crisis that is faced by South Africa is a primary cause of the country's high levels of poverty. The long period of colonialism and apartheid has had a big influence in creating the country's current challenges and in particular the disadvantages faced by black people, since it deprived black people of assets, of opportunities for accumulating assets, and of decent education. While redressing this legacy is obviously a priority of the post-1994 government, it is not easy to undo this legacy. In particular, employment has not kept up with the rapid increase in the workforce, moreover much employment is of a low quality, i.e. poorly paying and insecure. This is the context in which the present study on the role of small-scale agriculture is situated over this period. This has resulted in high poverty levels within the country for the majority of the population of the country that was excluded from economic participation of the economic growth. However, there has been a common agreement to reduce poverty, from the beginning of democracy up until now about the rate of poverty in which South Africa has managed to fight and overcome.

CHAPTER THREE: LITERATURE REVIEW

3.1 Introduction

This section reviews the literature regarding rural livelihoods, the residuality of agriculture and other factors concerning rural households' income. The section presents various theories and empirical studies about the correlation amongst rural livelihoods, household income and residuality of agriculture. The empirical literature reviewed is obtained from developed countries, developing countries as well as empirical literature from South Africa. It also contains theoretical literature on: 1) Consumption theory, which is discussed together with Relative income theory, Permanent income theory and Lifecycle theory; 2) Becker's new household economic theory; and 3) the sustainable livelihoods approach. At the end of the study, conclusions will be drawn from the results and the assessment of the literature about the residuality of agriculture, rural employment and rural livelihoods.

3.2 Theoretical literature

3.2.1 Theory of Consumption

Keynes (1939) highlighted that there are several determinants of consumption to society which are sometimes subjective and sometimes objective (Dechaux, 2015). According to Keynes, the factor that determines the consumption of both society and individuals are the current level of income. Keynes stressed that the determinant of consumption is absolute income, which was the basis of his well-known 'absolute income theory' (Alimi, 2013). Keynes emphasised the psychological law of consumption, which states that income is directly proportional to consumption, meaning that as income increases, consumption increases, however not by as much as the income increase, meaning that the marginal propensity to consume is less than one ($1 > \Delta C/\Delta Y > 0$) (Miller, 1996).

Kuznets pointed out an important puzzle about consumption that is contrary to Keynes's theory that the average propensity to consume falls with increased income. The great puzzle in consumption theory is that the average propensity to consume remains stable despite the substantial increase in income. Some theories of consumption, such as Duesenberry's relative income theory of consumption, Modigliani's life-cycle hypothesis, and Friedman's permanent income theory, have succeeded in resolving this puzzle (Miller, 1996).

Duesenberry's relative income theory of consumption, proposed that consumption expenditure depends less on the individual's abolsute income level than on his income relative to the incomes of other individuals in his society. Second was the theory known as the 'life-cycle hypothesis', which was founded by Modigliani, according to this theory people plan their consumption pattern bearing in mind their varying needs at different stages of their life-cycle (Modigliani, 1985). A somewhat similar contribution was that of Friedman, who advanced a theory of consumption behaviour called the 'permanent income theory', which stated that the consumption decisions of individuals at a moment in time depend not only on their current level of income but on 'permanent income', meaning their long-term average income expected over their lifetime (Deaton, 2005).

The theory of consumption will be discussed from the perspective of the relative income theory, permanent income theory, and life-cycle theory.

3.2.2 Relative Income Theory of Consumption

According to the relative income theory of consumption, a person's consumption depends not only on his current income, but on his previously reached income level and on his income relative to the income distribution within the society. For example if all individual incomes in a society rise by the same rate then relative income would remain the same even though the absolute incomes have increased; according to Duesenberry the individual will utilise the same amount of share of income on consumption as before the absolute income increased. This theory suggests that in the long run the community's consumption will be the same even though its income increased (Palley, 2008).

This theory is based on the assumption that has long been recognised by sociologists and psychologists, which states that individuals care their status. Duesenberry's theory thus departs from the assumption underlying Keynes's theory of consumption, which was based on "the hypothesis that individuals consume a decreasing, and save an increasing, percentage of their income as their income increases" (Singhal, 2015: 54). Even though it was observed in cross-sectional consumption data that poor people save less of their income than rich people, Duesenberry argued that with relative income theory it is possible to account for both cross-sectional and time series evidence. He concluded that the aggregate saving rate is independent of aggregate income and this is consistent with the time series evidence. Also for an individual the propensity to save is an increasing function of their percentile position in the income distribution, which is consistent with the cross sectional evidence, as he claimed that an

individual's utility index depends on the ratio of his consumption to a weighted average of the consumption of others (Duesenberry, 1949).

Households derive their satisfaction from two different things, namely own consumption and the consumption of others this is referred to as relative consumption. This results in consumption of an individual that is driven by his lifetime income when compared to the lifetime income of his or her reference group. Positional concerns of different people lead them to work and consume above the welfare maximizing levels that individuals or household would normally choose. There is a strong positive relationship between saving rates and lifetime income. People or household estimates of consumption increases with income, which is why households that are wealthier save large proportion of their income than poor households. The general assumption is that preferences are independent and different across households even though the standards and human behaviour in the economy are similar. However in relative income theory the level of satisfaction of individuals is driven by the given level of consumption of other community members (Francisco & Van Long, 2008).

Relative income theory has found justification from macro-economic evidence based on the observation that the higher the growth rate, the higher the rate of savings, which is not consistent with the life-cycle/permanent-income theory for the simple reason that people's total resources tend to be greater with higher growth rates. The preferences of people negatively depend on the previous consumption of individuals in the economy or past average consumption according to relative income theory. One important implication of the theory is that if individuals work and consume to increase their status, then they develop a tendency to work too much relative to the socially optimal level, and that is why there is a belief that income taxation could improve the social welfare of people. Relative income theory is sometimes referred to as a special case of negativity of interdependent preferences in a manner that individuals care both about their relative and absolute material payoffs (Duesenberry, 1949).

There is growing empirical evidence of important departures from basic predictions from a permanent income version of relative income theory considering an economy with overlapping generations and heterogeneous levels of wealth. This is whereby an individual's utility is derived from leisure, inheritances and relative consumption, the resulting consumption choice is driven by a comparison of one's own lifetime income to the lifetime income of one's reference group (Francisco & Van Long, 2011). While income is revealed to be the measure of

preferences in a relative form, income contributes to utility in addition to the absolute form, as utilities of individuals are shaped and interdependent by individuals' reference groups.

For some countries, especially rich countries, income is often used for measuring the choice of livelihood, however in developing countries, expenditure or consumption and income are often used as a proxy for well-being. This is because in developing countries reported income is sometimes underestimated and unstable, whereas reported consumption or expenditure tends to be more accurate. The difference between consumption and income is savings, because savings vary across the income distribution, with the poor having the lowest savings rate and the wealthy having the highest. The difference in the use of income is that it all depends on the choice on how individuals assess their own status compared to others in society. Sometimes people assess their own status according to their family's wealth rather than income. That is why modelling households' or individuals' relative income is different on behavioural assumptions. Interpreting estimated coefficient is different and most models that use income or consumption are not strictly comparable (Verme, 2013).

There are many theoretical and empirical developments within economics over the years concerning utility and relative income. Empirical work has contributed to the evidence on the well-being of households and individuals. However, the theory of relative income is still focusing on the most important characteristics of people as they are presumably act based on what they believe to be important (Clark *et al*., 2007). Relative income is therefore important for understanding actual human behaviour which will assist in identifying possible factors like income that influence households to move into and out of agriculture. Understanding how the welfare of households changes in response to changes in their members' participation in agriculture and non-agricultural (self-employment) in generating income.

3.2.3 Permanent Income Theory of Consumption

The well-known American economist Milton Friedman introduced the permanent income theory. This theory has common features with the life-cycle consumption theory, however they differ from each other in important respects. Like the life-cycle consumption theory, for the permanent income theory of consumption, consumption is determined by the long-term expected income rather than the current level of income. It is because of expected long-term income that people make their consumption plans For example, a person who receives income once a week does not concentrate her consumption on the one day, rather she will consider the whole week up until the next income is received. Permanent Income Theory of Consumption

argues that an individual will prefer to have a smooth consumption throughout the week, not a great deal of consumption today and smaller consumption tomorrow; in other words, the consumption of one day is not determined by income received on that day, but instead by average daily income received (or expected) over a period (Meghir, 2004).

The permanent income theory is derived from the basic assumption that people want to have smooth consumption for the long run which should not be disturbed by short-run income fluctuations. This helps explain, "why income is more volatile than consumption and why… the long run marginal propensity to consume out of income [is] higher than the short run income" (Christopher, Slacalekand and Tokuoka 2014, P:2). Freidman's theory hypothesised on the consumption of people that they base their consumption on the measurement of long term income or over their reasonable life time wealth. He believed that individuals only consume a fraction of their permanent income for a particular period, which is why the average propensity to consume will be equal to the marginal propensity to consume (Campbell & Mankiw, 1990).

Freidman tested his theory against a set of empirical facts from budget studies and time series data. The marginal propensity to consume is below the average propensity according to the standard least squares regression of consumption on income. It was this observation that led Friedman to bring together literature on both budget studies and time series analyses, with the use of econometric ideas to develop estimation techniques. Friedman brought together statistical theory and empirical results which led him to develop his model:

$$c = c_p + c_t \text{ and } y = y_p + y_t$$

where c = consumption, c_p = permanent consumption, c_t = transitory consumption, y = income, y_p permanent income, and y_t = transitory income. What one normally observes is measurable observed consumption (c), which is the sum of permanent and transitory consumption; and measurable observed income (y), which combines permanent and transitory consumption.

Here the transitory components tend to reflect measurements errors and fluctuations, and consumption is not dependent on these transitory components (Costas, 2004). Rather, permanent consumption is determined by the equation:

$$c_p = k(r,z)\, y_p$$

where c_p is permanent consumption, y_p is permanent income, and k(r,z) is the average (or marginal) propensity to consume out of permanent income, which depends on the rate of interest and on the taste shifter variables z.

Permanent income and permanent consumption play a critical role in the theory, however they cannot be directly observed for any individual consumer. The variables that can be observed are expenditure for some limited time, actual income and verbal statements as to people's expectations for the future. The theory provides a basis for predicting what could possibly happen for both permanent income and permanent consumption However to in order to be able to use the theoretical analysis and be able to interpret empirical data a correlation must be created between theoretical constructs and permanent income and permanent consumption (Friedman, 1957).

Although permanent consumption and permanent income cannot be observed, according to Friedman they can be estimated. This is done by means of adjusting expenditure data and receipts for each consumer unit differently for some of their income clear shortfall. Therefore, the estimates of permanent income and permanent consumption must be treated as if they are preferred magnitudes. For a certain period expenditures, especially cash spending, are regarded as income expenses which can be deducted from cash receipts. Even though they might be reasonable, the resulting estimate of permanent consumption turns out to be a smaller fraction of permanent income than measured consumption is relative to measured income. The assumption is that consumers are more concerned with their consumption in both the present and the future, which will maximize their lifetime utility, therefore consumers make choices subject to an intertemporal budget constraint, which determines the total resources available for present and future consumption (Dejuan & Seater, 2006).

Friedman revealed that the slope coefficient from a regression of observed consumption on observed income is an underestimate of the true marginal propensity to consume and to a positive estimated intercept. In Friedman's theory the marginal propensity to consume is equal to the ratio of the variance of permanent income relative to total income. He argued that the rate at which the propensity to consume, k, is reduced is the same as the observed elasticity of consumption to income, which is how he managed to provide an independent test of the permanent income theory. On the question of "Why is it the case that the marginal propensity to consume in cross sectional data is lower than the average propensity and how can this be reconciled with the fact that the consumption function shifts upwards over time?", Friedman's

interpretation was that the consumption function shifts over time as "permanent income" increases, which is why for a given level of observed income, permanent income will be higher in the future than in the past (Chao, 2000: 77).

3.2.4 The Life Cycle Theory of Consumption

The life-cycle theory of consumption was introduced during the early 1950s by Franco Modigliani and his graduate student, Richard Brumberg. According to their theory, individuals seek to maintain more or less stable consumption over the stages of their lives despite great variation in their income; typically, young people will borrow, middle-aged people will accumulate, and retired people will dis-save. This means that in making consumption decisions early in life, the individual must take into account their expectations of lifetime income.

One of the most important motives noted by the theory is that people want to provide for their retirement. The life-cycle theory provoked the view that the wealth of a society is accumulated by the young generation: "the very young have little wealth, middle aged people have more, and peak wealth is reached just before people retire" (Deaton, 2005: 91). A key determinant of a country's aggregate savings is therefore how long people expect they will need to support themselves as retirees. Moreover, in an economy with a rapidly growing population or income growth, savings will increase and the conditions will be set for (further) growth. It doesn't matter if it is population growth or growth in per capita income, what is important is simply the saving rate in total income growth (Hall, 1978).

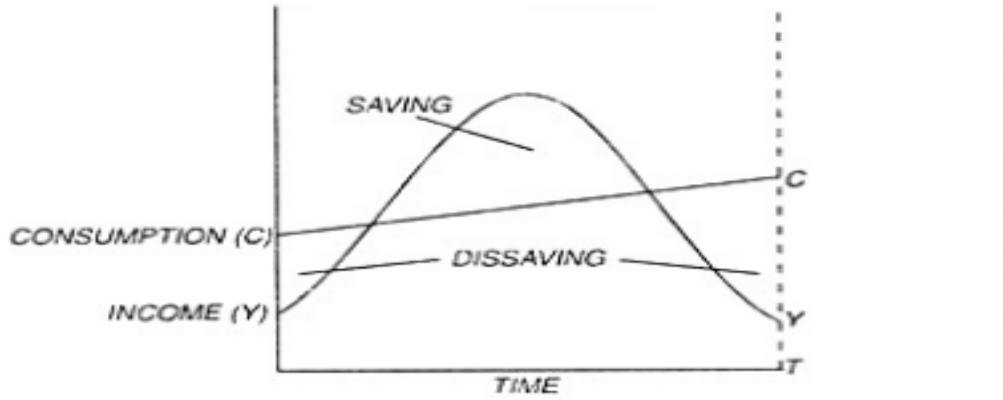
The life-cycle theory guaranteed internal stability and also provided its strength with the generality of accounts which is consistent with the consumer choice theory. The fundamental principles of life cycle theory offer an explanation on consumption and saving which can be possible used to deal with challenges affecting consumption and saving. One of the key policy issues today is social security, which did not play much of a role in societies at the time Modigliani and Brumberg formulated the original theory; but which the theory can assist in thinking about. The theory has also evolved over time to take into account more explicitly the role of uncertainty, for example uncertainty regarding future income. Economists have adopted tools from statistical analysis to handle and deal with future expectations, which have allowed for the original life-cycle theory to be embellished (Fuhrer, 1992).

Individual assumptions on preference increases in life are that time resources lead to equal increases in consumption in the long run. Consumption and life time resources are very

interrelated with each other and to the average income they more or less the same over a life span. A share of consumption in income is regarded as to be lower when it comes to better off households and that saving rate rises with income. However, for households who are low-income households there is actually a negative saving rate and lower consumption, proving Keynes law that consumption increases with the current level of income even though it's not at the same increasing rate. Modigliani and Brumberg argued that consumption and income are consistent in the long run, and the savings rate should be the same in the long run provided that the economic growth rate is does not change but will differ pro-cyclically over the business cycle (Deaton, 2005).

The model for life-cycle hypothesis departs from consumption and saving by households where at each point in time is a reflection of a conscious attempt into achieving the level of distribution of consumption over a life cycle. A consumption level for households indeed depends on current income level however importantly more on long-term expected income as individuals are expected to plan consumption over their life time earnings. The diagram below illustrates the life cycle theory.

Figure 3.1: Income and consumption over the life cycle



According to the theory, consumption gradually rise over the life cycle, whilst income rises sharply over the early working years, as it peaks reaches a level then starts to decline this is assumed to at the retirement level. From this pattern of consumption result of dissaving in both the early working years and late stage of life cycle, with positive saving rate over the high income during the middle period. The assumption about the way in which individuals create expectations concerning their life time income is that: an increase in current income with the assumed effect on future income will increase consumption. An increase in wealth will increase will also increase consumption. However, an increase known to be temporary will not affect

future expected income as it will have the same effect as increase in wealth. This is why the marginal propensity to consume of such temporary income is of the order of marginal propensity to consume of wealth (Fuhrer, 1992).

3.2.5 Becker's new household economic theory

One of the most frequently qouted and analysed alternative views about consumer behaviour was founded by Gary Becker. This theory focuses on different aspects of household behaviour. Becker's emphasis was on the time element charactoristics and was not in agreement with the over simplification of relationship between market goods and utility by traditional consumer theory. Becker considers the family to be the most essential societal institution in his theory, thus his 'New Household Economics' expresses the utility maximization proccess of households, resource allocation and decision making (Mattila-Wiro, 1999). What is unique about this theory is that it merges goods consumption with the time spent in the production of household utility. Previously used models of labour supply focused on consumption and leisure as different goods that provided utility separately. Becker's theory was mostly applied in developing countries and specifically to the analysis of agricultural households (Chiappori & Lewbel, 2015).

Household economic theories seek to take into account the complex structures of households and how they behave. In most times this bahviour is based on decision-making processes, demographic structures, income earning mechanisms, resource allocation and in particular the gender division of labour; understanding these in turn helps one to understand what are the effects of public and private interventions at micro level and their consequences at macro level. The behaviour of households consists of many dimensions and is affected by many factors. These factors include the time value of household members, the production of goods and the consumption value of members, which in turn determine the use of money that is exchanged by buyers and sellers having a certain level of understanding on the distribution of goods and services this is referred to as the "market mechanism". The traditional consumer theory is incomplete with its weakness concerning the interpretation of consumer behaviour, especially household behaviour. Most of the economic models have the assumption that a household is a rational behaving unit or a household member (Ironmonger, 2001).

The economic approach used by Becker in his theory seeks to analyse issues beyond the scope of what is normally considered by economists. It is stated that human behaviour is not only driven by mere self-interest but with a much more sophistcated set of preferences and values.

There are three main assumptions underpinning Becker's approach: market equillibrium, maximizing behaviour and stable preferences. He further supports his theory with the 'rational choice approach' which combines maximizing behaviour with an analaysis of the division of labour, investment in children. It is highleghted that there is actually no division between minor and major decisions, or between different income levels, family or education. It is argued that the 'rational choice approach' is a comprehensive approach despite its limitations (Mattila-Wiro, 1999).

Gary Becker's theory was formed to assess the decision-making, resource allocation and utility maximization process of households. Becker explains that a set of values and preferences are much richer drivers of human behavior. Becker's analysis rests on the special case of interdependent preferences, which is generally concerned with allowing the patterns of consumption for others, however it does not distinguish their preferences when it comes to consumption patterns. This theory focused more on differential or altruistic preferences which illustrate a crucial role of Becker's contributions and his assumptions. He further emphasised that the preferences position are not only fixed and exogenous, they are not identical across individuals. becker has avoided some of the difficulties which may follow from the assumption of identical preferences with the use of household production model and household differences with technology (Grossbard, 2011).

Associated with Becker's theory of household economics is a theory of time allocation which is used to provide a basic analysis of choice relating to the cost of time and to the cost of market-related goods. Becker merged time and goods consumption in the production of household utility, where he first took time and traded off between housework and paid work, where purchased goods are converted by households into commodities, for example meals that generate utility among household members. The emphasis of Becker's theory is that time is used on many different things, just as there are also many different types of consumption goods that can be combined in many different ways to yield commodities – like prepared meals – that yield utility. Becker observed that when different types of consumption and time are combined into a household's objective function, a single overall budget constraint is formed. From this, Becker managed to create a foundation for a modelling framework for analyses of time use and consumption for modern households (Becker, 1962).

Becker's model is more general when compared to those that are in common use today; the focus is more on different types of time where he considers weekends and weekdays to have

different shadow prices within households. Becker recognised the assumption of time additivity of utility as a natural extension. Originally the theory of time by Becker treated the household as if it were maximizing a single utility function, where the household is considered to behave in ways that are not different from an individual; this is what came to be known as the 'unitary model'. The analysis by Becker includes examining problems associated with household maximisation and traditional income expansion, and both substitution effects and trade-offs between consumption and the use of time. It is noted that the division of traditional time and the time used for labour or leisure is not the same even though it might be difficult to categorize the uses of time. Categorising for Becker is unnecessary and irrelevant as the type of leisure activity or consumption associated with utility contributions are the only economically relevant features (Browning & Chiappori, 2011)

The main contribution of Becker's theory on the study, it has influenced and created a discussion on expectations of the results concerning the residuality of agriculture on the household level. Becker's theory has generated ideas in shaping and building of the study and introduced consumers' time as a scarce resource in the decision making process. There may be an increase in available goods and services, however, available time remains the same. This results in consequences where demands are left unsatisfied; as goods become more abundant, time turns out to be valued more. According to Becker, time is divided in two categories where there is 'labour time' and 'consumption time'; this means that a consumer is seen either as a worker outside the household, or as a consumer within the household. Household constraints are imposed on available limited time and by available income. Income on commodities is spent either by exchanging income for producing goods meaning besides spending time at work to earn income it is spent at home producing food. (Mattila-Wiro, 1999).

3.2.6 Sustainable livelihoods approach

The sustainable livelihood approach (SLA) was created upon the notion that all interventions must be based on the appreciation of what underpins people's livelihoods, that is, their strategies for supporting themselves, which are often complex within a multifaceted context. There are many factors that contributed to the sustainable livelihoods approach for it to become what it is today. First it is important to take note that the sustainable livelihoods approach was invented from what is called an 'intentional approach' (IA) to development. Development has many meanings, however there two basic interesting forms which underpin the Sustainable Livelihoods Approach: immanent development and intentional development. Immanent

development indicates the broad processes needed in communities – especially rural communities – for advancement to occur, which is driven by many factors such as improvement in governance, communication, medicine, and so forth. Immanent development is aided by international integration (globalisation), which helps with the sharing of new ideas and more sophisticated technologies. Intentional development, by contrast, focuses on the process where government and non-government organisations create related projects to assist poor people. These projects are bound to time and resources, however the assumption is that after the project has ended the gains achieved would continue to be felt (Morse & McNamara, 2013).

The Sustainable Livelihoods Approach evolved through the framework of the intentional approach, whereby development practitioners were trying to find the most effective ways for their interventions to assist disadvantaged rural communities. In fact the SLA is a diagnostic tool that provides concrete analysis that leads to reliable suggestions for intervention. The SLA is used to analyse the current livelihoods of people and the enhancements or interventions that make the most sense in terms of their situation. However, it must be taken into account that it is not necessary for people to replace their current livelihood strategy upon recognising the need for enhancement, rather the idea is to render their current livelihoods less exposed to environmental, social or economic pressures. The sustainable livelihoods approach suggest that people must rely more on doing things by themselves instead of depending on other people doing things for them. It is therefore a very solid approach when it comes to understanding and improving the sustainability of livelihoods, even though it has to take note of what is possible in different circumstances. (Morse & McNamara, 2009).

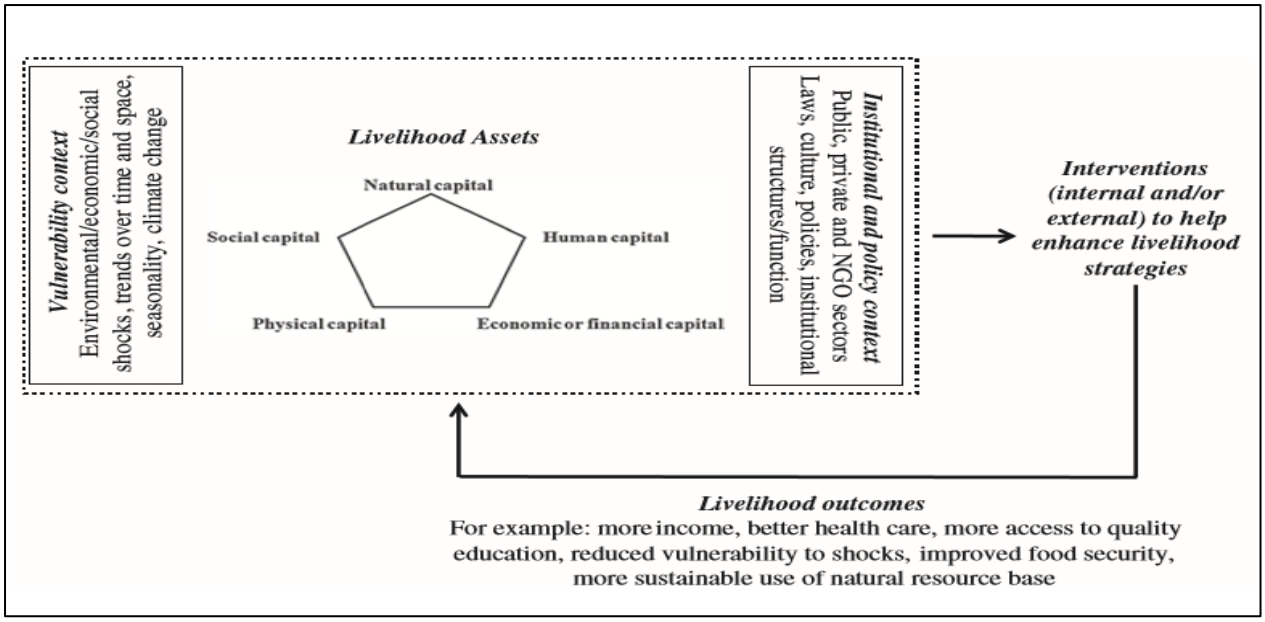
There are integrated approaches to development that existed before the Sustainable Livelihoods Approach. These integrated approaches are often based in rural areas that seek to bring important components such as education, infrastructure, health and agriculture, which has formed basis of Sustainable Livelihoods Approach. The challenge with most past approaches for assessing livelihoods is that they had too narrow a perspective, for example poverty does not only concern monetary income but is also linked to education, health and social networks. Most approaches to development suggest that past project that were created for developments and poverty reduction were ought to focus only on single factors (e.g. income). Becker has highlighted that poverty is a very broad aspect, even though this might have succeeded in boosting income but might have been in the expense of others (Solesbury, 2003).

The Sustainable Livelihoods Approach forms part of several analytical frameworks that deal with broad dynamic dimensions of poverty and the well-being of poor individuals, households, and communities, by establishing the types of assets that are needed in order to maintain well-being under continuously changing conditions. This is based on the observation that in order to sustain themselves, rural people are typically involved in a variety of different activities while managing a complex range of assets, which development officials and professionals often fail to see. This perspective is therefore seen as correcting the assumption that people survive primarily by living within households that have a limited number of economically active adults each of whom has one main job (Norton & Foster, 2001).

One of the key aspects of this approach is that its analytical framework seeks to take into account the surrounding institutional and policy environment and processes at different levels. The SLA assists even in reconceptualising something as seemingly straightforward as using public budgets to reduce poverty, because it helps identify people's most pressing needs, which often differ from conventional social expenditure categories such as health, education and welfare; poor people often need other sorts of assistance, for example in terms of access to markets or financial services. The SLA has made a major contribution to appropriate public policies having to do with poverty. It can offer richer perspectives for how to promote development by providing how a conceptual tool that places people's priorities at the centre of the analysis (Allison, 1999).

The sustainable livelihoods framework is often represented visually. The following is one commonly using diagram among several.

Figure 3.2: Sustainable Livelihoods Framework



The diagram shows that at the core of the livelihoods framework are five different types of 'capitals' that support livelihoods at the level of individual households, villages or groups. The different capitals are categorised as physical, human, social, natural and financial. These capitals are assessed in terms of how vulnerable they are to shocks which they are bound to occur. After this is fully understood then interventions can occur and be placed to enhance the sustainability of livelihoods, whether by increasing the capital or reducing the vulnerability. Therefore, the process is meant to understand the current situation and to develop suggestions that will improve it based on that particular understanding. The aim for the sustainable livelihoods approach is to avoid situations where there is no positive impact due to unguided interventions (Morse & McNamara, 2009).

The sustainable livelihood framework is created to model reality on people's way of living even though sometimes the situation may be different or limited in the point of exercise. It is important to take into consideration that the use of the SLA framework is not dependent on the assistance of an agency for the analysis. According to its advocates, anyone can use this model for the analysis of their own livelihood situation. Again the sustainable livelihood approach does point to specific methods and techniques to be adopted in order to explore the vulnerability, capitals, institutions, etc. In reality the procedure of applying the sustainable livelihood approach can adopt a range of techniques and standard methods based on current observations, interviews and focus groups. However, in the meantime the logic behind the sustainable livelihood approach is that it can be considered in many different ways (Morse & McNamara 2013).

"The framework depicts stakeholders as operating in a context of vulnerability, within which they have access to certain assets. Assets gain weight and value through the prevailing social, institutional and organizational environment (policies, institutions and processes). This context decisively shapes the livelihood strategies that are open to people in pursuit of their self-defined beneficial livelihood outcomes" (Kollmair *et al*., 2002). The external environment is shaped by the vulnerability context in which people liv. People experience limited or rather critical shocks, seasonal shocks as well as shocks that have an enormous impact on people's livelihoods and/or their assets. Negativity must not however always be considered with trends and seasonality. When people are faced with challenges of harmful threats or shocks with insufficient capacity to effectively respond, vulnerability emerges. The crucial relevance of assessing what causes poverty is the difference between risk and vulnerability. The degree of exposure to uncertainty, risk (shock, hazard), and the capacity of individuals or households to cope with risk, is what is meant by vulnerability (DFID, 2008).

As the study explores the relatively unpopular notion that small-scale agriculture is to large degree a 'residual' activity. The role of Sustainable Livelihood Approach on this study is to presents different livelihood strategies which sometimes results in them needing to produce their own food when non-agricultural income declines, however when non-agricultural income increases, the household leaves agriculture again. The underlying principles of Sustainable Livelihood Approach seek for processes that are accountable with dealing with the realities of poor people's conditions and finding ways to reducing poverty. This approach has actually given insight on the possible factors affecting the notion of residuality of agriculture by households. The sustainable livelihood approach focuses on the need to achieve outcomes of the poor livelihoods as it functions as a guide in applying the conceptual framework in practical situations and find ways for better understanding how it can be used by poor people. The use of sustainable livelihood approach helps to determine whether right choices have been made and not complicate the agenda of policies to a point where no services will be rendered. It is not created to contradict policies however assists in knowing and understanding how the analysis is applied or should be applied (Norton & Foster, 2001).

3.3 Empirical literature

In this section the empirical literature on this study is used with the aim to uncover what is happening based on different studies previously conducted around this topic. Empirical literature is reviewed with the hope of gaining direction from previous studies, to be able to

attain direct observation of different discussion from different perspectives. The findings of these empirical studies will be used to have access to statistical association between studies that will assist with the methods and analysis of this study. Empirical literature may not be directly linked to this study however these empirical studies are based on actual and objective observations, that will lead to answering the issue of 'residuality of agriculture and the time dimensions of rural employment'.

Cervantes-Godoy & Dewbre (2010) conducted a study on the "Economic Importance of Agriculture for Poverty Reduction". The study explores the question of to what extent agriculture can reduce the number of people living in extreme poverty in different countries. The countries are compared using their macroeconomic characteristics while focusing on their agricultural traits. The findings from the cross-section and time-series regression analysis show that even though economic growth is an important contributor to poverty reduction, so is the sector mix in which the increase in agricultural income plays a vital part. Van der Geest (2010) generally concluded that in rural areas, finding decent work is a major challenge in Sub-Saharan Africa, especially for the youth, however this is less so in Southern Asia and Southern Africa. Low agricultural productivity and limited opportunities to find work outside of agriculture in these sub-regions make the situation for young rural people particularly insecure. The evidence suggests that the general economic growth is preceded by a boost in agricultural productivity. When few people are involved in producing food and other primary products that are needed within the country, more people can spend more time in non-agricultural activities that will generate higher levels of income.

Gindling & Newhouse (2012) carried out a study on "Self-Employment within the developing world". The findings are that formal work have a clear procedure which is workers who are educated have household welfare that is maximum or well off maximum, followed by means of wage and salaried personnel, non-agricultural own-account employees, non-agricultural unpaid family workers and in the end agricultural employees. The nature of work that facilitates self-employment involves agriculture and employment that generates salaries and wages. The conclusions are that even though interventions which include credit access may benefit a large number of self-employed people, efficiently targeting the minority of self-employed with higher growth capacity is crucial, especially in low-income contexts. Fields (2015) found that throughout the developing world, the self-employed have many potentially profitable activities in which they might invest if only they could secure affordable credit. Policy priorities are focusing more economic growth on improving the earning opportunities of the poor, creating

off-farm employment opportunities, training people for wage-employment, and making micro-credit affordable are the most appropriate even though they are not the only possible policy interventions. They do, however, hold particular promise and are worth thorough consideration,

Conway (2011) carried a study on rural poverty and found that poor rural household have diverse livelihoods within countries. These households sometimes depend on different farming practices, agricultural wage labour, self-employment in the rural non-agricultural activities and migration. While some households depend more on one type of livelihood mostly having the tendency to change their livelihood to the most possible way to maximize income and to reduce risk. The mix of livelihood on each household relies on different factors that include assets (land and livestock) or lack of education and the opportunities available in the national and local economy. Estruch & Grandelis (2012) conducted a study on "decent rural employment for food security". The study revealed that to gain access to food, the rural poor rely especially upon income from their labour due to the fact that labour power is the most effective asset they have. Findings of the study show that for sustainable agricultural productivity for ease of access to food and improvement on decent rural employment is necessary for rural poor people. In most areas, rural development interventions, food security and agriculture have major contribution in the four dimensions to promote decent rural employment, increasing job creation, fighting gender equality gap in agriculture, improving the quality and upgrading the skills of rural people.

Talukder (2014) conducted a study aimed at explaining the determinants of income and growth in income of rural households in Bangladesh in the post-liberalisation era. To assess the determinants least square (OLS) regression models was applied using secondary data. Determinants are justified on past (1985-86) and present time (2005) based on endowments of household traits. The study observed both economic and non-economic characteristics and how they impact on household income. The findings revealed that household size is the most effective non-economic aspect that is statistically significant and positive determinant for household earnings in 1985-86 and 2005. The study showed that an increase in production of factor endowment no longer has an effect on income and growth in income for rural households. This has resulted in need by government authorities to intervene by assisting farming households in preserving food security and price stability within the economy. Hertz *et al*. (2014) revealed that during the financial crisis most rural areas, especially those far away from metro areas, did not lose many jobs, and household size was the biggest effective

determinant of income. Households' earnings and land access become the biggest high quality determinant and share of income on the percentage of agricultural profits for households.

Neves & du Toit (2013) examined rural livelihoods and 'survival' within South Africa, and found that combinations of elements such as land-based entitlements, informal farm and non-farm economic activities, and practices of social exchange and social state assistance, are essential to poor rural livelihoods. The power of these elements are not seen as highly classified, however to be able to understand the rural livelihoods their need of connections to be explored. The study emphasized on understanding the quality of rural livelihoods and their complexity but also how they are shaped by urban connections, and also how they feed and reflect into patterns of rural social differentiation.

Stefan & Gollin (2014) conducted a study on "Agriculture in African Development: A Review of Theories and Strategies". The study stated that agriculture is the most important area in maximum sub-Saharan economies in terms of employment, and it plays a critical role in imparting food and export profits. This paper asks how those elements form a role in agriculture in relation to improvements of strategies in Africa. Does agricultural increase form part of increase in different sectors? Or is urbanization and non-agricultural export markets in the end be the forces that will assist rural economic system to have better productivity? It argues that strategies of agricultural improvement will differ widely due to heterogeneity throughout and within Countries and can't conclude on agriculture to be the core part of poor countries' development strategies.

Daniels *et al*. (2013) conducted a study on "rural livelihoods in South Africa". This study focuses on changes of rural livelihoods based in South Africa using the NIDS data. The rural sector is currently going through a change where by rural household are increasingly depending on other sources of income besides agricultural based activities. Findings of the study reveal that between rural areas indeed there is migration, different labour market, and subsistence agricultural trends. Again findings also include that rural people migrating to urban areas between the period of 2008-2012 stand a better chance of being employed than those people staying in rural areas. There is evidence from the NIDS rural sample that de-agrarianisation is taking place with people more likely to move out of agricultural activities than to start joining these activities.

3.4 Assessment of the literature

In this section the literature is assessed from developed countries, in developing countries and South Africa surmising on the residuality of agriculture and both rural employment and self-employment. Evidence from empirical literature uncovers that households' livelihoods are continuously changing and most households now have different external income sources. Different households have different livelihoods which sometimes results in need by households to produce their own food when non-agricultural income declines. However when other non-agricultural activities that provide income improve, they leave /ditch agriculture. A major problem facing rural areas or rural communities is agriculture, where there is an overall decrease in the varieties of crops and livestock produced. Since the development of industrialized agriculture there's been a downshift in households involved with agriculture and which now depend more on industrialised agriculture. Rural community poverty is still regarded as a severe challenge and there are not enough development activities occurring in these areas. Rural communities are a cause of great concern as they still appear to be neglected and endure great poverty and deprivation.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the methodology to be used to examine the residuality of agriculture and the time dimensions of rural employment. The chapter is divided into different sections: data source, transition analysis, and estimation techniques. The chapter, therefore, lays the foundation for Chapter 5 which is the data interpretation and analysis chapter.

4.2 Data source

The study uses data from the National Income Dynamics Study (NIDS). The NIDS data is a panel dataset whereby the same households and household members were interviewed at different points in time, i.e. 'waves'. The first wave was in 2008, and the fourth in 2014-15, with roughly two-year intervals between each wave. The data are obtained from four types of areas, namely, tribal authority areas, rural formal, urban formal and urban informal. However, the main focus of this study is on tribal authority areas which resulted in data from the other area types to be eliminated from the active dataset.

The NIDS data are generated through one-on-one interviews involving structured questionnaires. Each wave is based on four main questionnaires, which are: the adult questionnaire, the child questionnaire, the household questionnaire and the proxy questionnaire; the proxy questionnaire was for cases whereby an adult household member was unavailable to be interviewed, whereby another (knowledgeable) adult from the household was asked to answer on the absent person's behalf. For purposes of this study, the unit of analysis was the household; even if participation in agriculture is not necessarily an activity that involves all adult household members, as per some of the theoretical and empirical literature noted above, it is assumed that participation in agriculture is an issue of household-wide significance. Moreover, virtually all of the questions regarding agriculture posed by NIDS are part of the household questionnaire, specifically section 'H'. Having said that, some variables emanating from the adult questionnaire were also used in the present study, in particular for adults who happened to be household heads.

4.3 Transition analysis

'Transition analysis' is not a specific technique, but rather a general label sometimes used for measuring and seeking to understand movements between different states. Within the literature on household welfare and livelihoods, the term is often used in the context of transitions into and out of states of poverty/non-poverty, for example in May *et al.*'s work on the income dynamics of households in KwaZulu-Natal (May, Carter, Haddad and Maluccio, 1999), or similar work in China (Sun, Wang and Bai, 2014) and Pakistan (Haq and Arif, 2005). A key conceptual / visual tool for such transition analysis is the 'transition matrix', which shows the numbers and/or shares of subjects in various possible states (e.g. poor and non-poor) in one period relative to in the following period. For purposes of the present study, these periods are the years in which the NIDS data were collected, or more precisely, consecutive waves of the NIDS data. Moreover, for our purposes, there are three pairs of consecutive waves to consider (e.g. waves 1 and 2, waves 2 and 3, and waves 3 and 4).

However, whereas the examples of transition analysis noted above are in relation to poverty states, the concept is used here for whether or not households are active in agriculture. As such, households are categorised according to four household 'types': household type 1 refers to those households that were involved in agriculture in the two consecutive waves; household type 2 refers to those households that were involved in agriculture in one wave but not the following wave; household type 3 refers to those households who were not involved in agriculture in one wave but were involved in the next wave; and household type 4 refers to households who were not involved in agriculture in either wave. The table below illustrates the basic structure of a transition matrix using waves 3 and 4, but similar matrices will be considered for waves 1 versus 2, and waves 2 versus 3.

Table 4.1: Example of disaggregated household types

		Wave 4: Agriculturally-active	
		Yes	No
Wave 3: Agriculturally-active	Yes	HHTYPE 1 / "Farmers"	HHTYPE 2 / "Leavers"
	No	HHTYPE 3 / "Arrivals"	HHTYPE 4 / "Non-farmers"

In this study, the researcher uses the transition matrix in two ways. First, it is used simply to illustrate the extent of stability versus instability in agricultural participation. This is important because people commonly speak of the 'small-scale farming sector' as though it is a stable category, whereas in fact there is much movement into and out of agricultural participation. And second, the transition matrix is used to explore possible correlates with the different household types noted above, either by way of trying to understand what accounts for these different types, or appreciating the consequences of these movements into and out of agriculture.

This second use of transition matrices is in turn approached in two ways. The first approach is to look at descriptive statistics associated with the various transition possibilities, which is another way of saying to look at descriptive statistics associated with the above-mentioned household types. The second approach is to use multinomial logistic regression whereby the household types are the dependent variable, and various household characteristics are the explanatory variables.

One limitation of these various exercises under the heading 'transition analysis', is that they all involve only subsets of the data at a time, i.e. pairs of consecutive waves, as opposed to using all of the data at once. To take advantage of having four waves of data in one analysis, the researcher used panel econometric models, that is, the Fixed Effects Model and the Random Effects Model. Here the objective, however, was not to try to understand what might determine or influence movements into and out of agriculture. However to appreciate the welfare implications of these movements and to understand how one can recommend policy options to improve welfare. The various econometric approaches are described below.

4.4 Multinomial logistic model

4.4.1 Overview

The multinomial logistic (ML) regression model generalises logistic regression to multiclass problems that have more than two possible discrete outcomes. This ML model will be used to predict the probabilities of the different possible outcomes of a categorically distributed dependent variable given a set of independent variables. This multinomial logistic regression is used when the dependent variable in question is evenly categorical which means it falls into any set of categories and for which there are more than two categories (Green 2012: 803-806)

The study will identify what influences households to move into and out of agriculture by conducting an analysis using a multinomial logistic (ML) regression approach. First, rural households are disaggregated or categorised according to the household types, as explained in the previous subsection. These types of households become the dependent variables for the multinomial logistic model. Since there are 4 categories (that is HHTYPE 1 through HHTYPE 4), it will in effect have 4 – 1 = 3 log-odds ratios, each resulting in its own set of estimated slope coefficients. Each log-odds ratio is defined relative to a common 'reference category'. Any category from the 4 categories can be chosen as a reference, However, perhaps for our categories (household types) the one that makes the most sense is HHTYPE 4, the reason being that it is those households that did not produce in either period. The estimated slope coefficients are not the same as the marginal effects, and in fact will not even necessarily have the same sign. In practice it is the marginal effects that are of more interest. These are calculated using the delta method.

General theoretical model:

$$ln\frac{P(HHT_i=m)}{P(HHT_i=4)} = \alpha_m + \sum_{k=1}^{K}\beta_{mk}X_{ik}$$

Where:

$P(HHT_i = m)$ is the probability that household i selects itself into household type m

α_m is the unknown intercept for each household type m

β_{mk} are the slope coefficients 1 to k for each household type m, and

X_{ik} represents independent variables.

4.4.2 Goodness of fit test for multinomial logistic regression

A goodness of fit test tests a model against the alternative that the model does not fit. When a fitted or when fitting a model, it is crucial to have tools that will enable you to test for lack of fit. This is one of the most important test for multinomial logistic model, which actually is very challenging to conceptualise or visualize the fit of the model. The toolbox of modelling requires general tests for goodness of fit for the whole model. However, more specific tests for lack of

fit outcome categories are required even though these tools are scarce for the multinomial logistic model. Formal goodness of fit is important in model building of the multinomial logistic regression model, because the fitted model is very difficult to visualise. The test of goodness of fit was developed by Pigeon and Heyse which stands in the tradition of goodness of fit test by Hosmer and Lemeshow (Goeman and le Cessie, 2006) for binary logistic regression. While looking at multinomial model as if it were a set of independent ordinary logistic models of each outcome against the reference outcome and testing the fit for each separately. Diagnostics for detecting influential, leverage and outlying samples in multinomial logistic regression, are given and mostly used but provide no explicit goodness-of-fit test. The only actual test for the fit of the multinomial logistic regression model is an extension of the test of Hosmer and Lemeshow for binary regression, which is well known to have low power for detecting the effects (Goeman & le Cessie, 2006).

4.4.3 Definition of variables and expected signs of marginal effects

Because of the lack of other studies that have attempted to understand household types as defined here, there was little to go on in the literature regarding either what variables to include, or their expected impact, here understood as their expected marginal effect. Thus, the researcher relied for guidance only in a general way on the literature, as well as on common sense, while of course being dependent on what is available in the NIDS data. Table 4.2 shows the variables that were considered for the multinomial logistic regression analysis.

Table 4.2: Definitions of variables

HHsizer	Number of household members/ Labour endowment
HHQ_INC	Total household monthly income
HHwage	Household monthly income from labour market. This includes main and second job, Casual wages, self-employment income, 13th cheque
HHgovt	Household monthly income from government grants
HHother	Households monthly income from other governments grants
HHinvest	Household monthly income from investment
HHremitt	Household monthly income from remittances
HHagric	Household average monthly income from subsistence agriculture
Ownd	Household member owns dwelling
HHincome	Household income
FOODEX	Household food expenditure
FOODEXPC	Household food expenditure per capita
Edus	The highest grade in school completed by household head
Gen	Gender of household head (1 = female , 0 = male)
Age	Age of household head
Agric	Agricultural participation (1 = yes, 0 = no)
Em1	Currently being paid a regular wage/salary (1 = yes, 0 = no)
Ems	Currently involved in self-employment (1 = yes, 0 = no)

Govt	Currently receiving one or more social grants (1 = yes, 0 = no)
Tribal	Geotype representing rural parts of former homelands
w1/2/3/4_HHID	HouseHold Identity
Agm1	= Agric * Em1, i.e. interaction variable (employment and agricultural participation)
Agms	= Agric * ems, i.e. interaction variable (self-employment and agricultural participation)
Agovt	= Agric * Govt, i.e. interaction variable (receiving grant income and agricultural participation)

Meanwhile, Table 4.3 indicates the researchers' expected signs in respect of the different household types. The general thinking was that some variables are associated with more ability to engage in farming (e.g. household size/labor endowment), while others make farming less necessary and/or complete for one's time (e.g. wage income), in the sense of the residuality hypothesis. What Tables 4.2 and 4.3 do not show, however, is that for many of the explanatory variables there were two or three versions from which to choose; for instance, where the analysis involved, say, a comparison of farming states in waves 1 and 2, then in principle one could use the household size variable from wave 1, or the household size variable from wave 2, or both household size variables, or the change in household size.

Table 4.3: Anticipated signs of marginal effects

Variables	HHTYPE 1 ('Farmer')	HHTYPE 2 ('Leaver')	HHTYPE 3 ('Arrival')	HHTYPE 4 ('Non-farmer')
HHsizer	+	–	+	–
HHwage	–	+	–	+
HHgovt	+	+	–	+
H_SUB	+	–	+	+
H_OWND	+	–	+	+
W3_H_GRN	–	+	+	+
HHagric	+	–	+	+
Geo-type				
HHQ_INC	+	+	–	+
W4/3_A_GEN	+	+	–	+
W4/3_A_AGE	–	–	–	+
W4/3_A_EDSCHGRD	+	+	–	+
W4/3_A_EDTERLEV	–	+	–	+
W4/3_A_EM1				
W4/3_HHID				

4.5 The Fixed Effects Model and the Random Effects Model

4.5.1 Overview

The NIDS dataset is a panel dataset whereby the same households and household members were interviewed at different points in time, i.e. 'waves'. This presents advantages and disadvantages. The advantages are that, in contrast to time series analysis, the researcher is able to take the heterogeneity of subjects into account: "Panel data enables us to study more complicated behavioural models; for example, phenomena such as economies of scale and technological change can be better handled by panel data than by pure cross-section or pure time series data" (Gujarati & Porter, 2008: 592-593). The disadvantage is that the researcher cannot simply perform 'pooled OLS' because of the likelihood of correlation between the error terms and the regressors.

The study will examine how changes in agricultural participation and rural employment impact on household welfare measures by adopting the Fixed Effects Model or Random Effects Model. Again the study shall understand how the welfare of households changes in response to changes in their members' participation in agriculture and non-agricultural (self-employment) using the models of Fixed Effects Model and Random Effects Model. For an analysis of a panel data set the term Fixed Effects estimator is used to estimate for coefficients in the regression model. In REM, the time-independent effect is subsumed in the error term. If this is correlated with any of the regressors, then there is a violation of the assumption that there is no such correlation, i.e. no correlation between the error and regressors. This is what the Hausman test is testing for. In essence a researcher would prefer to use REM because fewer degrees of freedom will be lost (as there are not so many parameters that are estimated which in the case of NIDS is considerable). If there is correlation between the error (or a component of the error) and the regressors then that is usually regarded as unacceptable, inter alia because it means the estimator is not consistent.

When analysing the impact of variables that vary over time fixed effects will be used and will explore the relationship between predictor and outcome variables within an entity (households). Each entity has its own individual characteristics that may or may not influence the predictor variables. Here all observations are pooled, but allow each cross-section unit (that is household) to have its own (intercept) dummy variable. This is why the Fixed Effects Model is also known as the "least-squares dummy variable" model, or 'LSDV'. The model allows for heterogeneity among subjects by allowing each entity to have its own intercept value. The term

"fixed effects" is due to the fact that, even though the intercept might differ across subjects, these intercepts do not change over time, i.e. they are "fixed" (Gujarati & Porter, 2008:596)

Unlike in the Fixed Effects Model, the Random Effects Model allows for variation across entities and it assumed to be random and uncorrelated with the independent variables that are included in the model. The assumption for the Random Effects Model is that the entity's error term is not correlated with the independent variable, which allows for time-invariant variables to play a role as explanatory variables. In Random Effects it is necessary to specify those individual characteristics that may or may not influence the predictor variables.

The following are the general theoretical models for the Fixed Effects Model and Random Effects Model that will be used.

Fixed Effects Model: $Y_{it} = \alpha_i + \sum_{k=1}^{K} \beta_k X_{itk} + u_{it}$, and

Random Effects Model: $Y_{it} = \alpha + \sum_{k=1}^{K} \beta_k X_{itk} + u_{it} + \varepsilon_i$

Where:

Y_{it} is the dependent variable (DV) which will be HH Income, FOODEXPPC and Agric Income (according to participating or not participating in agriculture) where i = entity (household) and t = time (wave)

α_i and α are the entity specific and general intercepts for the Fixed Effects and Random Effects Models, respectively

X_{itk} represents the value of the kth independent variable (IV) for entity i and time t,

β_k is the coefficient for that IV,

u_{it} is the error term, and

ε_i is the time-invariant error term (random effects only).

4.5.2 Hausman test

In principle there is an advantage of the Random Effects Model over the Fixed Effects Model, because the latter will have fewer degrees of freedom depending on the number of 'fixed effects' (intercepts) being estimated; this will especially be true where the number of cross-

sectional units is large relative to the number of time units, as is certainly the case with the NIDS data.

However, there is a possible downside to the Random Effects Model, namely that there may be correlation between the errors, u_i, and the regressors, which will mean that the Random Effects estimator is inconsistent. To choose whether to use Fixed or Random Effects essentially comes down to whether or not there is evidence of such correlation, which is what the Hausman test is for. The Hausman test in effect tests for correlation between the unique errors (u_i) and the regressors, of which the null hypothesis is that they are not correlated. This is done by first running a Fixed Effects Model and saving the estimated slope parameters and residuals, and then doing the same for the Random Effects Model. The Hausman test statistic can then be calculated as

$$W = \left(\hat{\beta}_{RE} - \hat{\beta}_{FE}\right)' \hat{\Psi}^{-1} \left(\hat{\beta}_{RE} - \hat{\beta}_{FE}\right) \sim \chi^2(k),$$

where $\hat{\beta}_{RE} - \hat{\beta}_{FE}$ is the vector of differences between the estimated coefficients from the two estimators, and $\hat{\Psi}$ is the element-by-element difference between the covariance matrices of the estimated slope vectors. The Hausman test is underlined by the null hypothesis that the Fixed Effects Model and Random Effects Model do not differ significantly. The test statistic has an asymptotic χ^2 distribution, whereby if the null hypothesis is rejected (i.e. if W is significant) it is concluded that the REM is not appropriate as its error terms are shown to be correlated with one or more regressors (Liu, 2010). Of course in practice the Hausman test is a built-in function of most statistical software packages.

4.6 Summary of Methodology

The main purpose of this chapter is to explain the nature of the data used, and describe the analytical methods that will be used to explore the question concerning the residuality of agriculture and the time dimensions of rural employment. Stata is used for the analysis of data obtained from National Income Dynamics Study (NIDS) then a transition analysis is conducted which is the first step to everything concerning data analysis. A Random Effects Model or Fixed Effects Model and multinomial logistic models will be employed for running the regressions through Stata. For Fixed Effects Model or Random Effects Model, a Hausman test will be used to detect effects in individual specific models, and for the multinomial logistic

model a goodness of fit test will be employed which will assist in deciding whether the model is correctly specified.

CHAPTER FIVE: EMPIRICAL RESULTS AND DISCUSSION

5.1 Introduction

This chapter presents the findings of the data analysis. The study made use of four waves of the National Income Dynamics Study (NIDS). Some of the analytical exercises used two consecutive waves at a time, while others used all four waves together.

The chapter begins by simply looking at the extent to which households move into, leave, or remain in agriculture. It then explores what other household-level changes might be associated with these transitions.

Following this, the chapter presents findings of two different estimation techniques, namely the multinomial logistic model and panel data models. A multinomial logistic approach is used to identify what influences households to move into and out of agriculture, and the panel models are employed to try to understand how changes in agricultural participation influence household welfare. It is through this chapter that the main objective of the study is achieved.

5.2 The extent to which households move into, leave, or remain in agriculture

The study examines movements into and out of agriculture by conducting various types of inter-wave transition analysis using the NIDS data. The basis for determining whether a household is or is not 'agriculturally active' is the answer to the question (which appears in the household questionnaires for each NIDS wave), "Over the last 12 months has anyone in this household participated in growing food or raising livestock other than as part of paid employment?" Only African and Coloured households are considered, however all geotypes are included.

Tables 5.1, 5.2 and 5.3 present the transition matrices for each of the three pairs of wave comparisons in turn. The numbers show the number of observations (as opposed to extrapolations) from the partially pooled datasets fitting the respective household types, as well as the percentages of the total number of observations.

Table 5.1: Transitions between waves 1 and 2

		Wave 2: Agriculturally-active	
		Yes	No
Wave 1: Agriculturally-active	Yes	88 (2.4%)	532 (15.3%)
	No	149 (4.3%)	2722 (78.1%)

Table 5.2: Transitions between waves 2 and 3

		Wave 3: Agriculturally-active	
		Yes	No
Wave 2: Agriculturally-active	Yes	48 (1.4%)	179 (6.6%)
	No	289 (8.5%)	2882 (84.8%)

Table 5.3: Transitions between waves 3 and 4

		Wave 4: Agriculturally-active	
		Yes	No
Wave 3: Agriculturally-active	Yes	193 (4%)	300 (6%)
	No	611 (12%)	3852 (78%)

What is striking about each of the transition matrices is that the number of households moving into or out of agriculture tend to be much greater than the number of households remaining in agriculture. In other words, the number of 'leavers' and 'arrivals' are large relative to the number of 'farmers'. While the balance between 'leavers' and 'arrivals' seems to vary from one wave comparison to the next, the two categories together make up roughly 14% to 18% of the sample, whereas farmers are only about 2% to 4%. While this observation does not prove the residuality of agriculture, this high degree of flux into and out of agriculture is certainly consistent with the residuality hypothesis.

5.3 Correlates of transitions into and out of agricultural participation

The discussion now proceeds to look for correlates between the household types and various other variables available in the NIDS dataset. The purpose of the exercise is to try to induce

what might be either the influences on, or effects of, transitions into and out of agriculture, before proceeding with a more rigorous multivariate model building.

There are various different ways in which relationships between household type and other variables could have been explored. The way chosen here was to consider the number of households for which the candidate variable increased in (real) magnitude between the one wave and the next, versus the number for whom it decreased, and to do this separately according to household type. For each candidate variable, two tests are performed. The first is the Pearson Chi-square test for independence, in which one is comparing increase versus decrease on one dimension, versus household type on the other dimension. The null hypothesis is that the balance between households for whom the variable increased versus decreased, is independent of household type. The second test is the z-test for different proportions, where the focus is specifically on the household type 2 versus 3 households, that is, Leavers versus Arrivals, in particular to see whether the shares who experienced an increase in the variable under consideration are statistically different from one another.

HHQ_INC – Household income from household questionnaire

The first candidate variable considered in the 'HHQ_INC' variable provided in the NIDS dataset, which is a derived variable expressing the NIDS team's most complete estimate as to total household income. Household economic theories seek to understand the complex structures of households and how they behave. The focus of such theories is to understand decision-making processes as a function of demographic structures, income earning mechanisms, resource allocation, and the gender division of labour, and so forth, which in turn should assist one to understand the effects of public and private interventions at micro level and their consequences at macro level. The behaviour of households consists of many dimensions and is affected by numerous factors. These factors include the time value of household members, the production of goods, and the consumption value of members that determines the use of money that is exchanged by both buyers and sellers having a certain level of understanding on the distribution of goods and services this is referred to as the "market mechanism" (Ironmonger, 2001).

The HHQ_INC variable is used for each wave comparison where it shows the share of households of a particular type that experienced an increase in income from the first wave to the second wave, the share that experienced a decrease in income, and the difference between

the two. For purposes of the comparison, it is necessary to adjust for inflation so that the comparison of household income from one period to the next is meaningful. Inflation is adjusted according to the consumer price index for each wave pair. There are two main observations. First, within each of the household types, the experience is diverse – some households have increasing incomes and some decreasing; so it is clearly not the case that movements into and out of agriculture can be easily or simply associated with changes in total household income. However, the second observation is that there does appear to be a distinction between Type 2 households (Leavers) and Type 3 households (Arrivals), whereby a greater proportion of Arrival households experience an increase in household income relative to Leaver households. The implications of this finding are ambiguous, in the sense that in principle it could be that some of the increase in income is because of the entry into agriculture; however, in practice the agricultural incomes captured in the NIDS data are very low, so more likely this finding contradicts the residuality hypothesis; in other words, households engage in agriculture as their incomes rise, presumably because the additional income from non-agricultural sources makes it easier to do so.

Table 5.4: Share of households experiencing an increase in HHQ_INC by household type

	Waves 1 vs 2	Waves 2 vs 3	Waves 3 vs 4
HHTYPE 1: Farmers	55.9%	65.3%	56.5%
HHTYPE 2: Leavers	58.9%	58.5%	52.5%
HHTYPE 3: Arrivals	65.2%	73.2%	57.0%
HHTYPE 4: Non-farmers	60.9%	62.2%	57.9%
Chi-square (3) Prob	4.028 0.258	20.049 0.000	4.627 0.201
Prob for 2-sample test of proportions	0.105	0.000	0.160

There are several factors that affect the increase in household income, however, education and changed farming practices, indicate a moderate correlation of increase in household income. For correlation, gender, marital status, education, household size, land holding, number of crops produced, and establishing new enterprises are positively correlated with household income. So for the factors or variables mentioned supports the idea that they are directly proportional to household's income, which is the best possible outcome or result of the increase (Fields, 2013). In sub-Saharan Africa, most people live in rural areas and most people work in agriculture. However, in South Africa, it would seem that particular in agriculture is to a large degree conditioned by the availability of non-agricultural income.

Most rural people live to achieve food security, most of the time this requires investing in working hard on rural development work force and in decent rural employment (FAO, 2012: 7). Most producers and other agricultural work will somehow contribute by producing food and the amount of food that can be purchased is determined by the amount of income generated from work. Given the fact that the majority of poor people spend more than half of their income on food, a change in personal income can have immediate effects on household food security (FAO, 2012: 7).

HHwage – Household monthly income from labour market

This variable captures the sum of household income coming from household members' main jobs, second jobs, casual wages, self-employment income (excluding agricultural), bonus payments, and profit shares. According to the residuality hypothesis, it is especially relative to this variable one would expect to see countervailing movements, i.e. an increase in wage income would be associated with a movement away from farming, and a decrease in wage income would encourage people to enter farming.

Table 5.5: Share of households experiencing an increase in HHwage by household type

	Wave 1 vs 2	Wave 2 vs 3	Wave 3 vs 4
HHTYPE 1: Farmers	32.9%	30.6%	34.8%
HHTYPE 2: Leavers	28.6%	30.0%	37.0%
HHTYPE 3: Arrivals	35.2%	43.5%	40.2%
HHTYPE 4: Non-farmers	38.4%	45.4%	45.4%
Chi-square(3) Prob	17.954 0.000	30.963 0.000	23.872 0.000
Prob for 2-sample test of proportions	0.074	0.001	0.321

Looking at the transition of waves 1 versus 2, and waves 2 versus 3, the share of households with increased wage income is statistically higher among Arrival households than among Leaver households. This is a similar trend to the one observed above regarding the HHQ_INC variable, but here it convincingly argues more against the idea of residuality, since one can rule out the influence of agricultural income itself.

Employment is still regarded as one of the most important sources of income for the majority of people and this occurs either through the participation of people in the labour market, or

through being part of a household of which other members are sustained by earnings from employment (UNRISD, 2011). It would appear that more and more households – including those in rural areas – now depend more on non-agricultural activities as much as they depended on agriculture many years ago. However non-agricultural activities have become more dominant in rural areas as much as lower urban areas (Kaur and Kulkarni, 2010). This supports the idea of a possible explanation that people from rural areas now are depending more on both agricultural and non-agricultural activities to generate income, which includes employment and self-employment.

HHagric – Household average monthly income from subsistence agriculture

This variable captures income from 'subsistence agriculture' as calculated from various questions asked as part of the adult questionnaire. The aggregated value of all crops harvested and/or animals consumed by the household formed the measure of this income source. This value was calculated from the adult questionnaire. The adult questionnaire included the question of, "Think about all the produce that you consumed from your own production last month. How much would it cost to buy all of this at the market?" The answer to this, plus the answer to, "Please estimate how much you earned from [subsistence agricultural activities] during the past 30 days," were summed to provide an individual-level value of agricultural income. Individual incomes were then aggregated up to the household level (NIDS, 2008).

Table 5.6: Share of households experiencing an increase in HHagric by household type

	Wave 1 vs 2	Wave 2 vs 3	Wave 3 vs 4
HHTYPE 1: Farmers	15.4%	33.9%	34.8%
HHTYPE 2: Leavers	0.0%	0.0%	0.0%
HHTYPE 3: Arrivals	12.2%	40.1%	44.9%
HHTYPE 4: Non-farmers	0.0%	0.0%	0.0%
Chi-square(3) Prob	431.019 0.000	1200.000 0.000	1900.000 0.000
Prob for 2-sample test of proportions	0.000	0.000	0.000

Obviously, Leavers did not experience an increase in agricultural income. For Arrivals, obviously one would have expected an increase in agricultural income, but the results reported in the table show that only a proportion in fact do so, either suggesting how risky agriculture

can be (i.e. one can start practicing agriculture without deriving any benefit from it), or that the benefits take time to materialise.

Agricultural practices in most times are considered on the basis on producing food that will assist in improving or increasing household food security level and also nutrition. However, these agricultural activities hardly measure these effects (food security levels as well as nutrition). It is not 100% assured that the agricultural activities will have a positive or negative impact on food security levels and nutrition levels for households that are food insecure and individuals who are declared as hungry. Having enough access to food or food security is more likely to be impacted by intervention from agricultural practices. It is now well predicted that farming practices together with its policies have the potential of having major impact on food security levels of households even though it cannot be clearly measured. Many of the effects occur through employment and many sources of income through market prices which is in turn affected by the choices of agricultural technology and the types of crop selected for farming (Levinson, 2011).

HHgovt – Household monthly income from government grants

This variable captures all income accruing to household members from government grants, including state old pensions, child support grants, disability grants, foster care grants and care dependency grants. For every year there is a new national budget speech that is released by the National Treasury, which explains all the increases in government grants, this adjustment is usually made to offset the increase of inflation rate (NIDS, 2008).

Table 5.7: Share of households experiencing an increase in HHgovt by household type

	Wave 1 vs 2	Wave 2 vs 3	Wave 3 vs 4
HHTYPE 1: Farmers	48.3%	56.5%	34.8%
HHTYPE 2: Leavers	49.9%	54.9%	32.1%
HHTYPE 3: Arrivals	49.1%	58.1%	40.3%
HHTYPE 4: Non-farmers	41.8%	44.0%	27.2%
Chi-square(3) Prob	15.279 0.002	39.330 0.000	44.009 0.000
Prob for 2-sample test of proportions	0.849	0.434	0.009

The HHgovt variable is used for each wave comparison where it shows the share of households of a particular type that experienced an increase in income from the first wave to the second wave, the share that experienced a decrease in income, and the difference between the two. Where households are involved in agricultural activities they experience a higher share of increase in income from government grants than those households who are leaving agriculture. This again counts against the residuality hypothesis.

HHsizer – Household size

This is the household size, defined as the number of people living in that particular household. One supposes that larger households are better able to engage in agriculture, and perhaps are also more in need of practicing agriculture; therefore, one might expect that an increase in household size might be associated with households entering agriculture, and a decrease with households leaving agriculture.

Table 5.8: Share of households experiencing an increase in HHsizer by household type

	Wave 1 vs 2	Wave 2 vs 3	Wave 3 vs 4
HHTYPE 1: Farmers	39.9%	32.3%	36.2%
HHTYPE 2: Leavers	40.3%	22.1%	27.6%
HHTYPE 3: Arrivals	43.0%	39.8%	36.9%
HHTYPE 4: Non-farmers	34.8%	25.2%	29.2%
Chi-square(3) Prob	11.149 0.011	40.633 0.000	19.138 0.000
Prob for 2-sample test of proportions	0.486	0.000	0.002

The HHsizer variable is used for each wave comparison where it shows the share of households of a particular type that experienced an increase in household size from the first wave to the second wave, the share that experienced a decrease in household size, and the difference between the two. For waves 1 versus 2, the share of households that experienced an increase in household size is not significant, but for waves 2 versus 3, and 3 versus 4, there is strong evidence in support of the idea that households tend to enter agriculture when they grow in size, in particular relate to Leaver households. This shows that when the household size is bigger households tend to participate more in agriculture as compared to households that are smaller.

Overall, this section does illustrate discernible differences between Arrival households and Leaver households, but not in a manner consistent with the idea of residuality. It remains to be seen whether this tentative conclusion against residuality will change once we use a multivariate model that is better able to accommodate the complexity of real-life households.

5.4 Analysing agricultural transitions by means of the multinomial logistic model

5.4.1 Introduction

This subsection seeks to identify what influences households to move into and out of agriculture by using a multinomial logistic (ML) regressions approach. As explained in the previous chapter, this analysis uses the household type variable – of which there are four possible values – as the dependent variable. From this we are going to see what kind relationship or influence do the Household-size (HHsizer), the Household-wage (HHwage) and Household monthly income from government grants (HHgovt) have on these different types of Household, using the different types of areas as dummy variables. The response variable, HHTYPE, is treated as a categorical variable under the assumption that the levels of HHTYPE status have no natural order and allow Stata to choose the referent group or outcome base, which in the case as hand is HHTYPE 4 (non-farmers). The type of areas which are rural formal, tribal authority areas, and urban formal area, are treated as dummy variables in the model (RURALF, TRIBAL and URBANF).

The analysis is conducted three times, once for each pair of consecutive NIDS waves.

5.4.2 Multinomial logistic regression using waves 1 and 2

The results for the multinomial logistic regression for wave 1 versus wave 2 are shown in the table below:

Table 5.9: Multinomial logistic regression results for waves 1 versus 2

Depvar = HHTYPEW12	Coef.	Std. error	Z	P>|z|	Delta-method			
					dy/dx	Std. error	Z	P>|z|
HHTYPE = 1								
w1_HHsizer*	0.171874	0.033674	5.100	0.000	0.004025	0.001066	3.770	0.000
w1_HHwage	-6E-05	0.000048	-1.240	0.215	-1.62E-06	1.56E-06	-1.040	0.300
w1_hhgovt*	0.000352	0.000136	2.590	0.010	8.59E-06	4.31E-06	1.990	0.046
RuralF	1.399134	0.779094	1.800	0.073	0.039734	0.025483	1.560	0.119

Tribal***	2.207399	0.723412	3.050	0.002	0.054173	0.02375	2.280	0.023
UrbanF	-0.02787	0.767738	-0.040	0.971	0.009243	0.024972	0.370	0.711
Constant	-5.3976	0.736048	-7.330	0.000				
HHTYPE = 2								
w1_HHsizer*	0.128768	0.019847	6.490	0.000	0.012952	0.00226	5.730	0.000
w1_HHwage	-1.2E-05	1.54E-05	-0.800	0.422	1.12E-08	1.94E-06	0.010	0.995
w1_HHgovt*	0.00026	7.76E-05	3.360	0.001	2.75E-05	9.07E-06	3.040	0.002
RuralF*	0.619988	0.278231	2.230	0.026	0.06489	0.034575	1.880	0.061
Tribal*	1.467498	0.24273	6.050	0.000	0.146075	0.029837	4.900	0.000
UrbanF*	-0.88452	0.269281	-3.280	0.001	-0.10373	0.033622	-3.090	0.002
Constant	-2.80825	0.250975	-11.190	0.000				
HHTYPE = 3								
w1_HHsizer*	0.086129	0.031624	2.720	0.006	0.002346	0.001538	1.530	0.127
w1_HHwage*	-7.4E-05	3.65E-05	-2.040	0.041	-3.47E-06	1.86E-06	-1.870	0.062
w1_HHgovt	5.84E-05	0.000126	0.460	0.644	-1.13E-06	6.23E-06	-0.180	0.856
RuralF	-0.27741	0.448506	-0.620	0.536	-0.02525	0.022752	-1.110	0.267
Tribal*	0.895211	0.342283	2.620	0.009	0.021721	0.017111	1.270	0.204
UrbanF	-0.3662	0.359259	-1.020	0.308	-0.00765	0.018293	-0.420	0.676
Constant	-3.13584	0.350925	-8.940	0.000				
Number of obs = 3352 LR chi2(18) = 700.65 Prob > chi2 = 0.0000 Pseudo R2 = 0.1308								

HHTYPE - This is the rresponse variable in this multinomial logistic regression, beneath are the three predictor variables which are representing the 3 estimated models: HHTYPE 1 relative to HHTYPE 4, HHTYPE 2 relative to HHTYPE 4, HHTYPE 3 relative to HHTYPE 4. Coefficients and reference group (base-outcome) are the estimated multinomial logistic regression coefficients and the referent group respectively, for this model. An important feature of the multinomial logit model is that it estimates k-1 models, where k is the number of levels of the dependent variable. In this instance, Stata by default has set HHTYPE 4 as the base-outcome which creates an estimated model for HHTYPE 1 relative to HHTYPE 4, HHTYPE 2 relative to HHTYPE 4, and HHTYPE 3 relative to HHTYPE 4. The estimated parameters are relative to the base-outcome, so the standard interpretation of the multinomial logit used is : a unit change in the predictor variable, the logit of outcome m relative to the base-outcome is expected to change by its respective estimated parameter given the variables in the model are held constant.

HHTYPE 1 relative to HHTYPE 4

HHsizer – if the household size were to increase by one unit the probability of the household participating in agriculture rather than not being involved in agriculture at all would be expected to increase by 0.17 while holding all other variables in the model constant. HHgovt if the government income were to increase by one unit the probability of the household participating in agriculture rather than not being involved in agriculture at all would be expected to increase 0.0003 while holding all other variables in the model constant. The rural areas have a probability of 1.39 chance of being involved in agricultural activities when compared to other areas in the model. The tribal areas have a probability of 2.20 chance of being involved in agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in HHsizer will increase the probability of household participating in agriculture by 0.004% and each unit increase in HHgovt increases the probability of household participating in agriculture by 8.5%. The probability of tribal areas participating in agriculture will increase by 0.05% compared to urban informal areas.

HHTYPE 2 relative to HHTYPE 4

HHsizer - if the household size were to increase by one unit the probability of the household leaving agriculture rather than being involved in agriculture would be expected to increase 0.12 while holding all other variables in the model constant. Regarding HHgovt if the government income were to increase by one unit the probability of the household leaving agriculture rather than participating in agriculture would be expected to increase 0.00026 while holding all other variables in the model constant. The rural areas have a probability of 0.61 chance of leaving agricultural activities when compared to other areas in the model. The tribal areas have a probability of 1.46 chance of leaving agricultural activities when compared to other areas in the model. The urban areas have a probability of -0.8 chance of being involved in agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in HHsizer increases the probability of household leaving agriculture by 0.002% and each unit increase in the HHgovt increases the probability of households leaving agriculture by 2.75%. The probability of rural and tribal areas will increase by 0.06% and 0.14% compared to urban informal areas and the probability of urban formal areas will decrease by -0.10% compared to urban informal areas.

HHTYPE 3 relative to HHTYPE 4

HHsizer - if the household size were to increase by one unit the probability of the household preferring to Re-joining agriculture rather than not being involved in agriculture at all would be expected to increase by 0.08 while holding all other variables in the model constant. HHwage - If the household wage is increased by one unit the multinomial probability of households re-joining agriculture would be expected to decrease by -7.4 while holding all other variables in the model constant. The tribal areas have the probability of 0.8 chance of re-joining agricultural activities when compared to other areas in the model. The Urban areas have a probability of -0.36 chance of re-joining agricultural activities when compared to other areas in the model.

In wave 1, The household size has an influence on whether households leave or participate in agriculture for all the household types relative to household type 4. The government grant also has an impact on households whether they participate or leave in agriculture. However, the government grant does not have any kind of influence in households re-joining agriculture after households have left agricultural activities in wave 1.

Marginal effects: each unit increase in HHwage decreases the probability of households re-joining agriculture by -3.4%.

5.4.3 Multinomial logistic regression using waves 2 and 3

The results for the multinomial logistic regression for wave 2 versus wave 3 are shown in the table below:

Table 5.10: Multinomial logistic regression results for waves 2 versus 3

Depvar = HHTYPEW23	Coef.	Std. error	z	P>|z|	Delta-method			
					dy/dx	Std. error	z	P>|z|
HHTYPE = 1								
w2_HHsizer*	0.138632	0.028893	4.800	0.000	0.003422	0.000922	3.710	0.000
w2_HHwage	-5.8E-05	0.000037	-1.560	0.118	-1.65E-06	1.21E-06	-1.360	0.173
w2_HHgovt	9.61E-05	0.000104	0.920	0.357	1.15E-06	3.31E-06	0.350	0.729
RuralF*	1.295015	0.776354	1.670	0.095	0.037543	0.025553	1.470	0.142
Tribal*	2.209701	0.721893	3.060	0.002	0.055486	0.023882	2.320	0.020
UrbanF	-0.0464	0.765204	-0.060	0.952	0.008349	0.025053	0.330	0.739
constant	-5.09496	0.727247	-7.010	0.000				
HHTYPE = 2								

w2_HHsizer*	0.102591	0.017431	5.890	0.000	0.01087	0.002007	5.420	0.000
w2_HHwage*	-2.4E-05	1.37E-05	-1.780	0.076	-2.43E-06	1.69E-06	-1.430	0.151
w2_HHgovt*	0.000136	0.000058	2.340	0.019	1.28E-05	6.86E-06	1.860	0.063
RuralF*	0.565576	0.275949	2.050	0.040	0.061059	0.034554	1.770	0.077
Tribal*	1.453353	0.241082	6.030	0.000	0.146572	0.029836	4.910	0.000
UrbanF*	-0.87033	0.267184	-3.260	0.001	-0.10139	0.0336	-3.020	0.003
constant	-2.63691	0.246782	-10.690	0.000				
HHTYPE = 3								
w2_HHsizer	0.033879	0.028493	1.190	0.234	0.000101	0.001388	0.070	0.942
w2_HHwage	2.15E-07	1.39E-05	0.020	0.988	4.57E-07	7.14E-07	0.640	0.523
w2_HHgovt*	0.000251	8.68E-05	2.890	0.004	1.08E-05	4.32E-06	2.500	0.013
RuralF	-0.33615	0.448311	-0.750	0.453	-0.02727	0.022745	-1.200	0.231
Tribal*	0.882997	0.342098	2.580	0.010	0.021223	0.017088	1.240	0.214
UrbanF	-0.4596	0.359322	-1.280	0.201	-0.01244	0.0183	-0.680	0.497
constant	-3.16912	0.347836	-9.110	0.000				
Number of obs = 3352 LR chi2(18) = 666.10 Prob > chi2 = 0.0000 Pseudo R2 = 0.1243								

HHTYPE 1 relative to HHTYPE 4

HHsizer – if the household size were to increase by one unit the probability of the household preferring to participate in agriculture rather than not being involved in agriculture at all would be expected to increase by 0.12 while holding all other variables in the model constant.. The rural areas have a probability of 1.29 chance of being involved in agricultural activities when compared to other areas in the model. The tribal areas have a probability of 2.20 chance of being involved in agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in the independent variable increases the probability of households participating in agriculture by 0.003%. and the tribal areas have a probability increase of 0.05% to participate in agriculture compared to urban informal areas.

HHTYPE 2 relative to HHTYPE 4

HHsizer- if the household size were to increase by one unit the probability of the household leaving agriculture rather than being involved in agriculture would be expected to increase by 0.10 while holding all other variables in the model constant. Regarding Hhgovt, if the government income were to increase by one unit, the probability of the household leaving

agriculture rather than participating in agriculture would be expected to increase by 0.00013 while holding all other variables in the model constant. HHwage if the household wages were to increase by one unit the probability of the household leaving agriculture rather than participating in agriculture would be expected to decrease by -2.4 while holding all other variables in the model constant.

The rural areas have a probability of 0.56 chance of leaving agricultural activities when compared to other areas in the model. The tribal areas have a probability of 1.4 chance of leaving agricultural activities when compared to other areas in the model. The urban areas have a probability of -0.8 chance of being involved in agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in the HHsizer increases the probability of households leaving agriculture by 0.01% and each unit increase in the HHgovt increases the probability of households leaving agriculture by 1.28%. The probability of rural and tribal areas will increase by 0.06% and 0.14% compared to urban informal areas and the probability of urban formal areas will decrease by -0.10% compared to Urban informal areas.

HHTYPE 3 relative to HHTYPE 4

Regards Hhgovt if the government income is increased by one unit, the multinomial probability of households re-joining agriculture would be expected to decrease by 0.0002 unit while holding all other variables in the model constant. The tribal areas have the probability of 0.8 chance of re-joining agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in the Hhgovt increases the probability of household re-joining agriculture by 1.08%.

In wave 2, the household size, households wages and the government grants are found to be statistically different from zero, as they have an in impact on whether households do participate or leave agriculture. However, only government grant is found to have an impact in households re-joining agricultural activities as it is found to be statistically different from zero.

5.4.4 Multinomial logistic regression using waves 3 and 4

For waves 3 and 4, two slightly different models are estimated. For the first, the variables having to do with household size, wage income, and government income are taken from the

wave 3 dataset, while for the second regression these variables are taken from the wave 4 dataset. (There was also an attempt to use versions of these variables depicting change in household size, wage income, etc., over time, but these results were not satisfactory.)

Table 5.11: Multinomial logistic regression results for waves 3 versus 4; version 1

Depvar = HHTYPEW34	Coef.	Std. error	z	P>|z|	Delta-method			
					dy/dx	Std. error	z	P>|z|
HHTYPE = 1								
w3_HHsizer*	0.053789	0.025667	2.100	0.036	0.002148	0.001148	1.870	0.061
w3_HHwage	1.32E-05	1.54E-05	0.860	0.390	8.71E-07	7.13E-07	1.220	0.222
w3_HHgovt*	0.000161	7.79E-05	2.070	0.039	4.24E-06	3.50E-06	1.210	0.226
RuralF*	1.203894	0.644568	1.870	0.062	0.033349	0.030227	1.100	0.270
Tribal*	2.386883	0.590534	4.040	0.000	0.077324	0.027849	2.780	0.005
UrbanF	-0.77187	0.665235	-1.160	0.246	-0.03781	0.031322	-1.210	0.227
constant	-4.51775	0.593444	-7.610	0.000				
HHTYPE = 2								
w3_HHsizer	0.018198	0.024545	0.740	0.458	0.000593	0.001572	0.380	0.706
w3_HHwage*	-3.7E-05	1.88E-05	-1.970	0.049	-2.48E-06	1.25E-06	-1.990	0.047
w3_HHgovt*	0.00019	6.39E-05	2.980	0.003	9.06E-06	4.10E-06	2.210	0.027
RuralF*	2.358079	0.738896	3.190	0.001	0.138301	0.049534	2.790	0.005
Tribal*	2.901872	0.717069	4.050	0.000	0.157888	0.048094	3.280	0.001
UrbanF*	1.418485	0.725236	1.960	0.050	0.106077	0.048565	2.180	0.029
constant	-4.68381	0.718256	-6.520	0.000				
HHTYPE = 3								
w3_HHsizer	0.021328	0.018812	1.130	0.257	0.00156	0.002067	0.750	0.451
w3_HHwage	-3.86E-06	1.06E-05	-0.360	0.716	-6.42E-08	1.22E-06	-0.050	0.958
w3_HHgovt*	0.000183	5.09E-05	3.600	0.000	1.65E-05	5.59E-06	2.940	0.003
RuralF*	0.784559	0.289852	2.710	0.007	0.042061	0.035028	1.200	0.230
Tribal*	1.459279	0.257008	5.680	0.000	0.098029	0.03105	3.160	0.002
UrbanF*	-0.5195	0.276101	-1.880	0.060	-0.07142	0.033948	-2.100	0.035
constant	-2.55806	0.259061	-9.870	0.000				
Number of obs = 3352 LR chi2(18) = 624.47 Prob > chi2 = 0.0000 Pseudo R2 = 0.1089								

HHTYPE 1 relative to HHTYPE 4

HHsizer- if the household size were to increase by one unit the probability of the household preferring to participate in agriculture rather than not being involved in agriculture at all would be expected to increase by 0.053 while holding all other variables in the model constant. Regarding Hhgovt if the government income were to increase by one unit, the probability of the household participating in agriculture rather than not being involved in agriculture at all would be expected to increase by 0.00016 while holding all other variables in the model constant. The rural areas have a probability of 1.20 chance of being involved in agricultural activities when compared to other areas in the model. The tribal areas have a probability of 2.38 chance of being involved in agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in the HHsizer increases the probability of a household participating in agriculture by 0.002%. The probability of tribal areas participating in agriculture will increase by 0.07 compared to urban informal areas.

HHTYPE 2 relative to HHTYPE 4

HHwage-If the Household-wage were to increase by one unit, the probability of the household leaving agriculture rather than participating in agriculture would be expected to decrease by -3.7 while holding all other variables in the model constant. Regarding Hhgovt if the government income were to increase by one unit the probability of the household leaving agriculture rather than participating in agriculture would be expected to increase by 0.00019 while holding all other variables in the model constant. The rural areas have a probability of 2.35 chance of leaving agricultural activities when compared to other areas in the model. The tribal areas have a probability of 2.9 chance of leaving agricultural activities when compared to other areas in the model. The urban areas have a probability of 1.4 chance of being involved in agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in the HHwage decreases the probability of households leaving in agriculture by -2.8%. Each unit increase in the Hhgovt increases the probability of households leaving agriculture by 9.8%. The probability of rural, tribal and urban formal areas leaving agriculture will increase by 0.13%, 0.15% and 0.10% compared to urban informal areas.

HHTYPE 3 relative to HHTYPE 4

Regarding Hhgovt, if the government income is increased by one unit, the multinomial probability of households re-joining agriculture would be expected to increase by 0.00018 while holding all other variables in the model constant. The rural areas have the probability of 0.7 chance of re-joining agricultural activities when compared to other areas in the model. The tribal areas have the probability of 1.4 chance of re-joining agricultural activities when compared to other areas in the model. The urban areas have a probability of -0.51 chance of re-joining agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in the Hhgovt increases the probability of household re-joining agriculture by 1.65%. The probability of tribal and Urban formal areas re-joining agriculture will increase by 0.09% compared to urban informal areas and probability of Urban formal areas re-joining agriculture will decrease by -0.07 compared to urban informal areas.

In wave 3, government grant is found to have an impact on households participating, leaving and re-joining agricultural activities as it is found to be statistically different from zero. The households wage is found to be statistically different from zero, as they have an influence on households leaving agriculture. The size of household size has an influence on households participating in agriculture.

Turning now to the second version of the model, i.e. using variables from the wave 4 dataset, the following results are reported:

Table 5.12: Multinomial logistic regression results for waves 3 versus 4; version 2

HHTYPE34	Coef.	Std. error	Z	P>|z|	Delta-method			
					dy/dx	Std. error	z	P>|z|
HHTYPE = 1								
w4_HHsizer*	0.094939	0.025032	3.790	0.000	0.003516	0.001111	3.160	0.002
w4_HHwage	3.03E-06	8.63E-06	0.350	0.726	3.49E-07	4.13E-07	0.850	0.397
w4_HHgovt*	0.000184	6.32E-05	2.920	0.004	5.51E-06	2.77E-06	1.990	0.047
RuralF*	1.30759	0.645404	2.030	0.043	0.036541	0.030117	1.210	0.225
Tribal*	2.410755	0.590396	4.080	0.000	0.076801	0.027681	2.770	0.006
UrbanF	-0.69943	0.665242	-1.050	0.293	-0.03482	0.031165	-1.120	0.264
constant	-4.75185	0.597288	-7.960	0.000				
HHTYPE = 2								
w4_HHsizer	0.011653	0.025158	0.460	0.643	-0.00071	0.001614	-0.440	0.658
w4_HHwage	-1.2E-05	1.25E-05	-0.980	0.328	-6.65E-07	8.28E-07	-0.800	0.422

w4_HHgovt*	0.000164	5.92E-05	2.770	0.006	7.40E-06	3.77E-06	1.960	0.050
RuralF*	2.388439	0.738853	3.230	0.001	0.139148	0.04965	2.800	0.005
Tribal*	2.978385	0.716621	4.160	0.000	0.163381	0.048218	3.390	0.001
UrbanF*	1.425971	0.725059	1.970	0.049	0.105366	0.048669	2.160	0.030
constant	-4.70099	0.719354	-6.540	0.000				
HHTYPE = 3								
w4_HHsizer*	0.066606	0.017898	3.720	0.000	0.006314	0.001938	3.260	0.001
w4_HHwage*	-1.1E-05	9.66E-06	-1.180	0.237	-1.17E-06	1.10E-06	-1.060	0.288
w4_HHgovt*	0.000172	4.46E-05	3.860	0.000	1.51E-05	4.78E-06	3.160	0.002
RuralF*	0.865913	0.29106	2.980	0.003	0.049045	0.034945	1.400	0.160
Tribal*	1.480321	0.257282	5.750	0.000	0.097564	0.030882	3.160	0.002
UrbanF*	-0.4558	0.276516	-1.650	0.099	-0.06423	0.033823	-1.900	0.058
constant	-2.76447	0.262777	-10.520	0.000				
Number of obs = 3352 LR chi2(18) = 644.38 Prob > chi2 = 0.0000 Pseudo R2 = 0.1123								

HHTYPE 1 relative to HHTYPE 4

HHsizer- If the household size were to increase by one unit, the probability of the household preferring to participate in agriculture rather than not being involved in agriculture at all would be expected to increase by 0.09 while holding all other variables in the model constant. Regarding Hhgovt if the government income were to increase by one unit the probability of the household preferring participate in agriculture rather than not being involved in agriculture at all would be expected to increase by 0.00018 while holding all other variables in the model constant. The rural areas have a probability of 1.3 chance of being involved in agricultural activities when compared to other areas in the model. The tribal areas have a probability of 2.4 chance of being involved in agricultural activities when compared to other areas in the model.

Marginal effects: Each unit increase in the HHsizer increases the probability of household participating in agriculture by 0.003%. Each unit increase in the HHgovt increases the probability of households participating in agriculture by 5.5%. The probability of tribal areas participating in agriculture will increase by 0.07% compared to urban informal areas.

HHTYPE 2 relative to HHTYPE 4

Regarding Hhgovt if the government income were to increase by one unit, the probability of the household leaving agriculture rather than participating in agriculture would be expected to increase by 0.00016 while holding all other variables in the model constant. The rural areas have a probability of 2.38 chance of leaving agricultural activities when compared to other areas in the model. The tribal areas have a probability of 2.97 chance of leaving agricultural activities when compared to other areas in the model. The urban areas have a probability of 1.42 chance of being involved in agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in the Hhgovt increases the probability of leaving agriculture by 7.4%. The probability of rural, tribal and urban formal areas leaving agriculture will increase by 0.13%, 0.16% and 0.10% compared to urban informal areas.

HHTYPE 3 relative to HHTYPE 4

HHsizer- If the household size were to increase by one unit the probability of the household preferring to re-joining agriculture rather than not being involved in agriculture at all would be expected to increase by 0.08 while holding all other variables in the model constant. Regarding Hhgovt if the government income is increased by one unit, the multinomial probability of households re-joining agriculture would be expected to decrease by 0.00017 unit while holding all other variables in the model constant. The rural areas have the probability of 0.8 chance of re-joining agricultural activities when compared to other areas in the model. The tribal areas have the probability of 01.48 chance of re-joining agricultural activities when compared to other areas in the model. The Urban areas have a probability of decreasing by -0.36 chance of re-joining agricultural activities when compared to other areas in the model.

Marginal effects: each unit increase in HHsizer increases the probability of households re-joining agriculture by 0.006%. Each unit increase in Hhgovt increases the probability of household re-joining agriculture by 1.5%. The probability of tribal areas re-joining agriculture will increase by 0.09% compared to urban informal areas and probability of Urban formal areas re-joining agriculture will decrease by -0.06 compared to urban informal area.

In wave 4, the household size, households wages and the government grants are found to be statistically different from zero, as they have an impact on whether households do participate

or re-join agricultural participation for those households that have left agriculture. Only government grants have been found to have an effect on households leaving agriculture.

5.5 How transitions on household welfare are Influenced

The study examines how changes in agricultural participation impacts on household livelihoods by means of panel models. The main indicator of household welfare considered was household income (or the natural logarithm thereof). In addition, household food expenditure was also used, but here there is an ambiguity because participation in agriculture at a 'commercial' scale could in principle enable a household to increase its food expenditure, while producing at a subsistence level would rather be expected to lower household food expenditure, *ceteris paribus*. To a large degree, however, the ambiguity is a theoretical one, at least where the NIDS data are concerned; on average agricultural income accounts for less than 0.3% of household income, thus what one is seeking to discover is whether participation in agriculture has the advantage of lowering household expenditure, which for purposes of this research would be understood as a benefit of participation in agriculture.

The third dependent variable considered is agricultural income, which of course is just one possible (and seemingly not very common) benefit of participation in agriculture. The main purpose of running this regression is in fact to further probe the relationship between agricultural participation and off-farm work.

For each dependent variable considered, more or less the same explanatory variables were included (differences are noted below), mostly drawing on the same variables used for the multinomial logit analysis. Each model was run twice, once with the Fixed Effects estimator, and again with the Random Effects estimator. This allowed the application of the Hausman test, which in each instance led to the conclusion that the Random Effects estimator was not consistent and thus should not be used, in favour of the Fixed Effects Model results. (For example, for the first specification presented below, running the FEM and REM led to a Hausman test value of $\chi^2 = 1071.3$.) Thus in what follows, only the results from the Fixed Effects Model are reported.

The results for the first regression are presented in the table below. The question is what influences the natural logarithm of total household income, and in particular the role of participation in agriculture. The explanatory variables include household size, a dummy variable to indicate whether the household owns its dwelling (to partially control for

wealth/assets), various characteristics of the household head (education, gender and age), and various dummy variables having to do with economic participation, including having a wage income ('Em1'), self-employment income ('Ems'), social grant income ('HHgovt'), and involvement in agriculture ('Agric'); as well as three interaction dummy variables, namely, between agricultural participation and having wage income ('Agm1'), between agricultural participation and having business income ('Agms'), and between agricultural participation and having social grant income ('Agovt'). The limitations of the regression are acknowledged: household income is an inadequate indicator of household welfare, especially where the contribution of agriculture is concerned.

Table 5.13: Fixed Effects estimation with household income as the dependent variable

Fixed-effects (within) regression				Number of obs	=	12931
Group variable: w4_hhid				Number of groups	=	3538
R-sq: within = 0.1358				Obs per group: min	=	1
between = 0.0619				avg	=	3.7
overall = 0.0859				max	=	4
				F(12,9381)	=	122.89
corr(u_i, Xb) = -0.1274				Prob > F	=	0.0000
Depvar = lnHHinc	Coef.	Std. Err.	z	P > z	95% Conf.	Interval
HHsizer*	-0.1103	0.0043	-25.600	0.000	-0.102	-0.119
Ownd*	0.1184	0.0202	5.850	0.000	0.079	0.158
Edus*	0.0060	0.0013	4.550	0.000	0.003	0.009
Gen*	-0.0762	0.0218	-3.500	0.000	-0.119	-0.033
Age*	0.0030	0.0008	3.950	0.000	0.002	0.004
Em1*	0.4267	0.0201	21.230	0.000	0.387	0.466
Ems*	0.2030	0.0317	6.400	0.000	0.141	0.265
HHgovt*	0.1913	0.0178	10.760	0.000	0.156	0.226
Agric	-0.0109	0.0383	-0.290	0.776	-0.086	0.064
Agm1	0.0055	0.0434	0.130	0.899	-0.080	0.091
Agms	0.0718	0.0609	1.180	0.239	-0.048	0.191
Agovt	0.0823	0.0397	2.080	0.038	0.005	0.160
constant	1.4355	1.4865	0.970	0.334	-1.478	4.349

The signs of the estimated slope coefficients on the demographic variables are as one would expect: female-headed households have lower incomes, whereas households whose heads are older and more educated have higher incomes. Participation in wage employment and self-employment both make positive contributions to household income, but the contribution of

wage employment appears to be greater. Receiving social grants also makes a positive contribution, on a par with participation in self-employment. Participation in agriculture in itself does not appear to have a significant relationship to household income, except that it has a small, positive significant relationship to household income in conjunction with grant income (note the estimated slope coefficient of 0.0823 on the Agovt interaction term). Importantly, the interaction dummies between agriculture and employment/self-employment do not have significant estimated slope coefficients; thus even though the transition analysis reported in 5.3 above suggests that households enter agriculture as their non-agricultural income increases (contrary to the residuality hypothesis), such a relationship is not supported by this fitted regression equation, for which one would have expected significantly positive estimated slope coefficients on the interaction terms. While the lack of significance does not prove that these relationships do not exist, there is at least a suggestion that they are not strong, else one would have seen a significant result, particularly for a panel model with such a large sample size. The same can be said for agriculture in itself: on its own, agriculture does not appear to make a significant, positive contribution to household income.

There has been increasing awareness in recent years that rural households are not limited to either the agricultural sector or to non-agricultural activities, but rather may well pursue multiple livelihood strategies, to which the researcher would add that the balance between agriculture and non-agricultural sectors appears to be continuously changing over time. But according to this regression, agriculture is a relatively insignificant sector in the greater scheme of things?. It is worth pointing out that very little changes if one re-runs the regression with only observations from traditional areas (not shown).

The next regression has as its dependent variable the natural logarithm of household expenditure on food.

Table 5.14: Fixed Effects estimation with household food expenditure as the dependent variable

Fixed-effects (within) regression				Number of obs =	12775
Group variable: w4_hhid				Number of groups =	3538
R-sq: within = 0.0329				Obs per group: min =	1
between = 0.0822				avg =	3.6
overall = 0.0654				max =	4
				F(12,9225) =	26.17
corr(u_i, Xb) = 0.0069				Prob > F =	0.0000
Depvar = lnfoodexppc	Coef.	Std. Err.	z	P > z	95% Conf. Interval

HHsizer*	0.0550	0.0040	13.730	0.000	0.047	0.063
Ownd*	0.0497	0.0189	2.630	0.008	0.013	0.087
Edus	-0.0014	0.0012	-1.120	0.264	-0.004	0.001
Gen*	-0.0368	0.0203	-1.810	0.071	-0.077	0.003
Age	0.0000	0.0007	0.070	0.944	-0.001	0.001
Em1*	0.1370	0.0187	7.310	0.000	0.100	0.174
Ems*	0.0901	0.0297	3.040	0.002	0.032	0.148
Govt*	0.0583	0.0165	3.520	0.000	0.026	0.091
Agric*	0.0881	0.0356	2.480	0.013	0.018	0.158
Agm1*	-0.0670	0.0404	-1.660	0.097	-0.146	0.012
Agms	0.0629	0.0566	1.110	0.266	-0.048	0.174
Agovt	-0.0188	0.0368	-0.510	0.610	-0.091	0.053
constant	6.3510	1.3814	4.600	0.000	3.643	9.059

Household food expenditure would be expected to have a complex relationship to households' agricultural activities, in the sense that surplus production could contribute to households' disposable income, would in turn could allow for higher levels of food expenditure; on the other hand, subsistence production should lower reliance on purchased food. Some of this complexity is captured in the results reported above. Participation in agriculture does have a positive relationship with food expenditure, however there is a significantly negative relationship that is almost equal in magnitude by way of the interaction term between agriculture and participation in wage employment. This suggests that households with one or more members in wage employment spend less on food, *ceteris paribus*, when the household also engages in agriculture.

To try to understand the underlying relationships a bit better, two regressions similar to the one above are run but with distinct subsamples, the first being households without wage employment, and the second being households with some wage employment. The interaction terms are dropped. The finding is that for households without wage employment, agriculture makes a positive contribution to household food expenditure, seemingly of a similar magnitude as government grants; for households with wage income, however, agricultural participation does not have a significant relationship to household food expenditure. Together with the preceding results, this is tentative support for the idea that agriculture is a residual sector, in the sense that it compensates for the absence of more significant income from wage employment.

Table 5.15: Fixed Effects estimations with household food expenditure as the dependent variable with two subsamples

Depvar = lnfoodexppc	Households without wage employment		Households with wage employment	
	Coef.	P > z	Coef.	P > z
HHsizer*	0.0506	0.000	0.0726	0.000
Ownd*	0.0660	0.010	0.0723	0.046
Edus	-0.0019	0.170	-0.0058	0.137
Gen	-0.0026	0.924	-0.1066	0.022
Age	-0.0006	0.420	0.0000	0.998
Ems*	0.1062	0.000	0.0666	0.449
Govt*	0.0666	0.001	0.0567	0.086
Agric*	0.0679	0.000	0.0498	0.251
Constant	7.6303	0.000	6.7188	0.386
R-sq: within = between = overall =	0.0290 0.0781 0.0744		0.0371 0.0317 0.0395	

Moving on to the third dependent variable, namely agricultural income, one hopes to shed more light on these inter-relationships. However, one must first note that because most households have an agricultural income of 0, here the dependent variable is not in logarithmic terms, and thus the magnitudes of the estimated slope coefficients are very different than for the preceding regression results.

Table 5.16: Fixed Effects estimation with agricultural income as the dependent variable

Fixed-effects (within) regression — Number of obs = 12937
Group variable: w4_hhid — Number of groups = 3538

R-sq: within = 0.0088 — Obs per group: min = 1
between = 0.0307 — avg = 3.7
overall = 0.0162 — max = 4

F(9,9390) = 9.29
corr(u_i, Xb) = 0.0409 — Prob > F = 0.0000

Depvar = HHagric	Coef.	Std. Err.	Z	P > z	95% Conf.	Interval
HHsizer	-0.8734	2.7928	-0.310	0.754	-6.35	4.60
Ownd	5.2112	13.1123	0.400	0.691	-20.49	30.91
Edus	-0.7788	0.8528	-0.910	0.361	-2.45	0.89
Gen	-8.7244	14.1221	-0.620	0.537	-36.41	18.96
Age	0.3293	0.4905	0.670	0.502	-0.63	1.29
Em1	-10.5426	12.4816	-0.840	0.398	-35.01	13.92
Ems*	41.9518	18.2037	2.300	0.021	6.27	77.63
Govt*	22.1607	10.8841	2.040	0.042	0.83	43.50
Agric*	95.4617	11.7785	8.100	0.000	72.37	118.55

Constant	-640.6807	963.8837	-0.660	0.506	-2 530.1	1 248.7

To start with one finding that is perhaps surprising, none of the demographic variables is significantly related to the dependent variable. Perhaps more importantly, however, neither does participation in wage income. However, self-employment, social grants, and of course agricultural participation, all have significantly positive relationships to agricultural income. What is particularly interesting about the results is that, again, the relationship between participation in agriculture and participation in wage employment, seems to be quite different than that between participation in agriculture and participation in self-employment. While this does not fully support the notion of residuality – for instance, there is no evidence that agricultural income is less for households engaged in wage income, even though the estimated slope coefficient is negative – it does suggest that agriculture and self-employment are complementary in a manner than agriculture and wage employment are not. The reason could be that wage employment stands apart as being relatively reliable and remunerative, thus households with wage employment may or *may not* feel compelled to farm, even though they have the advantage of income with which to invest in agriculture; by contrast, self-employment is relatively unreliable and unremunerative, thus self-employment and agricultural participation make a great deal of sense together as part of a multiple livelihood strategy.

5.6 Summary of Results

Conducting the transition analysis has given us some insight as to how households behave when they are involved in agriculture, what could be the possible reasons for them that results in leaving or not participating in agriculture, which they seem to do in considerable numbers. The analysis seems to suggest that agricultural participation is complementary with other forms of economic participation, rather than in reaction to the absence of such participation, as supposed by the idea of residuality. On the other hand, the multinomial logistic regressions do not tell a very clear story, but offer tentative evidence that households leave agriculture when wage and/or grant income increases, and engage in agriculture when wage and/or grant income decline. But there is little clear trend between wave-pairs, perhaps because households are also responding to broader contextual changes that are not captured in the models.

The panel data regressions, in particular the Fixed Effects Model regressions, further sought to address the question of the relationship between participation in agriculture and non-

agricultural pursuits. These regressions also provided tentative evidence in support of the idea that agriculture is a residual sector; in contrast to the evidence from the transition matrices, participation in agriculture does not appear to complement participation in wage employment, though it does seem to complement self-employment and receipt of social grants. The difference may be due to the fact that the HHwage variable combines income from wage income and the proceeds from self-employment, whereas the Em1 and Ems variables allow one to distinguish participation in wage employment versus self-employment.

CHAPTER SIX: CONCLUSIONS, RECOMMENDATION AND LIMITATIONS

6.1 Introduction

The purpose of this chapter is to summarise the study, while also proposing policy recommendations and then concluding.

6.2 Respective chapters

This study is aimed to better understand livelihoods and the time dimensions of agricultural participation versus other forms of economic activity. Chapter One set out the main research objectives and questions, while seeking to motivate as to why they are important. The first key question was, to what extent do households move into and out of agriculture? The second question was why households move into and out of agriculture? And the third was what are the welfare implications associated with movements into and out of agriculture? The working hypothesis is that agriculture is a largely 'residual' sector or activity, meaning it is an activity that households adopt and abandon in response to other developments at the level of the household; for instance, as a household loses wage income, it is apt to take up agriculture, but leave it again if and when the household regains wage income.

Chapter Two focused on the trends in employment, unemployment and agricultural employment between the periods of 2008 to 2015. The key or main purpose of this chapter is to provide an overview and understanding of the context on what is happening within the sector and how macroeconomic indicators like unemployment, agricultural employment and employment are trending. Unlike other studies, for this study the NIDS data is used because of the unique variables it has which allows to test for hypotheses. However, the research is conducted within a broader context to which gives the macroeconomic trends and that results in data for trends and data for regression analysis being different.

Chapter Three presented and provided a review on the literature regarding theories of household economics and the nature of multiple livelihood strategies. This section contains various theories and empirical studies about the correlation amongst rural livelihoods, household income and the role of agriculture. The empirical literature review is obtained from developed countries, developing countries as well as empirical literature from South Africa. It also contains theoretical literature on: 1) consumption theory, which is discussed with relative

income theory, permanent income theory and lifecycle theory); 2) Becker's new household economic theory; and 3) the sustainable livelihoods approach.

Chapter Four described the methodology used to examine the role of agriculture and the time dimensions of rural employment. The study uses data from National Income Dynamics Study (NIDS), for which the data started from 2008 and continued up to 2015, where the data were collected in four distinct waves. This chapter lays the foundation of Chapter Five, which is the data interpretation and analysis chapter.

In terms of Chapter Five, the first main finding of the study was that movement into and out of agriculture is tremendous. In fact, for any comparison of data from consecutive NIDS waves (which are roughly two years apart), there are several times more households either leaving or entering agriculture, than there are remaining in agriculture. It would seem that either the flux into and out of agriculture is because households take up farming when income from other sources improves, thus facilitating entry into farming; or, contrariwise, because many households take up agriculture in a moment of need, and then leave it again when they are able. It should be noted that both of these possibilities are consistent with the idea of a multiple livelihood strategy.

However, in practice it was not easy to determine why households move into and out of agriculture to such a great extent. Simple transition analysis appeared to show that the data are consistent with both dynamics mentioned above: some households enter agriculture as income from other sources *increases* (presumably meaning that they enter into agriculture when resources allow), while other households enter agriculture when income from other sources decreases, suggesting that agriculture offers a form of security that households resort to when in need. On balance, the former situation seemed to prevail, that is, more households take up agriculture as income from other sources of income improve than the other way around.

The multinomial logistic regressions sought to shed more light on this same question, but also without a clear-cut answer. On balance, the analysis produced tentative evidence in favour of residuality; relative to non-farming households, households experiencing an increase in non-agricultural income tended to leave agriculture rather than enter agriculture. But the results were by no means unambiguous.

The panel data econometric models were mainly aimed to help understand the welfare changes associated with movement into an out of agriculture, while possibly also shedding indirect light

on the 'why' question. One advantage of the panel analysis is that it for regressors it uses dummy variables to indicate households' different income sources, rather than the income from other sources themselves; this allowed one to distinguish participation in wage employment versus participation in self-employment, whereas at household level the NIDS data treated these together. It would seem that the role of agriculture is responsive to changes in wage employment, self-employment, and grant income in different ways. First, household income does not appear to be discernibly affected by agriculture, except to the extent the household receives a social grant. Second, it appears that households with one or more members in wage employment spend less on food, *ceteris paribus*, when the household also engages in agriculture; on the other hand, for households without wage income, the practice of agriculture appears to boost expenditure on food. Lastly, participation in wage income does not seem to contribute positively to agricultural income, whereas participation in (non-agricultural) self-employment does not. These various bits and pieces seems to suggest that agriculture and self-employment are complementary activities, whereas agriculture is a compensatory activity in the absence of wage income.

6.3 Conclusion

Rural households in the past produced most of their own food, however recent studies in South Africa have shown the extent to which both urban and rural households depend on market purchases. This is unlikely to change. Even so, agriculture plays an important role, not least by reducing households' vulnerability to poverty and food insecurity for both urban and rural households. What might appear to be agriculture's fickleness – i.e. the extent to which households engage in and disengage from agriculture – is perhaps one of its main virtues, because it shows how versatile agriculture is. What is less clear is how government or civil society partners can assist households take advantage of agriculture's versatility.

6.4 Limitations of the study

Like any other study it has its flaws and limitations, although the use of key recognised economics theories are used, this is a study that has brought to worlds together which is economics and agriculture. It was difficult to find the exact theories that directly link to household levels and agriculture together with economics. There were lot of challenges with the data, as some of the variables had missing variables where we ended re-coding them or dropping those variables. The data was not created to fit format the of the econometric techniques and models on the study, which led to creating more variables and restructuring the

data frame so the system for analysis will be able to understand and run regressions in achieving the objective. Merging the data was also was challenging as the data comes in waves and the data frame developed from one wave to the other with some variable names changing which ended up in exclusion of certain variables or try to find the updated names of variables and see if it still meet the definition in previous wave.

6.5 Policy implications and recommendations

The share of total income accruing to rural residents from agriculture is typically small in industrialized countries but may still be important in others. A significant amount of rural residents that is involved in agriculture has declined to low levels in many countries that depend on industrialised agriculture even though the share is still important to others.

For South Africa, the findings noted above suggest that households participate in agriculture for different reasons, and that they just as easily disengage in agriculture when those reasons change. It is not clear however that government policies take these diverse scenarios into account. In particular, it could be argued that government's commitment to 'emerging farmers' is such that it does not really understand those for whom agriculture is more of a convenient (and possibly temporary) safety net rather than a lifetime commitment. However, from a welfare perspective, it would seem to be very important to acknowledge these differentiated roles of agriculture, while also acknowledging the heterogeneity of the 'farming sector'.

Thus the first recommendation is that national and provincial agriculture departments work towards a better appreciation of the diversity of the small-scale farming sector. The second recommendation is that government departments differentiate their programmes accordingly. There possibly is some reality to the designation 'farmers' used in the transition analysis conducted above whereby some households have a relatively stable presence in agriculture; these households may indeed be the 'emerging farmers' that merit sustained support in order to realise their potential, and a sustained presence in the sector could possibly serve as a distinguishing characteristic on the basis of which government support could be directed.

But what of the larger number of households that seems to be coming and going? What, if anything, should government do to support them? On welfare grounds, there is a strong argument for providing some kind of support, but it has to acknowledge that for many such producers, agriculture is less of a life's calling than an emergent need, hopefully a temporary one. Perhaps the main policy recommendation is that forms of agricultural support need to be

devised that understand the episodic nature of agriculture, for instance an ease of accessing land for those who lack it, low-cost methods of offering extension support to large numbers of people, and more caution in providing support to co-ops and group-based projects that are likely hampered by the tendency of farmers to come and go.

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APPENDIX: EXCERPTS FROM STATA 'DO' FILES

TRANSITION ANALYSIS (for waves 1 vs 2)

```
replace w2_h_ag =1 if w2_h_agpou==1
replace w2_h_ag =1 if w2_h_aglvstk==1
replace w2_h_ag =1 if w2_h_agcrop==1
replace w2_h_ag =1 if w2_h_agorch==1
replace w2_h_ag =1 if w2_h_aghort==1
replace w2_h_ag =1 if w2_h_agoth==1
recode w2_hhagric miss = 0
replace w2_h_ag =1 if w2_hhagric>0

generate hhtype=0
replace hhtype=1 if  w1_h_ag==1 & w2_h_ag==1
replace hhtype=2 if  w1_h_ag==1 & w2_h_ag==2
replace hhtype=3 if  w1_h_ag==2 & w2_h_ag==1
replace hhtype=4 if  w1_h_ag==2 & w2_h_ag==2
drop if hhtype==0

// INFLATION ADJUSTMENTS

generate f1 = 0.7034
generate f2 = 0.7927
generate f3 = 0.86659
generate f4 = 1.0

recode w1_hhagric miss = 0
recode w1_hhwage miss = 0
recode w1_hhgovt miss = 0
recode w1_hhother miss = 0
recode w1_hhinvest miss = 0
recode w1_hhcapital miss = 0
recode w1_hhremitt miss = 0
recode w1_hhimprent_inc miss = 0
recode w1_hhincome miss = 0
recode w1_hhq_inc miss = 0

recode w2_hhagric miss = 0
recode w2_hhwage miss = 0
recode w2_hhgovt miss = 0
recode w2_hhother miss = 0
recode w2_hhinvest miss = 0
recode w2_hhcapital miss = 0
recode w2_hhremitt miss = 0
recode w2_hhimprent miss = 0
recode w2_hhincome miss = 0
recode w2_hhq_inc miss = 0
```

```
generate w1_hhagricz = w1_hhagric/f1
generate w1_hhwagez = w1_hhwage/f1
generate w1_hhgovtz = w1_hhgovt/f1
generate w1_hhotherz = w1_hhother/f1
generate w1_hhinvestz = w1_hhinvest/f1
generate w1_hhcapitalz = w1_hhcapital/f1
generate w1_hhremittz = w1_hhremitt/f1
generate w1_hhimprent_incz = w1_hhimprent_inc/f1
generate w1_hhincomez = w1_hhincome/f1
generate w1_hhq_incz = w1_hhq_inc/f1


generate w2_hhagricz = w2_hhagric/f2
generate w2_hhwagez = w2_hhwage/f2
generate w2_hhgovtz = w2_hhgovt/f2
generate w2_hhotherz = w2_hhother/f2
generate w2_hhinvestz = w2_hhinvest/f2
generate w2_hhcapitalz = w2_hhcapital/f2
generate w2_hhremittz = w2_hhremitt/f2
generate w2_hhimprentz = w2_hhimprent/f2
generate w2_hhincomez = w2_hhincome/f2
generate w2_hhq_incz = w2_hhq_inc/f2


// GENERATE DIFF VARIABLES

generate hhsizerdiff = w2_hhsizer - w1_hhsizer

generate hhagricdiff = w2_hhagricz - w1_hhagricz
generate hhwagediff = w2_hhwagez - w1_hhwagez
generate hhgovtdiff = w2_hhgovtz - w1_hhgovtz
generate hhotherdiff = w2_hhotherz - w1_hhotherz
generate hhinvestdiff = w2_hhinvestz - w1_hhinvestz
generate hhcapitaldiff = w2_hhcapitalz - w1_hhcapitalz
generate hhremittdiff = w2_hhremittz - w1_hhremittz
generate hhimprentdiff = w2_hhimprentz - w1_hhimprent_incz
generate hhincomediff = w2_hhincomez - w1_hhincomez
generate hhq_inczdiff = w2_hhq_incz - w1_hhq_incz


// GENERATE AND ASSIGN DIFFSIGN VARIABLES

generate hhsizerdiff_s = 0
replace hhsizerdiff_s = 1 if hhsizerdiff > 0

generate hhagricdiff_s = 0
replace hhagricdiff_s = 1 if hhagricdiff > 0

generate hhwagediff_s = 0
```

```
replace hhwagediff_s = 1 if hhwagediff > 0

generate hhgovtdiff_s = 0
replace hhgovtdiff_s = 1 if hhgovtdiff > 0

generate hhotherdiff_s = 0
replace hhotherdiff_s = 1 if hhotherdiff > 0

generate hhinvestdiff_s = 0
replace hhinvestdiff_s = 1 if hhinvestdiff > 0

generate hhcapitaldiff_s = 0
replace hhcapitaldiff_s = 1 if hhcapitaldiff > 0

generate hhremittdiff_s = 0
replace hhremittdiff_s = 1 if hhremittdiff > 0

generate hhimprentdiff_s = 0
replace hhimprentdiff_s = 1 if hhimprentdiff > 0

generate hhincomediff_s = 0
replace hhincomediff_s = 1 if hhincomediff > 0

generate hhq_inczdiff_s = 0
replace hhq_inczdiff_s = 1 if hhq_inczdiff > 0
```



```
// TO GENERATE STATISTICAL TESTS

tabulate hhtype hhq_inczdiff_s, chi2
prtest hhq_inczdiff_s if hhtype ==2  |  hhtype ==3, by(hhtype)

tabulate hhtype hhwagediff_s, chi2
prtest hhwagediff_s if hhtype ==2  |  hhtype ==3, by(hhtype)

tabulate hhtype hhgovtdiff_s, chi2
prtest hhgovtdiff_s if hhtype ==2  |  hhtype ==3, by(hhtype)

tabulate hhtype hhagricdiff_s, chi2
prtest hhagricdiff_s if hhtype ==2  |  hhtype ==3, by(hhtype)

tabulate hhtype hhsizerdiff_s, chi2
prtest hhsizerdiff_s if hhtype ==2  |  hhtype ==3, by(hhtype)
```

MULTINOMIAL LOGISTIC

```
recode w4_ HHwage miss = 0
recode w4_HHgovt miss = 0
```

```
recode w3_ HHwage miss = 0
recode w3_HHgovt miss = 0
generate RuralF = 0
generate Tribal = 0
generate UrbanF = 0
generate UrbanI = 0
recode RuralF 0=1 if w4_geo2001 == 1
recode Tribal 0=1 if w4_geo2001 == 2
recode UrbanF 0=1 if w4_geo2001 == 3
recode UrbanI 0=1 if w4_geo2001 == 4

mlogit HHTYPE w3_HHsizer w3_HHwage w3_HHgovt RuralF Tribal UrbanF
mlogit HHTYPE w4_HHsizer w4_HHwage w4_HHgovt RuralF Tribal UrbanF
mlogit HHTYPE w1_HHsizer w1_HHwage w1_HHgovt RuralF Tribal UrbanF
mlogit HHTYPE w2_HHsizer w2_HHwage w2_HHgovt RuralF Tribal UrbanF
```

PANEL MODELS

```
recode w1_hhincome miss = 0
recode w2_hhincome miss = 0
recode w3_hhincome miss = 0
recode w4_hhincome miss = 0

replace w2_h_ag =1 if w2_h_agpou==1
replace w2_h_ag =1 if w2_h_aglvstk==1
replace w2_h_ag =1 if w2_h_agcrop==1
replace w2_h_ag =1 if w2_h_agorch==1
replace w2_h_ag =1 if w2_h_aghort==1
replace w2_h_ag =1 if w2_h_agoth==1
recode w2_hhagric miss = 0
replace w2_h_ag =1 if w2_hhagric>0

replace w3_h_ag =1 if w3_h_agpou==1
replace w3_h_ag =1 if w3_h_aglvstk==1
replace w3_h_ag =1 if w3_h_agcrop==1
replace w3_h_ag =1 if w3_h_agorch==1
replace w3_h_ag =1 if w3_h_aghort==1
replace w3_h_ag =1 if w3_h_agoth==1
recode w3_hhagric miss = 0
replace w3_h_ag =1 if w3_hhagric>0

replace w4_h_ag =1 if w4_h_agpou==1
replace w4_h_ag =1 if w4_h_aglvstk==1
replace w4_h_ag =1 if w4_h_agcrop==1
replace w4_h_ag =1 if w4_h_agorch==1
replace w4_h_ag =1 if w4_h_aghort==1
replace w4_h_ag =1 if w4_h_agoth==1
recode w4_hhagric miss = 0
```

```
replace w4_h_ag =1 if w4_hhagric>0


generate agptcp1 = 0
replace agptcp1=1 if w1_h_ag==1
replace agptcp1=. if w1_h_ag==.

generate agptcp2 = 0
replace agptcp2=1 if w2_h_ag==1
replace agptcp2=. if w2_h_ag==.

generate agptcp3 = 0
replace agptcp3=1 if w3_h_ag==1
replace agptcp3=. if w3_h_ag==.

generate agptcp4 = 0
replace agptcp4=1 if w4_h_ag==1
replace agptcp4=. if w4_h_ag==.

generate owndw1=0
replace owndw1=1 if w1_h_ownd==1
replace owndw1=. if w1_h_ownd==.

generate owndw2=0
replace owndw2=1 if w2_h_ownd==1
replace owndw2=. if w2_h_ownd==.

generate owndw3=0
replace owndw3=1 if w3_h_ownd==1
replace owndw3=. if w3_h_ownd==.

generate owndw4=0
replace owndw4=1 if w4_h_ownd==1
replace owndw4=. if w4_h_ownd==.

generate em1w1=0
replace em1w1 =1 if w1_a_em1==1
replace em1w1=. if w1_a_em1==.

generate em1w2=0
replace em1w2 =1 if w2_a_em1==1
replace em1w2=. if w2_a_em1==.

generate em1w3=0
replace em1w3 =1 if w3_a_em1==1
replace em1w3=. if w3_a_em1==.

generate em1w4=0
replace em1w4 =1 if w4_a_em1==1
replace em1w4=. if w4_a_em1==.
```

```
generate emsw4=0
replace emsw4 =1 if w4_a_ems==1
replace emsw4=. if w4_a_ems==.

generate emsw1=0
replace emsw1 =1 if w1_a_ems==1
replace emsw1=. if w1_a_ems==.

generate emsw2=0
replace emsw2 =1 if w2_a_ems==1
replace emsw2=. if w2_a_ems==.

generate emsw3=0
replace emsw3 =1 if w3_a_ems==1
replace emsw3=. if w3_a_ems==.

generate Genw1=0
replace Genw1=1 if w1_a_gen==1
replace Genw1=. if w1_a_gen==.

generate Genw2=0
replace Genw2=1 if w2_a_gen==1
replace Genw2=. if w2_a_gen==.

generate Genw3=0
replace Genw3=1 if w3_a_gen==1
replace Genw3=. if w3_a_gen==.

generate Genw4=0
replace Genw4=1 if w4_a_gen==1
replace Genw4=. if w4_a_gen==.

generate Edus1 = w1_a_edschgrd
generate Edus2 = w2_a_edschgrd
generate Edus3 = w3_a_edschgrd
generate Edus4 = w4_a_edschgrd

generate Gen1 = Genw1
generate Gen2 = Genw2
generate Gen3 = Genw3
generate Gen4 = Genw3

generate w1_govtd=0
replace  w1_govtd=1 if w1_hhgovt > 1
replace  w1_govtd=0 if w1_hhgovt==.

generate w2_govtd=0
replace  w2_govtd=1 if w2_hhgovt > 1
replace  w2_govtd=0 if w2_hhgovt==.
```

```
generate w3_govtd=0
replace  w3_govtd=1 if w3_hhgovt > 1
replace  w3_govtd=0 if w3_hhgovt==.

generate w4_govtd=0
replace  w4_govtd=1 if w4_hhgovt > 1
replace  w4_govtd=0 if w4_hhgovt==.

generate Govt1 = w1_govtd
generate Govt2 = w2_govtd
generate Govt3 = w3_govtd
generate Govt4 = w4_govtd

generate HHsizer1 = w1_hhsizer
generate HHsizer2 = w2_hhsizer
generate HHsizer3 = w3_hhsizer
generate HHsizer4 = w4_hhsizer

generate Age1 = w1_a_dob_y
generate Age2 = w2_a_dob_y
generate Age3 = w3_a_dob_y
generate Age4 = w4_a_dob_y

generate Ownd1 = owndw1
generate Ownd2 = owndw2
generate Ownd3 = owndw3
generate Ownd4 = owndw4

generate Em11 = em1w1
generate Em12 = em1w2
generate Em13 = em1w3
generate Em14 = em1w4



// INFLATION FACTORS

generate f1 = 0.7034
generate f2 = 0.7927
generate f3 = 0.86659
generate f4 = 1.0


generate HHagric1 = w1_hhagric / f1
generate HHagric2 = w2_hhagric / f2
generate HHagric3 = w3_hhagric / f3
generate HHagric4 = w4_hhagric / f4

generate HHinc1 = w1_hhincome / f1
```

```
generate HHinc2 = w2_hhincome / f2
generate HHinc3 = w3_hhincome / f3
generate HHinc4 = w4_hhincome / f4

generate Foodex1 = w1_expf / f1
generate Foodex2 = w2_expf / f2
generate Foodex3 = w3_expf / f3
generate Foodex4 = w4_expf / f4

generate HHwage1 = w1_hhwage / f1
generate HHwage2 = w2_hhwage / f2
generate HHwage3 = w3_hhwage / f3
generate HHwage4 = w4_hhwage / f4

generate HHgovt1 = w1_hhgovt / f1
generate HHgovt2 = w2_hhgovt / f2
generate HHgovt3 = w3_hhgovt / f3
generate HHgovt4 = w4_hhgovt / f4

generate HHremit1 = w1_hhremitt / f1
generate HHremit2 = w2_hhremitt / f2
generate HHremit3 = w3_hhremitt / f3
generate HHremit4 = w4_hhremitt / f4

generate hhid1 = w1_hhid
generate hhid2 = w2_hhid
generate hhid3 = w3_hhid
generate hhid4 = w4_hhid

generate Ems1 = emsw1
generate Ems2 = emsw2
generate Ems3 = emsw3
generate Ems4 = emsw4

generate Agric1 = agptcp1
generate Agric2 = agptcp2
generate Agric3 = agptcp3
generate Agric4 = agptcp4

generate RuralF = 0
generate Tribal = 0
generate UrbanF = 0
generate UrbanI = 0

recode RuralF 0=1 if w4_geo2001 == 1
recode Tribal 0=1 if w4_geo2001 == 2
recode UrbanF 0=1 if w4_geo2001 == 3
recode UrbanI 0=1 if w4_geo2001 == 4
```

```
reshape long HHinc Govtinc HHagric Foodex HHwage HHgovt HHsizer HHremit Ownd
Gen Age Edus Em1 Ems Govt Agric hhid , i (w4_hhid)

xtset w4_hhid _j

recode HHagric miss = 0

generate Agm1 = Agric * Em1
generate Agms = Agric * Ems
generate Agovt = Agric * Govt

generate lnHHinc = ln(HHinc)
generate lnFoodex = ln(Foodex)
generate lnHHagric = ln(HHagric)

generate lnHHincpc = ln(HHinc/HHsizer)
generate lnFoodexpc = ln(Foodex/HHsizer)


summarize HHinc
summarize HHagric
summarize Foodex
summarize HHwage
summarize HHsizer
summarize HHgovt
summarize HHremit
```



```
* ONE - DEPVAR = HH INCOME

xtreg lnHHinc HHsizer Ownd Edus Gen Age Em1 Ems Govt Agric Agm1 Agms Agovt , fe
estimates store fixed

xtreg lnHHinc HHsizer Ownd Edus Gen Age Em1 Ems Govt Agric Agm1 Agms Agovt , re
hausman fixed ., sigmamore


* ONE ver 2    {with govt grant variables, per capita version}

xtreg lnHHincpc Ownd Edus Gen Age Em1 Ems Govt Agric Agm1 Agms Agovt , fe
estimates store fixed

xtreg lnHHincpc Ownd Edus Gen Age Em1 Ems Govt Agric Agm1 Agms Agovt , re
hausman fixed ., sigmamore


* TWO - DEPVAR = HH FOOD EXPENDITURE

xtreg lnFoodex HHsizer Ownd Edus Gen Age Em1 Ems Govt Agric Agm1 Agms Agovt , fe
```

estimates store fixed

xtreg lnFoodex HHsizer Ownd Edus Gen Age Em1 Ems Govt Agric Agm1 Agms Agovt , re
hausman fixed ., sigmamore

* TWO ver 2 {separate wage earning from non-wage earning HHs; excl interactions}

sort Em1
by Em1: xtreg lnFoodex HHsizer Ownd Edus Gen Age Ems Govt Agric , fe

* TWO ver 3 {with govt grant variables, per capita version}

xtreg lnFoodexpc Ownd Edus Gen Age Em1 Ems Govt Agric Agm1 Agms Agovt , fe
estimates store fixed

xtreg lnFoodexpc Ownd Edus Gen Age Em1 Ems Govt Agric Agm1 Agms Agovt , re
hausman fixed ., sigmamore

* THREE - DEPVAR = AGRIC INCOME

xtreg HHagric HHsizer Ownd Edus Gen Age Em1 Ems Govt Agric, fe
estimates store fixed

xtreg HHagric HHsizer Ownd Edus Gen Age Em1 Ems Govt Agric, re
hausman fixed ., sigmamore