Income diversification and poverty dynamics in the rural municipalities of South Africa

by

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DECLARATION

I, Manana Mamabolo declare that the thesis which I hereby submit for the degree Doctor of Philosophy in Agricultural Economics at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

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Date: February 2022

DEDICATION

This thesis is dedicated to my parents, Molehabang and Joalane Rancho and to my son,

Jonathan Mamabolo.

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ABSTRACT

Poverty, broadly defined as deprivation and lack of opportunities and choices, remains one of the major global challenges. In South Africa, poverty is most prevalent in rural areas. Literature indicates that poverty is dynamic, differs spatially, and households can transition in and out of poverty over time. Income diversification has been identified as a key and common strategy that households use to improve their resilience.

In South Africa, the analysis of poverty dynamics has been conducted at aggregated national level without further disaggregation into rural areas, where poverty is most prevalent. Furthermore, household income diversification coping strategies of rural households have not been analysed to determine whether households are diversifying more or less with time, and what the effect of this strategy is on rural household poverty. Understanding poverty dynamics and household income diversification is key for developing policies aimed at reducing rural poverty.

The purpose of this study was to investigate income diversification patterns of rural households and their effect on rural poverty across 22 district municipalities in four provinces of South

Africa from 2008 to 2017. There are two schools of thought on why households engage in income diversification. The first is that poor households diversify their income out of necessity, desperation, and survival. These negative factors act as "push" factors towards diversification. The second is that diversification of income is used for income growth and accumulation by households with access to assets and high return opportunities. These positive factors act as "pull" factors towards income diversification. This theory underpinned the investigation in this study in rural South Africa. Studies have shown that there are spatial and temporal variations in how households diversify income, whether driven by push or pull factors, as well as variations in poverty dynamics. The spatial disaggregation by rural districts was informed by this literature.

A combination of the Simpson Index of Diversity (SID), Foster-Greer-Thorbecke indices, Cox proportional hazard model and an ordered probit model were applied to panel data to investigate the relationship between income diversification and rural poverty dynamics. The data was obtained from the National Income Dynamics Study (NIDS) and covered a period of nine years.

The income diversification analysis revealed spatial and temporal variations in household income strategies. This pointed to the importance of disaggregating analyses of household income diversification strategies. Limpopo, KwaZulu-Natal and North West provinces had higher degrees of diversification than the aggregated index, while the Eastern Cape Province had a lower degree of diversification. Contrary to other studies, this study found that provinces with the highest and lowest income did not show the highest degree of diversification. For the low-income households in the Eastern Cape Province, this pointed to entry barriers into high-return activities, while for the high-income households in North West Province, the finding pointed to households that were in general specializing rather than growing their income through diversification. The temporal analysis indicated that these households diversified more over the nine years of this study, with the SID increasing from 0.16 in 2008 to 0.23 by 2017.

The poverty dynamics analysis also revealed varied poverty levels across the district municipalities and was most prevalent in Zululand, OR Tambo and Sisonke districts, and lowest in Bojanala, Ngaka Modiri Molema and Joe Gqabi districts. The districts that had the highest poverty rates, also had the highest poverty gap ratios, while those with the lowest poverty rates also had the lowest poverty gap ratios. Poverty transition analyses revealed that, in 18 out of 22 districts (82%), poverty declined between 2008 and 2017, while in 3 districts

(14%) poverty increased and in one district the poverty level remained the same. This transition was not mirrored between waves, with the majority of households remaining in the same poverty status between waves (t) and (t+1). This indicated resilience for those households that were non-poor and remained so in the following wave. For poor households, this pointed to a poverty status that did not improve between waves *ceteris paribus*.

The duration models supported these findings, with results indicating that residing in OR Tambo, Amajuba, Sisonke, Ugu, Uthungulu, Greater Sekhukhune, Mopani and Vhembe districts had a reinforcing effect on poverty. Residing in these districts increased the probability of poverty entry and reduced the probability of poverty exit.

On the other hand, residing in Umgungundlovu, Capricorn and Waterberg districts increased the probability of a household entering poverty, but had no effect on the probability of exiting poverty. Ngaka Modiri Molema and Zululand districts had the opposite effect. Residing in these districts reduced the probability of exiting poverty but had no effect on poverty entry.

Attaining education beyond matric level and job creation in these districts were important for reducing poverty entry and increasing poverty exit. Furthermore, the results indicated that the income diversification strategy was effective at reducing the probability of poverty entry when households had at least three income sources, while increasing the probability of poverty exit when households had at least two income sources.

This was important because these districts are predominantly rural, and livelihoods revolved around agricultural activities. The finding pointed to the importance of stimulating the non-farm economy in these districts, as literature indicates the non-farm sector to be a source of high-return activities. The results indicated that income diversification was significant at reducing probability of poverty entry and increasing the probability of poverty exit, thus this strategy should be supported particularly in these districts. A combination of agricultural activities that were already dominant in these districts and non-farm income generating activities could contribute towards this.

The study recommends that rural households be supported in their efforts to diversify income as this strategy can improve their resilience by increasing their ability to withstand shocks. In this regard, the recommendation of the study is that provincial governments in KwaZulu-Natal, Eastern Cape and Limpopo target Zululand, OR Tambo, Sisonke, Amajuba, Uthungulu, Greater Sekhukhune, Mopani, Vhembe, Umgungundlovu, Capricorn, Waterberg and Ngaka Modiri Molema districts in their poverty alleviation efforts, specifically by stimulating the non-

farm sector and promoting education beyond matric level. Targeting and prioritizing these districts will be important because government resources are limited, and to achieve poverty alleviation will require efficient allocation of these limited resources. This, however, is not to say that other districts be ignored as poverty was also relatively high in those other districts. The recommendation is that more effort be channelled into the identified districts in this study, particularly efforts to stimulate the non-farm economy.

The spatial disaggregation and temporal analyses provided insights into the pattern of income diversification and poverty dynamics that might not be observed at aggregated levels. The study contributes to rural household income diversification literature in South Africa by revealing the pattern of this strategy over time and across localities. The study also adds to the poverty dynamics literature, particularly within rural districts, revealing household poverty statuses and transitions over time within these districts. Knowledge of the effect of income diversification on households' conditional probability of poverty entry and poverty exit is another contribution that the study makes to existing literature. A key recommendation for future research is to further explore the non-farm activities that households in these districts engage in, to better understand rural income diversification. This is because the non-farm sector was found to be relatively important among these households. This could not be undertaken in this research because of data limitations. In addition, future research can extend similar analyses to other rural areas that were not covered in this research.

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ACRONYMS

CPI	Consumer Price Index
CRDP	Comprehensive Rural Development Programme
DALRRD	Department of Agriculture, Land Reform and Rural Development
EC	Eastern Cape
FGT	Foster-Greer-Thorbecke
FPL	Food Poverty Line
GHS	General Household Survey
HDI	Herfindahl index
IES	Income and Expenditure Survey
IDC	Industrial Development Corporation
KIDS	KwaZulu-Natal Income Dynamics Study
KZN	KwaZulu-Natal
LBPL	Lower Bound Poverty Line
LCS	Living Conditions Survey
LP	Limpopo
MIS	Mean of Income Shares
MTSF	Medium Term Strategic Framework
NDP	National Development Plan
NIDS	National Income Dynamics Study
NIS	Number of Income Sources
NW	North West
NYE	Number of Income Earners
OECD	Organisation for Economic Co-operation and Development
PID	Personal Identifiers
SDG	Sustainable Development Goals
SDI	Shannon Diversity Index
SID	Simpson Index of Diversity
SLF	Sustainable Livelihoods Framework
Stats SA	Statistics South Africa
THI	Total Household Income
UBPL	Upper Bound Poverty Line
UIF	Unemployment Insurance Fund

CHAPTER ONE

INTRODUCTION

1.1 Background

Poverty, broadly defined as deprivation and lack of opportunities and choices (United Nations 2020; Chambers 2006; Leßmann 2011), remains one of the major challenges facing countries globally, including South Africa. During the Millennium Development Goals (MDG) era, countries committed to eradicating extreme poverty and hunger by 2015, and again with the adoption of the Sustainable Development Goals (SDG) in 2016, countries continued with this commitment to poverty eradication, with the first goal of the SDGs being no poverty (United Nations 2021). Poverty is a complex phenomenon, and it is interlinked with other SDGs such as SDG 2 (zero hunger), SDG 3 (good health and well-being), SDG 4 (quality education), SDG 5 (gender equality) and SDG 10 (reduced inequality) (United Nations 2021).

In South Africa, a report by Statistics South Africa (Stats SA 2017c) indicated that poverty remains high in the country, at 55.5%, with the majority of poor people (53.5%) residing in rural areas in 2015. The National Development Agency reported the figure to be 65.4% of the rural population living below the poverty line in 2015 (National Development Agency 2019). By 2017, the poverty rate was 52.2%, using the nationally representative NIDS data (Zizzamia, Schotte and Leibbrandt 2019).[1] Over the years, the South African government has introduced policies to try to address a number of economic challenges of which poverty and vulnerability are among the topmost criteria (National Development Agency 2019). The National Development Plan (NDP) identified poverty as one of the major challenges it seeks to address. Some progress has been made, but more remains to be done, particularly in rural areas. These areas are marked by considerable poverty and inequality than urban areas, with households trapped in a vicious cycle of poverty (National Planning Commission 2011).

Poverty is dynamic and households can transition in and out of poverty over time or temporally as opportunities and resources become available or less available (Roberts 2001; Bokosi 2007; Zizzamia, Schotte and Leibbrandt 2019). Poverty dynamics refer to the inter-temporal changes

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[1] The 2015 report by Stats SA represents the latest official poverty rates for the country. Official poverty statistics beyond 2015 from Stats SA are not yet available.

in the poverty status of particular individuals, or households, over time (Yaqub 2000). This differs from poverty trends and poverty statuses, which use cross-sectional data and are aggregated without focus on specific individuals or households. This definition of poverty dynamics as stated by Yaqub (2000) is adopted in this study.

Poverty also varies spatially due to economic activities, proximity to markets and infrastructure (Noble and Wright 2013; Burger et al. 2017; David et al. 2018). In South Africa, spatially disaggregated analyses of poverty in rural areas are scanty particularly at the municipal level and at both local and district levels. The spatial differences also influence the coping strategies of households.

Previous studies (Reardon, Delgado and Matlon 1992; Ellis 1998; Wan et al. 2016; Djido and Shiferaw 2018; Wuepper, Ayenew and Sauer 2018) indicate that households use income diversification as the most common and important coping strategy against poverty and vulnerability to shocks. Other coping strategies include risk pooling as well as savings and credit transactions (Dimova and Sen 2010). However, these have been rarely observed among rural households (Dimova and Sen 2010). Income diversification is defined as a strategy of increasing income sources or changing the balance share among various sources (Wan et al. 2016). In this study, income diversification refers not only to increasing the number of income sources, but also to the contribution or share of each income source to total household income.

Income diversification is part of livelihood strategies but refers only to cash earnings and payments in kind that can be valued at market prices (Ellis 1998). It involves earning and/or receiving income from a combination of various sources, such as self-employment, wage income, social transfers or grants and remittance income. The payments in-kind include consumption of own produce as well as exchanges of consumption items between rural households, such as food (Ellis 1998). This strategy has been found to reduce the probability of poverty (Eshetu and Mekonnen 2006; Imai and You 2014). Livelihood diversification on the other hand is broader and includes both cash and non-cash payments, social institutions, gender relations and property rights to support and sustain a given standard of living (Ellis 1998). Thus, the two are not necessarily the same (Hussein and Nelson 1998).

Globally, studies show that diversification of income by households, particularly those in rural areas, is the norm rather than the exception. Barrett, Bezuneh and Aboud (2001a) observed income sources to be outside primary agriculture (non-farm activities) and away from own farms (off-farm) for many smallholder farmers in Africa. Reardon (1997) indicates the same

among farm households in developing countries. In China and India, Wan et al. (2016), Ma and Maystadt (2017) and Chuang (2019) found that households diversify their income sources away from agriculture to off-farm sources particularly to cope with climate change risk such as droughts and rainfall shocks. This trend of income diversification has also been observed in South Africa (Neves and Du Toit 2013; Pienaar and von Fintel 2014; Chaminuka et al. 2014; Mathebula et al. 2016; Mishi et al. 2020).

In the past, the majority of households in the former homelands in South Africa generated their living from agriculture and agricultural related activities (Machethe et al. 2004). In recent years, however, there has been a shift in terms of the role of agriculture in rural areas; with studies showing, that agriculture no longer constitutes the main source of income in most rural households in South Africa (Chaminuka et al. 2014; Mathebula et al. 2016). Cousins (2009) observed that farming households engage in activities such as wage labour, crafts or petty trading when cash income from marketed farm produce is insufficient. Studies (Neves and Du Toit 2013; Pienaar and von Fintel 2014; Chaminuka et al. 2014; Mathebula et al. 2016) show that remittances and social grants account for the highest proportion of income for most rural households in the country.

The General Household Survey (GHS) supports these findings and indicates that only 18.3% of households in the country are involved in agricultural activities. From these, only 1.9% rely on agricultural activities as the main source of income (Stats SA 2016a). The main sources of income for households was found to be salaries, followed by grants (Stats SA 2016a). By 2017, the percentage of households engaged in agricultural activities had declined to 15.6%. Other income sources included salaries, grants, pensions and remittances (Stats SA 2018).

Diversification patterns reflect household exchange of assets (e.g. labour) and decisions to allocate these assets across various activities so as to achieve optimal return for the household, whilst also minimising exposure to risk. Furthermore, diversification of income activities by households reduces vulnerability to a range of shocks that are normally associated with dependence on agriculture (Chuang 2019). These patterns in rural areas are a function of agricultural and non-agricultural asset base, wage labour, self-employment, and transfers such as remittances and social grants in the case of South Africa (Losch, Fréguin-Gresh and White 2012). In addition, changing incentives, the impact of disasters, civil strife, and saving and investment behaviour also contribute to the pattern of diversification in varying ways and

magnitude (Ellis 1998). These diversification patterns differ spatially and temporally across localities and influence the welfare of rural households.

In South Africa, income diversification and poverty studies have mainly been conducted at the aggregated national level (Finn and Leibbrandt 2013; Finn and Leibbrandt 2016; Schotte, Zizzamia and Leibbrandt 2018). However, literature shows that poverty also differs spatially (Noble and Wright 2013; Burger et al. 2017; David et al. 2018) and temporally (Finn and Leibbrandt 2016; Zizzamia, Schotte and Leibbrandt 2019; Baulch and McCulloch 2002) as households can be above the poverty line in one period and below it in another period. Similarly, studies from elsewhere show that income diversification as a coping strategy of households also differs spatially, depending on the location of the household and temporally (Chuang 2019; Abdulai and CroleRees 2001; Djido and Shiferaw 2018; Wuepper, Ayenew and Sauer 2018).

In South Africa, changes in household income diversification strategies over time have not yet been investigated. Yet, in order to come up with policies and programmes that address the specific poverty dynamics of households, it is important to study poverty and income diversification over time and across different localities at disaggregated levels. This will highlight the differences that exist among communities and what changes have occurred over time to better inform poverty alleviation strategies in those communities. It is also important to investigate these changes at disaggregated municipality level, given the bottom-up approach to development that government has adopted, which is reflected in the Integrated Development Planning (IDP) that remains the responsibility of local government. Such empirical analyses are key to informing the IDP processes and, in the case of rural municipalities, the Comprehensive Rural Development Programme (CRDP), a strategy adopted by the Department of Agriculture, Land Reform and Rural Development (DALRRD) that seeks to alleviate rural poverty.

1.2 Research problem

According to Stats SA (2017c), poverty declined from 66.6% in 2006 to 53.2% in 2011 but increased thereafter to 55.5% in 2015 using the Upper Bound Poverty Line (UBPL). Zizzamia, Schotte and Leibbrandt (2019), also using the Upper Bound Poverty Line, indicated a poverty rate of 52.2% in 2017 based on NIDS data[2]. These figures show that, although progress has

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[2] The official poverty rates from Stats SA beyond 2015 are not yet available.

been made in the country in reducing poverty, the problem persists. According to the report, the majority of those who are poor reside in rural areas of South Africa. Furthermore, research shows that poverty is dynamic and that households can transition in and out of poverty over time (Finn and Leibbrandt 2013; Finn and Leibbrandt 2016; Zizzamia, Schotte and Leibbrandt 2019). A number of triggers facilitate these transitions. Some relate to the job market, demographic factors (Zizzamia, Schotte and Leibbrandt 2019) as well as environmental factors. In addition, poverty also differs by geographic location, (i.e. spatially) (Noble and Wright 2013; Burger et al. 2017; David et al. 2018).

Households employ a number of strategies to mitigate the effects of poverty, and income diversification is the key copying strategy (Dimova and Sen 2010; Wan et al. 2016). The strategy is influenced by households' proximity to services and opportunities, and these differ spatially across localities (Ellis 1998). Rural households in South Africa also use this strategy (Mathebula et al. 2016; Pienaar and von Fintel 2014; Alemu 2012). However, poverty remains high in the rural areas of South Africa as reported in the national statistics.

In South Africa, poverty has been investigated both at specific point in time (static) (David et al. 2018; Ngwane, Yadavalli and Steffens 2001), and over time (dynamic). In particular, research by Finn and Leibbrandt (2016) and Zizzamia, Schotte and Leibbrandt (2019) represents the most recent literature on household poverty dynamics in South Africa. This research focuses on poverty persistence, vulnerability, the stable middle class and poverty triggers at the national level. Investigation of poverty at disaggregated levels across rural areas where poverty is understood to be relatively high has not been undertaken. Studies have also been conducted in South Africa investigating income diversification, but without analysing the effect of the strategy on the poverty status of households (Pienaar and von Fintel 2014; Oduniyi and Tekana 2019). Both studies used cross-sectional data and were limited to one period (Pienaar and von Fintel 2014; Oduniyi and Tekana 2019).

A lack of understanding of the income diversification strategies of rural communities over time risks the successful implementation of development policies and programmes that seek to reduce rural poverty, but which are blind to what households are doing. Such policies end up missing their targets by not providing rural communities with the kind of support and conducive environment they require. Ellis (2000) notes that the distinguishing feature of rural household strategies is their highly diversified portfolio of activities, which have implications

for poverty reduction because it means conventional approaches aimed at increasing single occupations may be missing their targets.

In South Africa, few studies (Alemu 2012; Mathebula et al. 2016) have investigated the relationship between income diversification and poverty, particularly for rural households, most of which are understood to depend on social grants and agriculture for livelihoods. The studies were conducted at aggregated (national) rural level, without further spatial disaggregation into different rural districts and communities, where differences may exist as previous research indicates (David et al. 2018). The study by David et al. (2018) shows the importance of spatially disaggregating poverty analyses to lower levels, although their analysis covered only 2011.

Important contributions to the literature have been made by previous studies on poverty dynamics and income diversification in South Africa at the national level. However, a knowledge gap still exists in terms of the dynamics of rural poverty at spatially disaggregated levels as well as in terms of the pattern of temporal income diversification in rural areas. In addition to these, the effect of income diversification on poverty over time in South Africa has not yet been explored.

This study, therefore, seeks to fill these gaps in the literature by analysing income diversification over time to determine the pattern and degree of household income diversification. The study further seeks to investigate rural poverty dynamics at spatially disaggregated levels and determine the effect of income diversification on rural household poverty. This will highlight differences in diversification patterns and poverty dynamics that may exist across rural districts, as well as what temporal changes have occurred which might better inform poverty alleviation strategies in those communities. The disaggregated analyses at municipality level are also important for local development, which is the responsibility of local government.

1.3 Research objectives

The main objective of the study is to analyse income diversification patterns of rural households and their effect on rural poverty over time and across localities in South Africa.

The specific objectives of the study are to:

1. Analyse temporal and spatial variations of income diversity of rural households.

2. Identify whether income diversification among rural households is for survival or income growth.

3. Analyse the poverty status of households and the related poverty transitions over time.

4. Determine whether income diversification has assisted rural households to transition out of poverty over time.

5. Evaluate the effectiveness of income diversification as a strategy for poverty reduction.

6. Investigate factors affecting effectiveness of income diversification as a strategy for poverty reduction.

1.4 Statement of hypotheses

1. *The majority of rural households adopt income diversification*. Globally a number of studies (Wan et al. 2016; Wuepper, Ayenew and Sauer 2018; Ma and Maystadt 2017; Chuang 2019) have indicated that income diversification is the norm rather than the exception. It is therefore also expected that this will be observed among rural households in this study.

2. *Most rural households who engage in income diversification do so to reduce poverty or use income diversification as a strategy for survival*. Studies have shown that rural households diversify their income sources. Poor households use income diversification as a strategy for survival, to cope with risk and distress (Reardon, Delgado and Matlon 1992; Chuang 2019; Dev, Sultana and Hossain 2016), and the national statistics indicate high rates of poverty in rural areas of South Africa (Stats SA 2017c). On the other hand, other studies have found that relatively wealthier households diversify their income sources for accumulation and growth purposes (Dimova and Sen 2010; Loison 2015; Neudert et al. 2015). Studies conducted in South Africa also found that households are diversifying their income, although the studies analysed this for only a single period with the last study using data from 2012 (Mathebula et al. 2016; Pienaar and von Fintel 2014; Alemu 2012).

3. *Most rural households who engage in income diversification have remained above the poverty line over time*. Studies have shown that income diversification aids households out of poverty (Eshetu and Mekonnen 2006; Imai and You 2014).

4. *The effectiveness of income diversification as a strategy for poverty reduction will depend on factors such as locality, economic activities, and household characteristics*. Using data from the 2011 census, David et al. (2018) found that there were significant spatial variations in poverty and deprivation across different municipalities of South

Africa. This was because of high spatial inequality in economic activities amongst other reasons. Similar spatial differences were observed by Noble and Write (2013) as well as Burger et al. (2017).

1.5 Outline of the thesis

The thesis is organized into eight chapters. The following chapter (Chapter 2) reviews literature and identifies the gaps that the current study seeks to fill. The chapter also presents the theoretical and conceptual frameworks on which the study is based. The methods and procedures followed in the study are discussed in Chapter 3, together with the data used. Chapter 4 analyses the temporal and spatial variations of income diversification in four rural provinces of South Africa, as well as the purpose of rural household income diversification. Chapter 5 analyses the poverty status of rural households and the related poverty transitions at district municipality level. In Chapter 6, the relationship between household income diversification and rural household poverty transitions is evaluated. Chapter 7 evaluates the effectiveness of income diversification as a strategy to reduce rural poverty. The chapter also identifies factors that affect its effectiveness. Chapter 8 summarises the study and presents the conclusions and recommendations. The chapter also makes suggestions for future research.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The purpose of this chapter is to review literature from which the current study drew its information. The chapter firstly discusses literature on the temporal and spatial variations of income diversification. This is followed by a review of poverty dynamics in South Africa. The chapter then discusses methods that have been used in previous studies on income diversification and poverty dynamics. This is followed by a discussion of the theoretical and conceptual frameworks underpinning the research. The chapter ends with a summary.

2.2 Spatial and temporal variation of income diversification

Income diversification has been observed to differ by location and can alter over time. This is because the physical context affects opportunities for diversification (Johny, Wichmann and Swallow 2017), and as these opportunities change, the combination of income sources changes. Spatial and temporal variations in income diversification have been evident in different countries.

In rural Burkina Faso, Lay, Narloch and Mahmoud (2009) observed temporal variations in the pattern of income diversification in the years 1993, 1994 and 2003. The study used surveys to analyse shocks, structural changes, and patterns of income diversification. The finding was that income diversification patterns changed, with households diversifying less over time due to higher returns from cotton and livestock activities, as well as better opportunities in non-farming activities. The authors noted that, had the analysis been limited to one period after the drought experienced in the country, the conclusion would have been that livelihood patterns of rural households did not change over the period.

Using data covering three decades, Chuang (2019) found spatial variations in household income diversification among farming households in India. The diversification was into non-farming income sources and differed depending on the location of the farming households. In areas that had more historically variable weather, households diversified less into non-farming activities compared to households in areas with historically less variable weather conditions. This was because, over time, households in areas with more variable weather developed coping measures while those in areas with less variable weather had not adapted to the variations and

diversified more into non-farming wage jobs. The findings had implications for climate change strategies in India, as the investigation of household income strategies over time revealed which areas were more vulnerable to climate change risk.

Similarly, in Uganda and Nigeria, Djido and Shiferaw (2018) also observed spatial differences in household income diversification. The authors found that, in Uganda, rural households far from roads and urban markets used the income diversification strategy more compared with households in urban areas. In Nigeria, income diversification was highest among households closer to markets and urban centres. The relatively higher engagement in non-farming activities observed in Nigeria implied that transition from farming to non-farming activities positively and progressively related to income diversification, while the opposite was true in Uganda. The study used panel data from the Living Standards Measurement Study-Integrated Survey on Agriculture (LSMS-ISA) (2010/11 and 2012/13) in Nigeria and (2009/10, 2010/11, 2011/12) in Uganda.

Spatial variations in income diversification have also been evident in rural China. Wan et al. (2016) found that the spatial location of households determined the type and number of income sources as well as the degree of income diversification in which households engaged. The study used primary data collected in 2014 from 291 rural households in 13 townships. Households in the mid plains area had the highest degree of diversification, followed by households in the South mountain area and lastly those in the north hilly area. In the mid plains, the most common sources of income were crops (spring wheat, naked oat, benne, millet, and corn), vegetables, and non-farming wages and state grants. In the north hilly area where the level of diversification was the least, households diversified their income with crop, potato, and livestock production, as well as non-farming wage income and state grants. This highlighted the fact that, though the income sources were more numerous in this area, households were either not receiving income from all sources or the relative contribution or weight of each source to total income was small such that it did not improve their degree of diversification.

In addition to spatial differences in income diversification in China, temporal variations in this strategy also occurred. Using panel data from 1995 to 2015, covering 31 provinces, Xu (2017) found differences in the level of income diversification among provinces, and that this diversification increased over time. Household income diversification was found to increase with the level of income, thus pointing to diversification for growth or accumulation by households. Spatial differences in income diversification also occurred when categorizing

households into three main province groupings in China based on economic, social and cultural backgrounds. Households in the eastern provinces had the highest level of income diversification, followed by households in the western provinces and lastly those in the middle regions. The households in the eastern provinces also had the highest average income of all the provinces, while those in the western provinces had the lowest average income. Households in the middle region had an average income that was between the eastern and western regions. This further pointed to diversification for accumulation and growth among the high-earning households and diversification for income risk reduction among low-earning households.

The spatial and temporal analysis of income diversification in rural Kenya also revealed variations in the efficacy of this strategy between 2008 and 2013 (Loison 2019). In Kakamega district, there was an increase in household income between the two periods, particularly from non-farming activities. Households in this district diversified more over time into non-farming income sources, although this was in low-return income activities. In the district of Nyeri, on the other hand, there was an overall decline in household income because of the decline in farming income. This pointed to less on-farm income diversification by these households over time.

In South Africa, Daniels et al. (2013) investigated rural livelihoods using data from 2008 to 2012. The study found that, over the four-year period, rural households that were involved in non-employment agricultural activities or subsistence agricultural production of crops, livestock, and poultry in 2008 were no longer involved in such activities by 2012. To a smaller extent, this decrease in production also included horticulture and orchards. The households were taking up more non-agricultural income sources, including social grants, and thus diversifying out of agriculture over time (Daniels et al. 2013). When disaggregated by province, using data from the Income and Expenditure Survey (IES) 2010/2011 and the 2010 NIDS data, Mathebula et al. (2016) observed spatial differences in household income diversification among three provinces of South Africa. The degree of income diversification was highest in Limpopo and KwaZulu-Natal provinces. The Eastern Cape Province had the lowest level of income diversification. Although the data differed slightly, it reflected similar findings to that of Daniels et al. (2013) showing a relatively low share of agricultural income to total household income in all three provinces. The highest share of income was from various forms of employment (salaries and wages), followed by social grants (Mathebula et al. 2016).

Although conducted in various countries and contexts, the studies above indicate spatial and temporal variations in income diversification. These variations have implications for strategies that can be adopted to assist rural households. The findings imply that generalized strategies across localities and over time may miss their target. Some of the literature reviewed above (e.g. Chuang 2019 and Lay et al. 2009) points to this. In India, the temporal and spatial analysis revealed that policy decisions to assist rural households should be targeted at households in areas with historically less variable weather, while conventional wisdom was to focus on areas with more historical weather variations (Chuang 2019). In Burkina Faso, Lay et al. (2009) indicated that temporal analysis of income diversification revealed changes that took place over time that would not have been evident had the analysis been limited to one period after the drought. The latter analysis would have led to incorrect conclusions about household livelihoods strategies indicating that these had not changed, contrary to what was happening, with diversification including more non-farm sector activities than previously.

2.3 Poverty dynamics in South Africa

Baulch (2013) defines poverty dynamics as household or individual intra- or inter-annual changes in welfare that result in a transition over a poverty line from one period to another. This section reviews poverty dynamics studies in the context of South Africa and identifies the gap that the current study seeks to fill.

Poverty dynamics have been analysed in South Africa, beginning with the research by Carter and May (2001) who developed a typology of structural and stochastic poverty. The study used the 1993 and 1998 South African Living Standards Survey and found that, following the end of the apartheid regime, relatively more South Africans were experiencing structural poverty. In addition, households lacked means to exit poverty. Roberts (2001), using data from the KwaZulu-Natal Income Dynamics Study (KIDS) also from 1993 to 1998, found that over 30% of households in the province were transitioning in and out of poverty, while about 22% were chronically poor. The characteristics of these two groups differed, with the transient poor on average having smaller household sizes, being better educated, less likely to be headed by females and with relatively fewer livestock than the chronically poor. Foster-Greer-Thorbecke (FGT) or P-alpha poverty measures and the expenditure per adult equivalent measured the poverty status of households. Thus, around 1993 to 1998 structural poverty prevailed at the national level while at the provincial level in KwaZulu-Natal, households experienced transient poverty. The structural changes that were taking place in the country would have contributed

to changes/movements in poverty statuses of households as was found by Roberts (2001). Thus, the disaggregation to provincial level provided further insights into the type of poverty (transient) experienced at that level because of changes that were taking place at the national level.

Woolard and Klasen (2005) used the same dataset for KwaZulu-Natal though they only focused on the African household sample to investigate income mobility and poverty dynamics. The poverty line was R212 per adult equivalent per month in 1993 prices. The study found that there were poverty entries and exits within the sample. Demographic factors were the main reason for poverty entry of over 27% of households and poverty exit for about 24% of households. Economic factors included loss of employment by household head or family member and fall in household income. These factors accounted for over 72% of poverty entries and 76% of poverty exits. Again, further disaggregation of the data provided more insight into poverty facing a particular group of households within the province, which was otherwise not evident at a higher level of aggregation.

Agüero, Carter and May (2007) also used the KIDS data set, with an additional wave three of the data conducted in 2004. The authors used both income and expenditure as indicators of welfare. The Foster-Greer-Thorbecke poverty measures or P_α (0, 1 and 2) were estimated for 1993, 1998 and 2004. The expenditure and income measures gave similar poverty results (i.e. converged) as would be expected from economic theory. However, there were some differences because of the reporting of the data. Using the income-based measure, the results showed that 35% of the households were chronically poor, while the corresponding figure was 28% using the expenditure-based measure. On the other hand, 42% of the households were transitory poor using the income measure and 45% of the households using the expenditure measure. Thus, relatively more households in KwaZulu-Natal between the year 1993 and 2004 were transitory poor, similar to the period 1993 to 1998 as observed by Roberts (2001). This distinction between chronically poor and transitory poor is important as the policy interventions required to address these types of poverty differ.

Finn, Leibbrandt, and Levinsohn (2014) used data from the first two waves of NIDS (2008-2010) to analyse poverty transitions. They found that using the poverty line of R515 per capita per month, 70% of the panel members who were poor in wave 1 remained poor in wave 2. This coincided with the period of economic slowdown in the years 2008 to 2010. There were,

however, relatively more poverty exits than entries among the panel members in the two waves. This corresponded with the national poverty headcount reduction around that period.

For the period 2008 and 2012, Finn and Leibbrandt (2013) analysed poverty dynamics of a balanced panel of household members throughout the country using three waves of NIDS dataset. The study found that 64% of the balanced panel members who were poor in wave one, remained poor in wave three, while 22% who were non-poor in wave one, were poor by wave three. The poverty line used was R636 per capita per month in real terms based on the cost of basic needs approach. Similar to Woolard and Klasen (2005), demographic factors, such as household size were important contributors to poverty transitions. Other variables included gender, race, rural areas and property ownership. These variables correlated with a lower probability of poverty exit. For rural areas, this again hinted that poverty was more prevalent in those areas.

When including NIDS wave four in their analysis, Finn and Leibbrandt (2016) found that 73% of panel members who were poor remained poor between wave one and wave four, while 26% of the members transitioned to being non-poor by wave four. About 79% of panel members who were not poor remained non-poor between wave one and wave four. The study used a different poverty line based on the food poverty line together with the average amount of non-food expenditure. This amounted to R1283 at January 2015 prices.

More recently, Zizzamia, Schotte and Leibbrandt (2019) analysed poverty dynamics utilizing NIDS data from 2008 to 2017. The study focused on poverty persistence, vulnerability, and the stable middle class, using expenditure as a measure of economic welfare. The study used Stats SA UBPL and the Food Poverty Line (FPL). Overall, the study found that persistent (chronic) poverty was the main form of poverty experienced in South Africa over the period. About 27% of the sample were transient poor and vulnerable. The transient poor and vulnerable households had similar household characteristics, which differed from the chronically poor. The analysis also disaggregated urban, rural and farm areas. The majority of the chronically poor households were located in the rural areas, whereas the majority of the transient poor and the vulnerable households were located in urban areas.

Lastly, David et al. (2018) analysed spatial poverty and inequality in South Africa at the local municipality level using the 2011 census. A spatial econometric model, together with the Morgan I local and global tests were used. The study found significant differences in income and multidimensional poverty across municipalities due to differences in economic activities

and welfare outcomes. This pointed to the importance of disaggregating poverty analyses to lower levels, which can reveal differences that may exit across municipalities.

What was also evident from the research done in South Africa was that the earlier studies that investigated poverty transitions relied on the KIDS panel data, while the more recent studies have relied on the NIDS dataset. This was because panel surveys have been rare in the country, with available datasets being mainly cross-sectional.

2.4 Methods used in previous studies on income diversification and poverty dynamics

This section reviews methods that have been used to analyse income diversification and poverty dynamics in previous studies. The first subsection focuses on indices that have been used to measure income diversification and the second subsection focuses on approaches that have been followed in poverty dynamics.

2.4.1 Methods used to analyse household income diversification

The methods reviewed only focus on diversification indices that have been employed in previous studies, as the current research seeks to estimate an index of income diversification. These indices can be categorised into one-dimensional indices and two-dimensional indices.

2.4.1.1 One-dimensional indices

One-dimensional indices include indicators that count either the number of activities households engage in, or to evaluate the change in the volume or share of the different activities to total household income (Zhao and Barry 2013). These indices, as they are called, only look at one dimension of income diversification. These indices are the Number of Income Sources (NIS), the Number of Income Earners (NYE) and the Mean of Income Shares (MIS). NIS is an index based on the number of income generating activities in which a household is engaged. The index is created by counting all the income sources of a household. This index was utilised by Ersado (2006) analysing income diversification in Zimbabwe. Mathebula et al. (2016), analysing income diversification in three rural provinces of South Africa, also used it. Similarly, Babatunde and Qaim (2009) analysing income diversification in rural Nigeria used the NIS index. The advantage of this index is its relative simplicity. However, it has the weakness that it does not account for the contribution or the relative importance of each income source to the total household income. Counting the number of income sources is only meaningful if the income shares are evenly distributed (Zhao and Barry 2013). Thus, if the

contribution of each income source to the total income of the household is not equal, the index is not appropriate to use.

NYE is another type of one-dimensional index. Similar to the NIS index, it has the disadvantage of not accounting for the relative importance of each income source to the household total. It is created by simply counting the number of economically active members in the household. Again, Ersado (2006) utilised this index, in combination with the NIS index, to evaluate income diversification in rural and urban Zimbabwe. Equation 1 shows the combined NIS and NYE index:

$$D = \left[\sum_{i=1}^{G} S_g^{\alpha}\right]^{1/(1-\alpha}$$
(1)

Where:

> D = diversity index;
>
> S_g = share of the gth income source (where $S_g = \frac{Yg}{Y}$, $g = 1,2,3...G$);
>
> Y_g = total income from source g;
>
> $Y= \sum_g Yg$ is total household income from all sources; and
>
> α = diversity parameter, such that $\alpha \geq 0$ and $\alpha \neq 1$.

In addition to these two indices, the MIS is another one-dimensional approach used in some studies. It is used to estimate the income shares of income sources to the total household income. Agyeman, Asuming-Brempong and Onumah (2014), analysing income diversification in rural Western region of Ghana, used this index. Likewise, Dagunga et al. (2018) also used the MIS index to measure income diversification among maize farm households in Ghana. The index identifies the share of incomes at the individual household level by finding the share of each income source in the Total Household Income (THI) for each household (Agyeman Asuming-Brempong and Onumah 2014). The mean share for each income source for all the households is then estimated. Unlike the NIS and NYE, this index has the advantage that it considers the relative importance of each income source to the total income of households. However, the disadvantage of this index is that it uses the mean (average) and may be sensitive to outliers, particularly in small samples.

Equation 2 shows the MIS index:

$$MSi = \frac{\sum_{h=1}^{n} {Y_{ih}}/{Y_h}}{n}$$
(2)

Where:

i = income source;

Y= total Income;

y= income from a particular activity;

h= the household; and

n= number of households.

The sum of Total Household Income (*THI*) is given as:

$$THI = \sum_{j=1}^{N} Y_j \tag{3}$$

Where:

THI = Total Household Income coming from all income sources j; j = 1, 2, 3…N.

2.4.1.2 Two-dimensional indices

Two-dimensional indices evaluate both the number of activities engaged in and their relative volume or share to the total household income (Zhao and Barry 2013). There are a few commonly used two-dimensional indices in the income diversification literature. These are: the Shannon Diversity Index (SDI), the Simpson Index of Diversity (SID) and the Herfindahl Index (HDI).

The Shannon Diversity Index (SDI)

The SDI accounts for the number of income sources of a household and the shares of each source (Mathebula et al. 2016). This index has mainly been used in ecological studies to evaluate species diversity. The index has the advantage that it is relatively simple to calculate. However, as in species diversity, the SDI assumes that all income sources are represented in the sample and that they are randomly sampled. The index is also sensitive to changes in rare or uncommon income sources. Thus, should there be uncommon income sources from which rural households derive their income, this would affect (bias) the diversity index. Equation 4 shows the SDI formula:

$$SDI = -\sum_{i=1}^{s} i[(incshare_i).In(incshare_i)] \tag{4}$$

Where:

S = number of income sources; and

$incshare_i$ = share of income from activity i in total household income.

The Simpson Index of Diversity (SID)

Similar to the Shannon Index, the Simpson Index of Diversity is another commonly used index. SID was also first applied in studies that evaluate species diversity. It has, however, been applied in income diversity studies (Sultana, Hossain and Islam 2015; Dagunga et al. 2018; Agyeman Asuming-Brempong and Onumah 2014). Like the SDI, the SID is used to measure the number of income sources and the distribution of the income among various sources (Agyeman Asuming-Brempong and Onumah 2014, Dagunga et al. 2018). Equation 5 shows the SID formula:

$$SID = 1 - \sum_{i=1}^{s} P_i^2 \tag{5}$$

Where:

      SID = measure of income diversification; and

      P_i = proportion of income coming from i^{th} source (activity).

The value of SID always lies between zero and one. In the case of only one income source, (when *p = 1*), SID = zero. When the number of income sources increase, the share of p_i declines. The sum of the squared shares also declines, and SID gets closer to one. The closer SID is to one, the higher is the level of diversification. The closer it is to zero, the higher is the level of specialization (Sultana, Hossain and Islam 2015).

The disadvantage of the Simpson index, as identified in studies evaluating species diversity, is that it gives relatively more weight to the species that are abundant and relatively less weight to rare species (Yeom and Kim 2011). Similarly, it would be expected that the index would weigh those income sources that are rare as relatively less compared to other income sources. This would be a disadvantage if those rare income sources are relatively more important to the households and contribute more to total household income. However, from previous studies on household income diversification in South Africa, this is not expected to be the case as the most important income sources are expected to be common across most of the rural households, such as remittances and social grants.

The Herfindahl Index (HDI)

The HDI is another popular index in the income diversification literature, although it originated in the industrial literature (Babatunde and Qaim 2009). The index is increasing in concentration, with perfect specialization by households having a value of one. The reverse of

the concentration therefore represents diversification (Babatunde and Qaim 2009). The diversification is thus one minus the Herfindahl index, with the highest HDI representing the largest diversification (Barrett and Reardon 2000; Babatunde and Qaim 2009). The main advantage of the HDI is its computational simplicity (Barrett and Reardon 2000; Babatunde and Qaim 2009). In the context of rural household diversification, the HDI has been calculated for wealth shares held as farm, non-farm, and livestock assets (Block and Webb 2001). The index is used to explore the link between diversification and asset accumulation. Thus, it is an index that indicates the concentration of wealth holdings (Block and Webb 2001). The disadvantage of the HDI is that it does not provide information on the shares of wealth derived from specific assets (Block and Webb 2001). This index has been found to be similar to the Simpson Index of Diversification and provides similar results (Barrett and Reardon 2000).

The HDI Index as applied by Block and Webb (2001) is shown in Equation 6:

$$H = (\sum_I (s_i)^2 \tag{6}$$

Where:

i = livestock, farm and non-farm assets; and

S = shares.

This section highlighted the different one and two-dimensional indices that have been used in the income diversification literature. The main disadvantage of one-dimensional indices is that they consider either the number of income sources only or the number of income earners, without accounting for the relative importance of each income source to total household income. In cases where the contribution of each income source is taken into account, the mean thereof is used, and this is sensitive to outliers. Zhao and Barry (2013) found that for relatively richer households in rural China, the distribution of income shares are important and one-dimensional indices did not reflect this. For poorer households however, the type of diversification measure used should emphasise the number of income sources because this is more important than the shares of the sources (Zhao and Barry 2013). This is because poor households have less control over job opportunities (Zhao and Barry 2013). To account for the different types of households (both poor and relatively wealthy), two-dimensional indices are more appropriate to use.

Among the two-dimensional indices, the most commonly used index is the SID because of its advantage to account for both the number of income sources and the shares of each income

source. The index also takes into account the uniformity of the distribution of the incomes generated. The Shannon Diversity Index on the other hand is sensitive to changes in income sources, while the HDI is found to generate similar results to the Simpson Index of Diversity. Therefore, to analyse income diversification among rural households in this study, the two-dimensional Simpson Index of Diversity was used.

2.4.2 Approaches used in poverty dynamics

There are two approaches followed to measure poverty. These are (a) monetary approaches, where poverty is defined and measured using either income or consumption/expenditure of the individual or the household; and (b) the non-monetary approach, which considers other non-monetary dimensions such as health, education living standards and employment (Stats SA 2017c). The non-monetary approach is broader than the monetary approach and is referred to as the multidimensional poverty measure. This review will focus on the monetary approaches. As mentioned previously, poverty has been measured as both a static and a dynamic concept. The focus in this study will be on the measurement of poverty as a dynamic concept. However, before these approaches are reviewed, the FGT poverty measure is discussed. This is because this measure, although static, also features in the literature on poverty dynamics (Roberts 2001; Agüero, Carter and May 2007; Jaiyeola and Bayat 2019).

Foster, Greer and Thorbecke developed the FGT method in 1984 as an improvement on the Sen Measure of poverty, which, at the time was found to be limited in terms of its applicability in analysing regional data (Foster Greer and Thorbecke 2010). The FGT measure was consistent with the axioms of the Sen Measure, (i.e. monotonicity and transfer)[3] and yet also broadly applicable (Foster Greer and Thorbecke 2010). The method has been used in a number of studies that measured poverty at a specific point in time (Javed et al. 2015; David et al. 2018; Roberts 2001; Jaiyeola and Bayat 2019).

The FGT formula is shown in Equation 7.

$$FGT_\alpha = \frac{1}{N} \sum_{i=1}^{H} \left(\frac{z - y_i}{z} \right)^\alpha \tag{7}$$

---

[3]Monotonicity axiom stated that, given other things, a reduction in the income of a poor household must increase the poverty measure.

Transfer axiom stated that, given other things, a pure transfer of income from a poor household to any other household that is richer must increase the poverty measure.

Where:

FGT_α = the weighted poverty index, α ranges from 0 to 2; 0 for incidence or headcount poverty, 1 for depth and 2 for severity of poverty;

z = poverty line;

H = number of households below the poverty line;

N = total number of households in the survey;

y_i = per capita income of household;

$z - yi$ = poverty gap;

$z - yi/z$ = poverty gap ratio; and

H/N = proportion of the population that falls below the poverty line.

Studies that have used the FGT measure in dynamic poverty analyses using panel data, first estimate poverty in each of the study years, and then compare these static poverty estimates over time to determine the changes in poverty that have taken place (Roberts 2001; Agüero, Carter and May 2007; Jaiyeola and Bayat 2019).

2.4.2.1 Dynamic poverty

Approaches used in the poverty dynamics studies mainly include transition matrices and regression analyses to understand the determinants of poverty. Agüero, Carter and May (2007) states that transition matrices provide a compelling window into poverty dynamics.

2.4.2.1.1 Transition matrices

In determining poverty transition matrices, studies first estimate the poverty status of the households using a poverty line. Households would then be classified as either poor (falling below the poverty line) or non-poor (being above the poverty line). Depending on how far below the poverty line households fall, some studies also include a category of severe poverty when the poverty level of households (using either income or consumption/expenditure measure) is less than half of the given poverty line. The transition matrices are based on these categories and compare the poverty status of households over the study period. The matrices are then used to illustrate how household poverty status has changed over time.

Following Lee, Ridder and Strauss (2010), the poverty transition matrix is shown in Equation 8:

$$P_{jkt}^* = \frac{\Pr(b_{j-1} \leq C_{i,t-1}^* < b_j b_{k-1} \leq C_{it}^* < b_k)}{\Pr(b_{j-1} \leq C_{i,t-1}^* < b_j)} \qquad (8)$$

Where:

P_t^* = m x m matrix of transition probabilities; and

C^*_{it} = per capita expenditure of household i in period t.

Household consumption level j in period t if $b_{j-1} \leq C^*_{it} < b_j$ with $b_0 = 0 < b_1 ...... b_{m-1} < b_m = \infty$ (Lee, Ridder and Strauss 2010). The probability that household i makes a transition from consumption level j in period $t-1$ to level k in period t (Lee, Ridder and Strauss 2010) is given by equation 8.

A number of studies have used poverty transition matrices including Roberts (2001), Zizzamia, Schotte and Leibbrandt (2019), Finn and Leibbrandt (2013) and Baulch and McCulloch (2002). From the matrices, households are then classified as either chronically poor, if they were found to be poor in all the years of the study period (i.e. they did not transition out of poverty), or they are categorised as transitory poor if they were found to transition in and out of poverty over the study period.

2.4.2.1.2 Regression models

Poverty regression models have been used to identify the determinants of poverty following a multivariate framework, usually a logit or probit. Some studies have used these regression models to identify the determinants or correlates of poverty status while other studies have used these models to determine the correlates of poverty transitions.

Poverty status

When poverty status is investigated, it is regressed against a number of variables that include characteristics of the household head, household size, dependency ratio, location (rural or urban), employment, gender, age, race and education. In this case, the dependent variable (poverty status) would be a dichotomous variable representing whether the household is poor or non-poor (Biyase and Zwane 2018; Baulch and McCulloch 2002).

A household is denoted as being poor by $P_i = 1$ and non-poor by $P_i = 0$ (Baulch and McCulloch 2002). The conditional probability that a household is poor is given by $Pr\ [P_i = 1\ /\ x_i]$, and is shown in Equation 9:

$$Pr\ [P_i = 1\ /\ x_i] = Pr\ [e_i < \beta x_i] = F\ (1 - \beta x_i) \tag{9}$$

Where:

x_i = vector of household characteristics;

β = vector of coefficients;

ε_i = error term; and

F = cumulative density function.

A probit model is estimated if a normal distribution is followed and a logit model is estimated when a logistic distribution is followed (Baulch and McCulloch 2002). Biyase and Zwane (2018) used a random effects probit model to investigate the determinants of poverty. The model was specified as shown in Equations 10 and 11.

$$Y_{it}^* = x_{it}\beta + \delta_i + \varepsilon_{it} \tag{10}$$

$$Y_{it} = 1 \; [Y_{it}^* > 0] \tag{11}$$

Where:

i and t subscripts = household and time periods respectively;

Y_{it}^* = latent dependent variable for being in poverty;

Y_{it} = observed outcome;

x_{it} = vector of time-varying and time invariant regressors that influence Y_{it}^*;

β = vector of coefficients associated with the regressors;

δ_i =unobserved household-specific random effects; and

ε_{it} = random error which is assumed to be normally distributed.

The binary outcome variable is shown in Equation 11. The dependent variable was a dummy for poverty; 1 = poor and 0 = non-poor.

The explanatory variables were: dependency ratio, living with partner, marital status, age of the household head, asset ownership, size of household, race, education, gender of household head, employment of household head and location dummy for provinces.

The advantage of the probit model is that, unlike the logit model, it does not have the assumption of "independence of irrelevant alternative" (Chen, Lupi and Hoehn 1997; University of Houston ND). The study found these variables to be significant. An unmarried household head was found more likely to be poor as well as a female-headed household. Employment and education levels had an unfavourable effect on poverty. Urban households were found to be less likely to be poor than rural households. Provinces of the Eastern Cape, KwaZulu-Natal and Northern Cape had households with relatively higher probabilities of being

poor compared to the Western Cape. North West, Mpumalanga and Gauteng had households with the probability of being poor that were not significantly different from the Western Cape.

Similarly, Baulch and McCulloch (2002) applied a logit model to estimate the determinants of poverty in Pakistan. The dependent variable was dichotomous with $P_i = 1$ for poor household and $P_i = 0$ for non-poor household. The dependent variables included: location, household size, age of household head, gender of household head, dependency ratio, education, land ownership, value of livestock as well as value of capital. The study found that large household size and lack of land ownership increased the likelihood of households being poor. Ownership of other assets, completed primary education and secondary education of other household members, as well as the age of the household head reduced the probability of households being poor.

Poverty transitions

Other studies have used the same probit/logit framework to understand the determinants of poverty transitions. The dependent variable, represented by the probability of entering or exiting poverty, would be regressed against a set of independent variables, which include some characteristics of households such as educational level, employment status, gender and age of the household heads, household size and/or dependency ratio, as well as location. These factors are assessed to determine their effect on the probability of households entering or exiting poverty (Schotte, Zizzamia and Leibbrandt 2018; Finnie and Sweetman 2003; Bokosi 2007).

Finnie and Sweetman (2003) used the logit framework to investigate the probability of entering or exiting low income in Canada. This was modelled as a function of family characteristics, age, province or location, language, and area size. Separate models were estimated for males and females for each year of the study. This was done to observe variations along these dimensions. The entry models were estimated separately from the exit models. The disadvantage however was that the study only analysed transitions over a year while literature highlights the importance of longer periods of analysis of poverty transitions (Finnie and Sweetman 2003). This however was not a weakness of the model per se, but rather a limitation of the available data.

The model revealed that single parents who remained so from one year to the next had a higher probability of entering poverty, while change from single parent to other family type decreased the probability of moving to low income. When accounting for age effect, younger individuals with children were found to have a higher probability of entering into low income compared to

older families. The location variable revealed that, *ceteris paribus*, poverty entry rate was higher in the reference province (Ontario) than the other provinces in Canada. The finding from the exit models were in line with expectations, where being a female single parent negatively affected the probability of exiting. While being young had a higher probability of exiting poverty.

In a dynamic analysis of poverty entry and exit, Schotte, Zizzamia and Leibbrandt (2018) employed a multivariate probit model to determine the probability of households being poor in the current period conditional on their poverty status in the previous period. Literature indicates that the initial poverty status of households could affect the likelihood of experiencing poverty in the future (Zizzamia, Schotte and Leibbrandt 2019). The explanatory variables included characteristics of the household head in period *t-1*, race, gender, age, education and employment status, geographic location (urban or rural) and accounted for provincial and time fixed effects. The study found that households with young heads were more likely to change poverty status. Household size, gender, location, and race were found to effect household poverty transitions. The model made use of instrumental variables and had the advantage that it accounted for the initial poverty state of the households. Similar to Schotte, Zizzamia and Leibbrandt (2018), Bokosi (2007) controlled for the initial poverty status of households, when investigating household poverty dynamics and transitions in Malawi. The study however estimated a bivariate probit model, rather than a multivariate model as in Schotte, Zizzamia and Leibbrandt (2018). The disadvantage of the logit and probit models is that they assume a distributional form (Jones and Branton 2005). This is a disadvantage because should the model be incorrectly specified, the model will not be useful.

Another type of regression adopted in the poverty dynamics literature uses duration or hazards models (Baulch and McCulloch 2002; Denisova 2007; Nordholt 1996). The most common model used being the Cox proportional hazards model. The Cox model is a semi-parametric model and has mainly been applied to determine survival in the health /medical field. It has also, however, been adopted in poverty studies. It has the advantage of being flexible and allowing for the inclusion of covariates of survival. Another advantage is that the model does not require the assumption about the distribution of the parameters to be made. For instance, Baulch and McCulloch (2002) used the model to determine the probability of entering or exiting poverty given that a spell of the opposite state lasted up to the present period in rural Pakistan. Similarly, Denisova (2007) used the model to analyse poverty entry and exit using longitudinal data in Russia, while Nordholt (1996) in Netherlands, did the same.

The Cox model is specified in Equation 12:

$$Pr_{it} = Pr_{0t}e^{\beta.x}{}_i \qquad\qquad (12)$$

Where:

Pr_{it} = probability of household i exiting or entering poverty given that the spell lasted until time t;

Pr_{0t} = unknown baseline hazard;

β = vector of coefficients; and

x_i = vector of covariates for households i.

A positive coefficient increases the chances of an event occurring, while a negative coefficient decreases the chance of an event occurring. The factors or covariates for each spell are observed at the values they hold when the household enters the spell. The model estimates the way in which differences between households affect the probability of an event by scaling the baseline hazard Pr_{0t} (Baulch and McCulloch 2002).

Another duration or survival model used is the Weibull model. It is a parametric model and, similar to the Cox model, has the advantage of being flexible and allowing for the inclusion of covariates of survival in the model. Unlike the Cox model however, the Weibull model requires the specification of the distribution of the parameters. Reviewing the available literature, this model has not been applied in poverty dynamics, but has mainly been used in health/medical sciences studies. It is however recognized as an alternative to the Cox model.

Roberts (2001) used another approach to understand the determinants of poverty transitions among the chronically poor and transitory poor. The author used correlation and a combination of Chi-square and Scheffé (with Oneway ANOVA) tests to understand the poverty correlates of three groups (i.e. the chronically poor, the transitorily poor and the never poor). The studied characteristics were spatial profile, demographic characteristics, as well as educational characteristics. The study found that the spatial location of the households was significant in characterizing the chronically poor from the transitory poor and those from the non-poor households. In terms of demographic characteristics, the chronically poor had relatively larger household sizes than the transitorily poor and non-poor households. While the education variable indicated relatively lower levels of adult literacy among the chronically poor compared to the other groups.

From the above review, two main approaches have been used in the studies of poverty dynamics. These have been transition matrices and a variety of regression models. To investigate the determinants or covariates of poverty transitions, the Cox model was used in this study. This was because the model does not require specification of the distribution of the parameters, which makes it the most flexible of the regression models.

2.5 Theoretical framework

Income diversification is a coping strategy used by households and entails increasing the number of income sources a household has or changing the balance share among various income sources (Wan et al. 2016). Ellis (1998) describes income diversification as being part of livelihoods but only refers to cash earnings and payments made in kind that can be valued at market prices. These include sale of crops or livestock, wages/salaries, remittances, consumption of own produce, exchanges of consumption items, as well as social transfers or grants (Ellis 1998). A livelihood on the other hand, includes more than income or cash earnings. It includes people, their capabilities and means of living (Chambers and Conway 1991). The Sustainable Livelihoods Framework (SLF) or Theory stipulates that a livelihood should be environmentally and socially sustainable. Environmental sustainability of a livelihood refers to the livelihood maintaining or enhancing local and global assets on which the livelihood depends and having a net beneficial effect on other livelihoods (United Nations Development Programme 2017; Chambers and Conway 1991). Social sustainability of a livelihood on the other hand refers to the livelihood being able to cope with and recover from stress and shocks and provide for future generations (United Nations Development Programme 2017; Chambers and Conway 1991). Thus, livelihoods and sustainable livelihood theory are broader than, and include income diversification.

Household's decisions to diversify income into various activities is a function of capacity and incentives (Reardon et al. 2007). Households maximize their returns subject to limited resources and trade-off to minimize risk (Reardon et al. 2007). The capacity of households to diversify income relates to households' capital endowments (Reardon et al. 2007; Loison and Bignebat 2017), which include human, social, financial, organization and physical capital. These can be common to an area, or they can be distinct to a household (Reardon et al. 2007). Households' incentives on the other hand are driven by various push and pull factors. The push-pull theory of diversification is based on theories of neoclassical economics (Loison and Bignebat 2017) and follows two schools of thought.

The first is that poor households protect themselves against various shocks to their income by using income diversification as a strategy (Reardon et al. 2007; Dimova and Sen 2010). In other words, income is diversified because of necessity, desperation, and survival (Dimova and Sen 2010; Barret and Reardon. 2000). According to this school of thought, diversification is driven by "push" factors (Reardon et al. 2007; Barrett, Reardon and Webb 2001b) and it is regarded as the most common and important strategy used by households to smooth consumption (Dimova and Sen 2010; Wan et al. 2016). Risk averse households with earnings from different sectors that are not perfectly correlated use income diversity to reduce overall risk (Reardon, Delgado and Matlon 1992; Ellis 1998). These are usually poor households, given that lower income and wealth are associated with risk aversion (Reardon, Delgado and Matlon 1992; Dimova and Sen 2010). Reardon et al. (2007) also indicate that such diversification can also get a household out of poverty. However, this income diversity can also just be one of impoverishment if households merely diversify into equivalent subsistence-level income activities (Reardon et al. 2007).

The second school of thought is that income diversification is driven by economies of scope and access to high return economic activities (Dimova and Sen 2010). In contrast to economies of scale, which support specialization, economies of scope support profit maximization in production through income diversification. Economies of scope occur when inputs are spread over a range of activities to generate income. This is facilitated by entry into non-farm activities that require capital or access to land, which relatively wealthier households own. Such households are thus able to access high return activities. These act as "pull" factors towards income diversification (Reardon et al. 2007). According to this school of thought, accumulation or growth motives are the main drivers of income diversification (Reardon et al. 2007; Dimova and Sen 2010).

Income diversification used either for survival or to grow income has also been observed to differ by location and can change over time (Lay, Narloch and Mahmoud 2009; Chuang 2019; Djido and Shiferaw 2018; Wan et al. 2016; Xu 2017; Loison 2019). This is because the physical context affects opportunities for diversification (Johny, Wichmann and Swallow 2017) and as these opportunities change, the combination of income sources can also change.

2.6 Conceptual framework

Income diversification is the most commonly used coping strategy by rural households and is driven by various factors as indicated in section 2.4 above. In this study, income diversification

is conceptualized to affect rural household poverty in four ways or through four pathways. Figure 2.1 illustrates this conceptual framework.

The first pathway involves rural households' participation in farm activities. From these, rural households earn farm income through livestock and crop sales as well as in-kind income. This also includes household participation in natural resource related activities to earn income (Ellis 1998; Loison and Bignebat 2017). The World Bank (2008) refers to this pathway as agricultural entrepreneurship. It includes activities such as combining food crop production for own consumption and non-traditional cash crops and raising livestock, as well as diversifying into commercial crops and improving land productivity through sustainable cultivation practices, as has been observed in countries like Tanzania, Uganda and Niger (World Bank 2008).

The second pathway through which income diversification affects rural household poverty involves rural households' participation in non-farm activities. These are all activities outside of agriculture. They include all wage-employment and self-employment outside of agriculture (Barrett and Reardon 2000). The World Bank also identified the nonfarm economy as an important pathway for rural households out of poverty (World Bank 2008; Loison and Bignebat 2017). The non-farm sector has been identified as a source of high-return activities (Barret, Bezuneh and Aboud 2001a; Alemu 2012) and therefore has the potential to aid rural households out of poverty.

The third pathway is through labour migration, both domestic and international migration (World Bank 2008 Loison and Bignebat 2017). This pathway offers a way out of poverty for those who leave the rural areas and those who remain through remittances. This also increases land per capita for those who remain (Asian Development Bank 2006). Remittances provide additional income to the rural household and can aid households out of income poverty (Tetreault 2010). These pathways are complementary and can be combined in various ways by households. It is through increasing participation in these or changing the balance share among them that these pathways can aid rural households out of poverty.

In the South African context, a fourth pathway that has been identified in the literature is that of social transfers or social grants. These include old age pension transfers and child support grants. These have been found to have an impact in reducing poverty and hunger in rural South Africa (Armstrong and Burger 2009; Pienaar and von Fintel 2014; UNICEF South Africa 2010), thereby providing a safety net and improving human capacity (Neves et al. 2009; Sinyolo, Mudhara and Wale 2017).

Barrett and Reardon (2000) conceptualize the effect of income diversification on poverty in a similar way as the first three pathways described above. However, they recommend classification following standard practice of national accounts. As such, the classification they make is by economic sector; primary (agriculture, mining and other extractive), secondary (manufacturing), and tertiary (services), rather than by functional composition (wage-employment and self-employment) or spatial composition (local, "distant away from home" and foreign) (Barrett and Reardon 2000). The challenge with this classification in the context of this study is in how the available data is structured, as it does not allow for sectoral classification.

From these pathways, the expected relationship between income diversification and poverty, as households participate in these activities, is negative. In other words, the expectation is that as households diversify their income through participation in various combinations of activities, as outlined in these pathways, these will have a negative or reducing effect on poverty compared to households that are not diversifying income.

Although the study investigates the pattern of income diversification and its effect on rural household poverty, other factors that affect poverty are also considered. These have been identified in the literature as important and include the demographic characteristics of the household head such as age, gender, education, marital status, employment status, household size as well as location.

These independent variables are expected to have varying relationships with poverty. Specifically, age, education and marital status are expected to have a negative relationship with regards to poverty. As the age of the household head increases, poverty is expected to decline. This is particularly because of the old age pension incomes that provide additional income to households headed by an older individual. Sekhampu and Muzindutsi (2014) observed the same among female-headed households in Bophelong Township in South Africa, and Bilenkisi, Gungor and Tapsin (2015) in Turkey. Similarly, as the educational level of the household head increases, poverty is expected to decline, as education enables access to better income opportunities (Bilenkisi, Gungor and Tapsin 2015). A married household head is expected to have a reducing effect on poverty. This is because an additional partner can contribute resources such as additional income that can assist the household (Maja and Oluwatayo 2018). Thus, these variables are expected to enhance poverty reduction.

On the other hand, household size, female-headed households and an unemployed household head are expected to enhance poverty. A large household size is expected to enhance poverty as household resources are shared among more members (Meyer and Nishimwe-Niyimbanira 2016). In addition, large household may also mean a high dependency ratio (Sekhampu and Muzindutsi 2014). Female-headship is also expected to enhance poverty, as previous investigations have shown that female-headed households were more likely to be poor than male-headed households (Rogan 2014; Maja and Oluwatayo 2018). Similarly, an unemployed household head is expected to enhance poverty. This is because unemployment is associated with increased poverty (Bilenkisi, Gungor and Tapsin 2015). Thus, these variables are expected to hinder poverty reduction.

Studies (Noble and Wright 2013; Burger et al. 2017; David et al. 2018) also indicate that poverty differs by location because of various factors. These can be economic and demographic factors, among others. It is also expected that poverty will also differ across localities in this study, and that the effectiveness of income diversification as a strategy for poverty reduction will also differ and depend on factors such as locality, economic activities, and household characteristics.
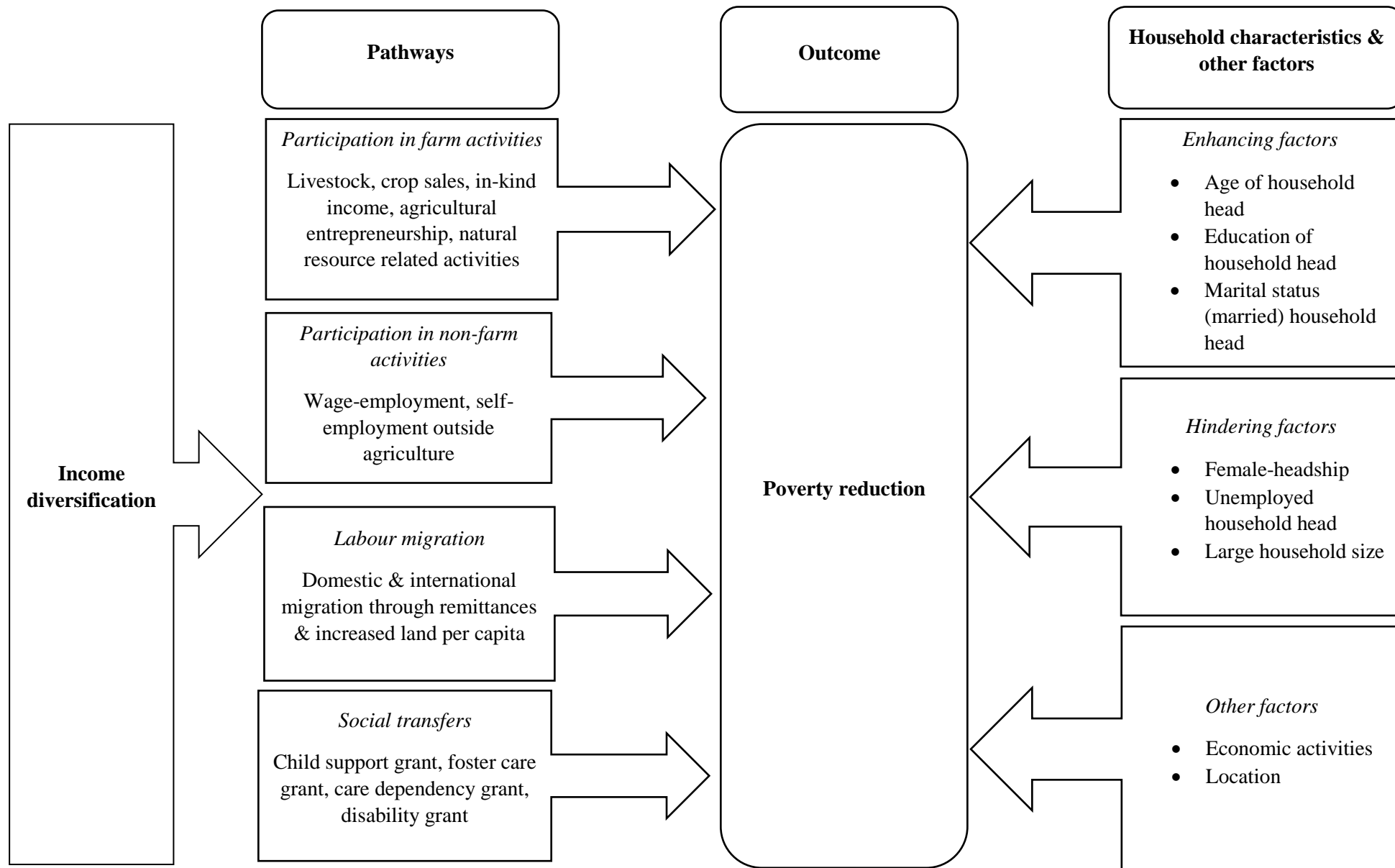
Figure 2.1: Conceptual framework

Source: Author's compilation adapted from Barrett and Reardon (2000) and World Bank (2008)

2.7 Summary

This chapter reviewed literature on which the current study was based. Four aspects of literature were covered. The first was on the spatial and temporal variations of income diversification. These variations were observed across different countries and contexts. The second part of the literature review covered poverty dynamics in South Africa. It was found that studies on poverty dynamics in the country have been at the national level, with the distinction between urban and rural areas also at the aggregated national level. Further disaggregation within rural areas, where poverty is most prevalent, remains a gap in the literature. What the literature also indicated was that panel data for analysing poverty dynamics is limited, with earlier studies using KIDS dataset and the more recent studies using NIDS dataset.

The chapter also reviewed indices that have been used to estimate the diversification of income and various approaches used in poverty dynamics. It was found that two-dimensional indices have an advantage over one-dimensional indices. To analyse the spatial and temporal variations of household income diversification, the current study used a two-dimensional index, specifically the SID index. From the approaches followed in previous studies on poverty dynamics, the literature indicated transition matrices and regression models to be the most common. Within regression models, the Cox proportional hazard model has the advantage of not requiring the specification of the distribution of the parameters. The study therefore used the Cox proportional hazard model to investigate poverty dynamics in rural areas of South Africa.

Lastly, the chapter discussed the theoretical and conceptual frameworks underpinning this research. This included the push-pull theory of income diversification, which explains households' incentives to diversify income. These factors affect poor and non-poor households to diversify for survival and income growth respectively. The chapter also highlighted the different pathways through which income diversification affects poverty. These included household participation in farming activities, non-farm activities as well as migration. In the South African context, it was also observed that income from social transfers also serves as another pathway for poverty reduction. These pathways are complementary and household participation in various combinations can aid rural households out of poverty.

CHAPTER THREE

METHODS AND PROCEDURES

3.1 Introduction

The purpose of this chapter is to detail the methods and approaches followed to address each of the specified objectives. The chapter firstly discusses the data used in the study as a subset of methods and procedures. This is followed by a discussion of the data analysis techniques. The specific variables used in each model are explained under the respective model. The last section gives a summary of the chapter.

3.2 Study data

The study used secondary data obtained from NIDS. NIDS is a nationally representative longitudinal study conducted approximately every two years and collects data on income and expenditure of the same individuals and their household in each respective wave. There are currently five waves of NIDS available. Wave one was conducted in 2008, wave two in 2010, wave three in 2012, wave four in 2014 and wave five in 2017.

NIDS data covers the rural (traditional) farm and urban areas of South Africa. Only the rural sample of the dataset was used in this research, as the focus of the research was on rural areas. The rural households are in the former homeland areas in communally owned land under the jurisdiction of traditional leaders, and the settlements within these areas are villages (Brophy et al. 2018). Following the structural reforms in the country, these areas now fall under different provinces, and include different economic activities, such as agriculture, mining, and government services (Stats SA 2017a).

The data is available in cross section form and from that a panel dataset of the households, which formed part of all five waves, was created. The study only used a panel of individuals successfully interviewed in all five waves of the survey. The selection of these individuals was limited to those identified as household heads. This was because household composition could change between waves with members moving in and out of households. This could happen because NIDS follows the same individuals and not necessarily the household. Thus, the choice to focus on consistently and successfully interviewed household heads was to overcome the challenge with possible changes in the household composition. This resulted in a balanced

panel of 596 household heads representing 596 households. Some of the provinces had very few observations, partly due to their urban nature, and therefore did not form part of the study sample. The remaining number was 511 in four provinces of South Africa, namely, KwaZulu-Natal (KZN), Eastern Cape (EC), Limpopo (LP) and North West (NW) provinces. The analyses were conducted at provincial and district municipal levels. There were 22 districts in the four provinces. Table 3.1 shows the number of districts represented in the study, as well as the total number of districts in each province.

Table 3.1: Number of districts in the sample and total districts in each province

Province	District municipalities in sample	Total number of districts per province
KwaZulu-Natal	10	10
Eastern Cape	4	6
Limpopo	5	5
North West	3	4
Total	22	25

Source: Own compilation from NIDS survey

From the 511 household heads, a balanced panel of 2555 observations over the period of 2008 to 2017 was created using the household head's Personal Identifiers (PID). This is the panel used in the research. With the exception of national poverty lines, all data used in this study is from NIDS. The income data used in the research is in real terms and converted using Stats SA Consumer Price Index (CPI) with December 2016 as the base year. The data is available in Stata software and analyses were carried out using a combination of Stata and Microsoft Excel. The section that follows discusses the analytical techniques employed to address each of the specified objectives.

3.3 Data analysis

3.3.1 Income diversification: Simpson Index of Diversity (SID)

In Chapter 2, it was mentioned that to analyse income diversification patterns of rural households, the SID index was used in this study. SID is a two-dimensional index and measures both the number of income sources as well as the distribution of the income among various sources (Agyeman, Asuming-Brempong and Onumah 2014; Dagunga et al. 2018).

Equation 13 represents the SID formula from Chapter 2:

$$SID = 1 - \sum_{i=1}^{s} P_i^2 \tag{13}$$

Where:

SID = measure of income diversification;

S = number of income sources; and

P_i = proportion of income coming from i^{th} source (activity).

Equation 14 shows how P_i is calculated:

$$P_i = \frac{X_i}{\sum_i X_i} \qquad (14)$$

Where:

X_i = income coming from source i; and

$\sum_i X_i$ = sum or total of all the income for the household.

Equation 15 estimates P_{it} as the proportion of income over time:

$$P_{it} = \frac{X_{it}}{\sum_i X_{it}} \qquad (15)$$

Where:

P_{it} = the proportion of income coming from i^{th} source (activity) at year t.

The value of SID lies between zero and one. When income sources are few, SID is low. SID becomes zero when the household has a single income source (i.e. when P = one), SID = zero. When the number of income sources increases, the share of P_i declines. The sum of the squared shares also declines, and SID gets closer to one. The closer SID is to one, the higher the level of diversification. The closer it is to zero, the higher the level of specialization (Sultana, Hossain and Islam 2015). Although an SID closer to zero measures the degree of specialization, this study focused on diversification and the interpretation of the results was in terms of income diversification. The income sources used in estimating the index were employment (wages), social grants, investment income, capital income, remittances, and income from other government sources as well as income from agricultural activities.

3.3.2 Poverty analysis: Foster-Greer-Thorbecke poverty measure and transition matrices

The definition of a poor household in this study was a household whose per capita income fell below the poverty line in a given year. To determine the poverty status of rural households, the study used the national poverty line from Stats SA, specifically, the Lower Bound Poverty Line

(LBPL). This poverty line refers to the amount required for an individual to afford the minimum required daily energy intake and the average amount derived from non-food items of households whose total expenditure is equal to the food poverty line (Stats SA 2018). This poverty line was chosen because it gives an indication of the minimum amount an individual requires to purchase the most basic food basket and essential non-food items. In addition, the LBPL is the most commonly used poverty line in the country's poverty reduction targets in the Medium Term Strategic Framework (MTSF), the NDP as well as the SDGs (Stata SA 2017c). Table 3.2 gives the LBPL amounts used in each year under analysis in this study.

Table 3.2: National Lower Bound Poverty Lines

Year	Lower Bound Poverty Line (Value in ZAR)
2008	R447
2010	R466
2012	R541
2014	R613
2017	R758

Source: Stats SA 2019

The study followed an income-based approach to measure poverty following Baulch and McCulloch (2002). This was because at the core of the definition of poverty is the inability of households to acquire a certain minimum bundle of goods (Baulch and McCulloch 2002), and this largely depends on their income. In addition, the use of an income measure was important for consistency with the index of diversification that was determined based on household income and income sources.

The LBPL was used in combination with the FGT or Pα poverty measure to calculate the poverty headcount (α equal to zero) and poverty gap (α equal to one) ratios. Equation 16 indicates the FGT formula from Chapter 2:

$$FGT_\alpha = \frac{1}{N}\sum_{i=1}^{H}\left(\frac{z-y_i}{z}\right)^\alpha \qquad (16)$$

Where:

FGT_α = weighted poverty index, α ranges from 0 to 2; 0 for incidence or headcount poverty, 1 for depth and 2 for severity of poverty;

z = poverty line;

H = number of households below the poverty line;

N = total number of households in the survey;

y_i = per capita income of household;

$z - y_i$ = poverty gap;

$\frac{z-y_i}{z}$ = poverty gap ratio; and

$\frac{H}{N}$ = proportion of the population that falls below the poverty line.

From the headcount poverty estimates based on the FGT poverty measure, the poverty transitions of the households were determined. The poverty transition was determined based on the poverty status of the household in wave (*t*) compared to the poverty status in wave (*t+1*). In other words, poverty status in 2008 was compared to that of 2010, 2010 was compared to 2012, 2012 was compared to 2014 and 2014 was compared to 2017. Thus, the analyses represented changes between two consecutive waves. This approach followed that of Zizzamia, Schotte and Leibbrandt (2019). The Distributive Analysis Stata Package (DASP) was used for the FGT analyses (Abdelkrim and Duclos 2007).

3.3.3. Income diversification and poverty: Cox proportional hazard model

To investigate the relationship between income diversification and poverty, the Cox proportional hazard model was used. The Cox model is a survival, hazard or duration model that estimates hazard ratios. It is a semi-parametric model, and the hazard ratio is the conditional probability that "failure" or an "event" occurs at time (*t*) given that it had not occurred until time (*t*). In this context, the hazard ratio is the conditional probability that a poverty spell ends at time (*t)* given that the poverty spell had been experienced until time (*t*). Similarly, for the non-poverty spell, the hazard ratio is the conditional probability that a non-poverty spell ends at time (*t*), given that a household has been non-poor until time (*t*).

The Cox model is shown in Equation 17 from Chapter 2:

$$Pr_{it} = Pr_{0t}e^{\beta.x}{}_i \tag{17}$$

Where:

Pr_{it} = probability of household *i* exiting or entering poverty given that the spell lasted until time *t*;

Pr_{0t} = unknown baseline hazard;

β = vector of coefficients; and

x_i = vector of covariates for households *i*.

The model was used to evaluate the relationship between poverty spells and various explanatory variables or covariates. The model was also used to investigate the relationship

between the same explanatory variables and the non-poverty spell. Thus, two separate Cox models were estimated, one for poverty entry and one for poverty exit.

To apply the Cox proportional hazards model, the 2555 panel data was restructured. A spell approach was used following Bane and Ellwood (1986). Other studies such as Nordholt (1996), Denisova (2007), and Baulch and McCulloch (2002) have also used a similar approach. The poverty and non-poverty statuses were determined by the headcount poverty estimate from the FGT analysis.

A poverty spell was defined as starting in the first year that household income fell below the poverty line after having been above the line, and as ending when household income increased above the poverty line after having been below it (Banes and Ellwood 1986). Thus, from this definition, only households whose poverty status was observed in the first and last year that it occurred could be evaluated. However, when using the proportional hazard model, right censored spells can be included, as the model can handle right-censored spells (Nordholt 1996; Denisova 2007).

Following this approach, the data was transformed into 1481 poverty spells over the period 2008 to 2017. From those spells, 344 poverty spells were left-censored or began before 2008. The left censored spells were excluded from the analysis. Multiple spells were observed among the households. Each household was observed as many times as it experienced a spell of poverty. Thus, the remaining spells used were 1137, with 265 of those spells right censored. These were the poor spells used to estimate the Cox proportional hazard model for poverty exit.

The spell approach was also used to determine the "non-poverty spells". In this regard, a non-poverty spell was defined as beginning in the first year that income was above the poverty line after having been below it and ending when income fell below the poverty line after having been above it. Similarly, left-censored non-poverty spells fell outside this definition and were therefore not included. The data was again transformed and resulted in 1074 non-poverty spells and 167 of those spells were left censored. The households were observed as many times as they experienced a non-poverty spell. The remaining non-poverty spells used were 907 with 246 of those spells being right censored. These were the non-poor spells used to estimate the Cox proportional hazard model for poverty entry.

Having restructures the data, a number of covariates or variables were used to estimate the models. Table 3.3 lists the explanatory variables that were used to estimate the Cox

proportional regression models. The covariates for each spell were set at the value they held when the poverty or non-poverty spells were experienced.

Table 3.3: Explanatory variables used in the Cox regression models

Variable	Category	Description
Age	Youth category	20-35 years
	Adult category	36-59 years
	Retirement age category	60-65
	Beyond retirement age	≤66
Education	No schooling	
	Primary education	Grade 0 to 7
	Secondary education	Grade 8 to 11
	Certificate with less than matric	Certificate without matric
	Matric	Grade 12
	Diploma/certificate beyond matric	Diploma/certificate in addition to Grade 12
	Bachelor's degree	Undergraduate degree
	Higher degree	Masters and doctoral degrees
Marital status	Married	
	Divorced or separated	
	Never married	
	Widow/widower	
	Living with partner	
Districts	Chris Hani, Joe Gqabi, OR Tambo and Alfred Nzo	Districts in the Eastern Cape province
	Amajuba, Ugu, Uthukela, Uthungulu, iLembe, Umkhanyakude, Sisonke, Umgungundlovu, Umzinyathi and Zululand	Districts in KwaZulu-Natal province
	Mopani, Vhembe, Waterberg, Greater Sekhukhune and Capricorn	Districts in Limpopo province
	Bojanala, Dr Ruth Segomotsi Mompati and Ngaka Modiri Molema	Districts in North West province
Simpson Index of Diversification	No diversification	One income source
	Level 1	Two income sources
	Level 2	Three income sources
	Level 3	Four income sources
Household size	Single member	
	Between 2 and 3 members	
	Between 4 and 6 members	
	More than 6 members	

Gender	Female	
	Male	
	Employed	
	Not economically active	
Employment status	Unemployed	Includes those defined as unemployed using the strict definition as well as discouraged job seekers.

Source: Author's compilation from NIDS data

Table 3.3 gives the variables, their categories, and their descriptions. All variables and their respective categories were obtained, and some created from, the NIDS data. The demographic variables (age, gender, and marital status), education and employment status were those of the household head. The variables were categorized in order to observe differences that may exist among different groups of the same variable. The variables marital status, household size and gender were not described further in Table 3.3, as their categories were common and conformed to definitions generally used in the literature. The district variables were included as dummy variables, one for residing in the specific district and zero otherwise.

The variable Simpson Index of Diversification was further categorised into levels of diversification based on the number of household income sources as shown in Table 3.3. These were *no diversification* for households with one income source, *level one diversification* for households with two income sources, *level two diversification* for households with three income sources and level *three diversification* for households with four income sources[4]. The average income associated with each category of diversification is shown in Table 3.4.

Table 3.4: Average income associated with each level of diversification (Rand)

Level of Diversification	Average income
No diversification	2 596
Level 1	3 878
Level 2	5 415
Level 3	7 169

Source: Author's compilation from NIDS data

Table 3.4 indicates that average household income increased with the level of income diversification. Households with level three diversification had, on average the highest income. There was a correlation coefficient of 0.9993 between the level of diversification and average household income shown in Table 3.4. Due to this high correlation, only one of the variables

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[4] Two households had five income sources in the sample and these were included in level 3 diversification to minimize the margin of error in the regression due to their small number.

could be included in the Cox regression model. The different levels of diversification were therefore used in the Cox regression model, given that the subject of interest in the research was diversification.

3.3.4 Effectiveness of income diversification and factors affecting its effectiveness: Ordered probit model

Effectiveness of income diversification in this study was defined as income diversification enhancing poverty reduction by having a negative effect on poverty. Effectiveness was measured by evaluating the effect of income diversification on household poverty entry and poverty exit. If income diversification negatively affected poverty entry, it was considered effective. Similarly, if it positively affected poverty exit, it was also considered effective.

The approach followed in this analysis was based on the 1137 poor observations and the 907 non-poor observations whose poverty statuses were observed when they first occurred. These were the same observations used to estimate the Cox proportional hazard model for poverty exit and poverty entry. Among the 1137 poor observations, it was found that some were poor because they had no income at all. Thus, for analysing income diversification, which required a household to have a stated income source, these observations were excluded from the analysis. This resulted in 963 poor observations used in the regression. On the other hand, some of the non-poor observations had missing values and were dropped from the analysis. The remaining non-poor observations used were 901. From these observations, an ordered probit model was used to determine factors affecting income diversification and its effectiveness. It was assumed that factors that affected income diversification positively, also affected its effectiveness positively, and those that affected it negatively also affected its effectiveness negatively. Two models were estimated, one using the poor observations and another using the non-poor observations.

The ordered probit model was used because the dependent variable of income diversification was ordered according to different levels of diversification as specified in Table 3.3. These were *no diversification*, for households having only one income source, *level one*, for households having two income sources, *level two* for households having three income sources and *level three* for households having four income sources.

The same covariates used in the Cox proportional hazards model specified in Table 3.3, were also used in the ordered probit regressions. The only exception was with the education variable. It was observed that among the poor observations, none had a bachelor's degree and/or a higher

degree. Therefore, these categories of the education variable were dropped from the analysis of the poor observations. This was not observed among the non-poor, thus these categories of education variable remained in the analysis of the non-poor. In addition, the category with certificate less than matric was found to create a collinearity problem in the probit model of the poor, therefore this category was also dropped. This was not the case with the non-poor. The category with diploma beyond matric was combined with the matric variable in both regressions.

The probit model specification is shown in Equation 18:

$$y_i^* = x_i\beta + \varepsilon_i \tag{18}$$

Where:

y_i^* = continuous, latent variable;

x_i = vector of explanatory variables;

β = vector of coefficients to be estimated; and

ε = error term assumed to be independently and identically distributed.

In the ordered model, y_i^* is represented by y_i which is characterized by a set number of ordered outcomes (Johnston, McDonald and Quist 2019). The ordered categorical outcome or dependent variable is a function of independent variables. The income diversification variable was naturally ordered, from zero to three, representing different levels of diversification. The ordered probit allows for such natural ordering of the dependent variable. In addition, the model does not require that the difference between categories of the dependent variable be equal (Greene 2002; Katchova 2013), although, in this case, the difference between the categories of the income diversification variable was the same, (i.e. one additional income source from level one to level two and from level two to level three). Even if this had not been the case, the model would still have been appropriate.

3.4 Summary

This chapter discussed the data used and methods followed in the study. This was data from the NIDS, to analyse income diversification and poverty in rural areas of South Africa. This is a secondary data source, covering the period of 2008 to 2017. The study area was limited to rural provinces and districts in South Africa. All data used in the study was obtained from this data source. The chapter also detailed the methods and approaches followed in the study to address each of the specified objectives. To analyse the patterns of income diversification over

time, the two-dimensional Simpson Index of Diversity was used. This was used to determine both the number and the distribution of each income source. Poverty dynamics was analysed using firstly the FGT poverty measure, followed by poverty transition matrices. The relationship between income diversification and poverty was evaluated using the Cox proportional hazard model, while the effectiveness of income diversification as a strategy for poverty reduction was investigated using an ordered probit model.

CHAPTER FOUR

RESULTS: PATTERNS OF INCOME DIVERSIFICATION OF RURAL HOUSEHOLDS AND PURPOSE OF DIVERSIFICATION [5]

4.1 Introduction

This chapter addresses two specific objectives by presenting the results on the temporal and spatial variations of income diversity and the purpose of rural household income diversification. The SID was used to analyse rural household income diversification over the period 2008 to 2017 in four rural provinces of South Africa. The chapter adds to existing studies by providing insights from analyses over a longer period, using the most recent NIDS data and presenting a disaggregated analysis of income diversification trends. The literature on income diversification uses characteristics and attributes of household heads, such as age, gender, marital status and education level, as some of the important factors that influence household income diversity (Senadza 2012; Javed et al. 2015). The chapter follows this literature.

The first section reports the various sources from which rural households derived income. This is followed by the results on the degree of household income diversification and lastly the purpose of diversification. The chapter ends with a summary.

4.2 Sources of income of rural households over the period 2008 to 2017

This section discusses household income sources and reports the share of households earning income from each income source. The section also reports the average number of income sources per household in each province as well as the household monthly income derived from those sources.

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[5] A modified version of this chapter is published in *Development Southern Africa* as Mamabolo, M., Chaminuka, P., and Machethe, C. 2021. Temporal and spatial variation of income diversification strategies among rural households in South Africa. Development Southern Africa, https://doi.org/10.1080/0376835X.2020.1870935.

4.2.1 Income sources adopted by rural households

The study identified eight sources of income across all waves of NIDS from 2008 to 2017. These were employment (wages), social grants, investment income, capital income, remittances, rental income, income from agricultural activities as well as income from other government sources. The NIDS survey imputes rental income from owner-occupied housing (Brophy et al. 2018). This, however, did not represent actual income received by the owner or the household. Therefore, rental income was not included in this analysis. In addition, income from other government sources, made up of the Unemployment Insurance Fund (UIF) and workmen's compensation, represented less than one per cent of household income. These were also not included. Therefore, six income sources were considered in this analysis as shown in Table 4.1.

Table 4.1 shows the income sources in terms of the percentage of households in the panel, receiving income from each source. The main income sources across all five waves were social grants (75%), wages (39%), remittances (19%) and income from agricultural activities (14%).

Table 4.1: Percentage of households adopting each income source by province from 2008 to 2017

Year	Income source	KwaZulu-Natal	Eastern Cape	Limpopo	North West	Total
2008	Wages	40,77	30,09	41,35	65,67	41,78
	Social grants	84,12	65,49	75,96	68,66	76.40
	Investment	0,00	0,88	0,00	2,99	0.58
	Capital	2,58	0,88	0,96	1,49	1.74
	Remittance	15,45	15,04	21,15	11,94	16.05
	Agriculture	27,47	13,27	32,69	11,94	23.40
2010	Wages	26,18	29,20	35,58	47,76	31.53
	Social grants	70,8	65,49	76,92	64,18	70.02
	Investment	8,15	0,00	0,96	5,97	4.64
	Capital	2,58	1,77	1,92	4,48	2.51
	Remittance	9,87	9,73	11,54	8,96	10.06
	Agriculture	0,86	7,08	0,00	0,00	1.93
2012	Wages	39,48	29,20	36,54	52,24	38.30
	Social grants	81,55	70,80	77,88	58,21	75.44
	Investment	1,29	0,88	0,96	10,45	2.32
	Capital	0,00	4,42	1,92	2,99	1.74
	Remittance	17,17	16,81	13,46	8,96	15.28
	Agriculture	10,30	12,39	8,65	8,96	10.25
2014	Wages	42,06	31,86	47,12	53,73	42.36
	Social grants	82,83	76,11	76,92	67,16	78.14
	Investment	1,72	2,65	2,88	7,46	2.90
	Capital	0,43	3,54	0,00	5,97	1.74
	Remittance	26,61	20,35	35,58	29,85	27.47
	Agriculture	19,31	14,16	22,12	2,99	16.63
2017	Wages	37,77	38,05	48,08	53,73	41.97
	Social grants	76,39	76,11	81,73	74,63	77.18
	Investment	3,43	7,96	7,69	5,97	5.61
	Capital	0,86	0,88	0,96	2,99	1.16
	Remittance	29,18	26,55	27,88	20,90	27.27
	Agriculture	20,17	29,20	5,77	8,96	17.79

Source: Own compilation from NIDS data

On average, the proportion of households that received social grants over the period 2008 to 2017 was just over 75%. By province this was over 70% of households in KwaZulu-Natal and Limpopo provinces. In the Eastern Cape Province, over 65% of panel households received social grants in the period 2008 to 2010. This increased to over 70% in the period 2012 to 2017, while in North West Province this number increased to almost 75% by 2017. This relatively high proportion of households receiving social grants gives an indication of the wide reach of the social wage policy in these provinces.

Table 4.1 also indicates that a number of panel households received wages between 2008 and 2017. The average percentage of all households that received wages ranged from 32% to 42% over the entire period. From these, the proportion of households that received wages ranged from 26% to 48% in KwaZulu-Natal, Eastern Cape and Limpopo provinces. The figure was higher in North West, ranging from 47% to 76%. Previous studies on income diversification in South Africa have identified these two income sources (social grants and wages) as dominant sources of income in rural areas (Daniels et al. 2013; Mathebula et al. 2016).

What is also evident from Table 4.1 is that a number of households also received remittance income. This was around 20% of all households over the entire period of five waves. The percentage of panel households receiving income from this source was particularly high between 2014 and 2017. In 2014, households in Limpopo and North West provinces received remittances in greater proportion than total households in that year. In 2017, this was again observed among households in Limpopo but also among those in KwaZulu-Natal. This could be explained by the relatively high out-migration by those from Limpopo and KwaZulu-Natal provinces to Gauteng province (Stats SA 2016b; University of Pretoria 2021). The North West province also had relatively high out-migration, mainly to Gauteng province (University of Pretoria 2021).

Lastly, Table 4.1 shows that some of the panel households participated in agricultural activities. The percentage of such households was relatively low and fluctuated over the nine-year period, from 23% in 2008 to as low as two per cent in 2010 and then increased to 18% in 2017. Machethe et al. (2004) stated that, historically, households in the former homeland areas or rural areas of South Africa relied on agriculture for their livelihoods. However, in recent years, studies (De la Hey and Beinart 2017; Connor and Mtwana 2018) have found that the participation of households in agricultural activities in the former homeland areas has been declining. This may be attributed to numerous factors such as costs, risks, environmental problems, declining patriarchy and changing attitudes to work (De la Hey and Beinart 2017). All these could have led to emigration and people from these areas sending remittances as reflected by the percentage of households receiving remittance above. Although the relative percentages of households engaging in agricultural activities were small as reflected in Table 4.1, there were some differences among the provinces. KwaZulu-Natal and the Eastern Cape provinces had relatively more households participating in agriculture in four out of the five survey years (2008, 2012, 2014, and 2017). North West, on the other hand, had the lowest

percentage of households participating in agriculture, while Limpopo had relatively high participation only in 2008 and 2014.

The smallest percentage of households received investment and capital incomes over the period 2008 to 2017. No more than 10.5% of households per province in any year received income from these sources. The nine-year average of total households receiving investment income was around three percent, while the average of those receiving capital income was around two percent. This aligned with findings in other studies that there has been a decline in household savings over time in South Africa (Prinsloo 2000; Kasongo and Ocran 2017).

4.2.2 Average number of income sources per household

Having observed the type of sources rural households derived income from, this section provides information on the average number of sources per household. The number of income sources is presented in Figure 4.1 from 2008 to 2017 and is for each province as well as the total for the sample in each year.
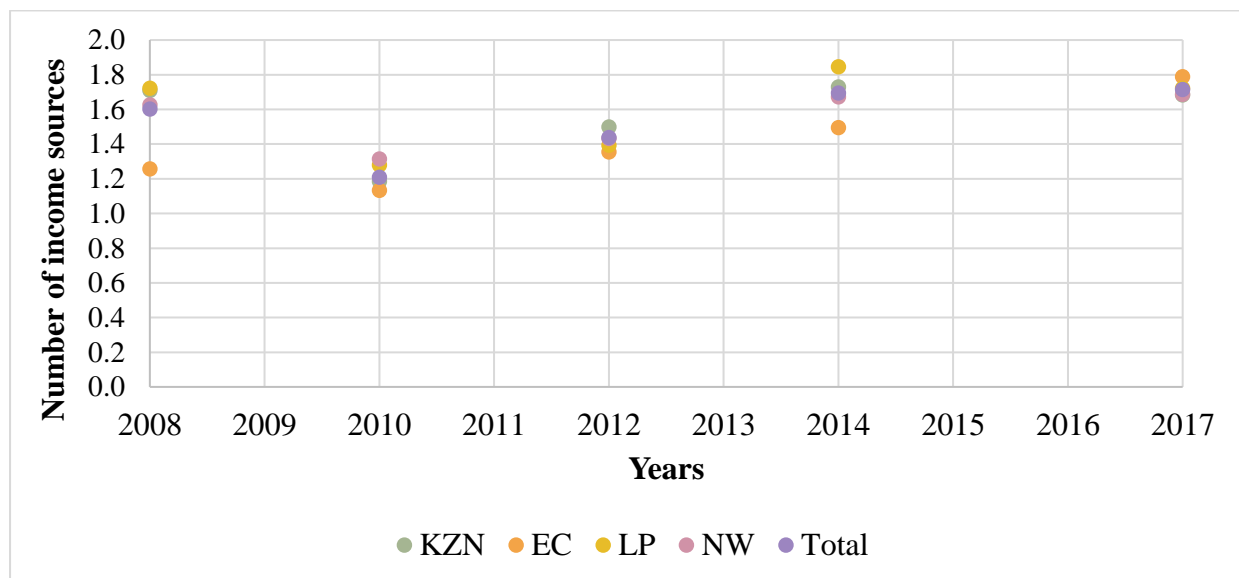
Figure 4.1: The average number of income sources per household from 2008 to 2017
Source: Own compilation from NIDS data

Figure 4.1 shows that in 2008, the average number of income sources in KwaZulu-Natal, Limpopo and North West was two[6]. This was also equal to the average number of income sources for all the households (total). In the same year, households in the Eastern Cape had an

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[6] The number of income sources in Figure 4.1 are not rounded off to ensure the Figure is clear and easy to read, while those in the discussion are rounded off.

average of one income source, which was the lowest number of sources in that year, and even lower than the average for the total households.

The number of income sources declined in 2010, with panel households in all four provinces having, on average, one income source. In 2008 to 2010, there was a global economic crisis, which affected the South African economy (OECD 2010; IDC 2013) and this could have affected household sources of income. The average number of income sources increased by 2014 to two sources in three of the provinces, while households in the Eastern Cape remained with an average of one income source, again lower than the average number of sources for the total households. By 2017, the average number of income sources in all provinces was the same, at two sources.

4.2.3 Rural household monthly income

Section 4.2.1 indicated the six income sources from which the households in rural areas derived their income. However, not all households derived their income from all six sources, but rather from various combinations of sources. Table 4.2 shows the average monthly income households generated from those income sources from 2008 to 2017 for each province and the average for all households combined.

A combination of One-way ANOVA and Welch tests determined the statistical significance of the income values reported in Table 4.2. Both tests report results at five per cent significance level. Table 4.2 also shows these results. Waves one and two (2008 and 2010) show the results of all the provinces, while waves three to five (2012 to 2017) give the results of North West compared with Limpopo, Eastern Cape and KwaZulu-Natal. The results indicated statistical significance, with variations. Household income in North West province was statistically different from income in the other provinces in all waves. In Limpopo, Eastern Cape and KwaZulu-Natal provinces, there was no significant difference in income. The fact that most of these rural households received social grants more than any other form of income could explain the insignificant differences. This implied that the income received by households in these provinces from other income sources, such as agricultural activities, wages, and remittances, were not making a sufficient contribution to total income earned to account for significant differences in the result among the provinces.

Table 4.2 shows that in all provinces, the average income increased from 2008 to 2017, with the exception of KwaZulu-Natal and North West in 2017. The decline in KwaZulu-Natal

resulted from the decline in the number of households that reported receiving wages, social grants, and income from agricultural activities in that year. In North West, the percentage of households that received remittance income between 2014 and 2017 declined. In addition, the province experienced negative growth in 2016 (Stats SA 2017a), which could also have contributed to the decline in household income by 2017. This decline in income between 2014 and 2017 in these two provinces was also mirrored in the declining average for total households in the same years. The decline was relatively small however, from R3888 in 2014 to R3815 in 2017.

Table 4.2: Average monthly household income from 2008 to 2017 (Rand)

Year	Province				Total
	KwaZulu-Natal	Eastern Cape	Limpopo	North West	
2008	2 336	2 106	2 401	3 506	2 451
2010	2 445	2 218	2 832	3 964	2 670
2012	3 358	3 162	2 794	4 220	3 313
2014	3 739	3 131	3 620	6 100	3 888
2017	3 552	3 452	3 753	5 435	3 815

Source: Own compilation from NIDS data
Mean difference tests:
2008: Oneway Anova: Prob > F (0.0061)
2010: Oneway Anova: Prob > F (0.0226)
2012: Welch test: Pr (|T| > |t|) = 0.0378
2014: Welch test: Pr (|T| > |t|) = 0.0025
2017: Welch test: Pr (|T| > |t|) =0.0093

Table 4.2 also indicates that the average household income was highest in the North West province, and lowest in the Eastern Cape Province. This could be because relatively more households in North West Province received wages from various forms of employment. These included wages from formal employment, casual work, self-employment, a 13th cheque, bonus payments, profit shares, income from friends, as well as any extra piece-rate income. In other provinces, the percentage of households receiving wages was relatively low.

What is also seen from Table 4.2 is that the average monthly income of households in the North West province was relatively higher than the average for total households in each year. In Limpopo, this was observed in 2010, when the average household income exceeded the average income of all households. The same was observed in KwaZulu-Natal in 2012. On the other hand, the average income of households in the Eastern Cape was lower than the average for total households in all the years. This coincided with what was observed above, where households in this province had, on average, fewer income sources than the number of income sources for all (total) households.

The numbers compared relatively well with Stats SA's national numbers for rural households. The Income and Expenditure Survey (IES) of 2010/11 indicated an average household income of R3356 per month in that year (Stats SA 2012), while the sample used in the present study indicated an average that ranged from R2218 in Limpopo to R3964 in North West and R2670 for total households. The average income from the IES reported does not include owner-imputed rent. Similarly, the Living Conditions Survey (LCS) of 2014/15 indicated an average monthly income of R4881 (Stats SA 2017b), while the present study found an average of R3888 for total households.

4.3 Degree of income diversification

The previous sections identified the type of sources from which the panel of households derived their income over the period 2008 to 2017, as well as the average monthly income generated by these sources. This section used the SID to determine how diversified the income sources of the households were. The estimated SID is from 2008 to 2017. SID ranges from zero to one. The level of income diversification increases the closer SID is to one. Figure 4.2 presents the SID results for each province from 2008 to 2017 as well as the Total SID for all the provinces. It also indicates the trend of the SID for each province over time.
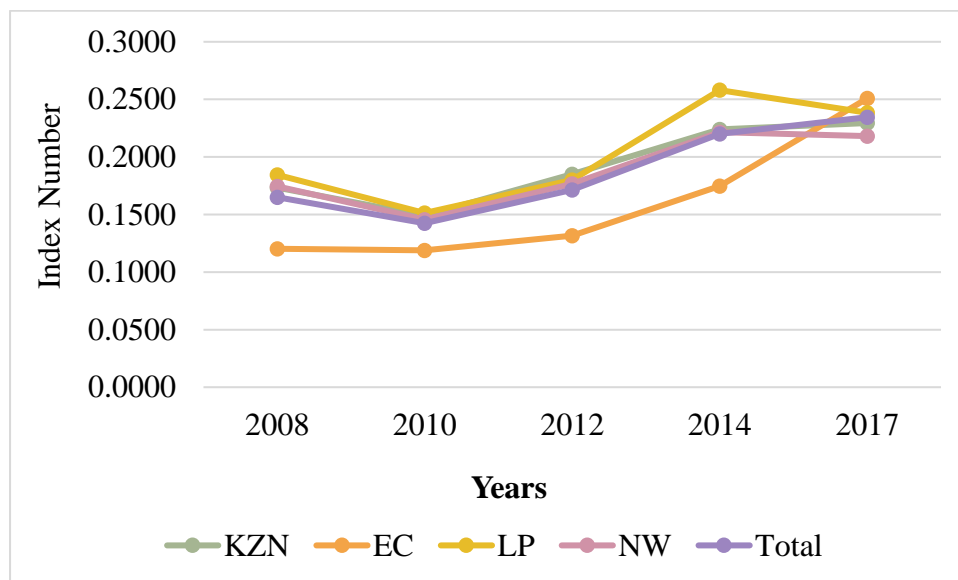
Figure 4.2: Average provincial SID from 2008 to 2017
Source: Own compilation from NIDS data

Figure 4.2 indicates that SID in 2010 was generally lowest in all the provinces. The decline in SID from 2008 to 2010 resulted from the drop in the number of income sources observed in 2010, as mentioned in the previous section. SID increased from 2010 to 2017 in KwaZulu-

Natal and Eastern Cape provinces, indicating that the panel of households in these provinces consistently increased their income sources and level of diversification over that period. Relative to the Total SID, the SID of households in KwaZulu-Natal remained on par, while that in the Eastern Cape Province remained below average, except in 2017. For the Eastern Cape Province, the increase observed between 2014 and 2017 reflected the improvement in the percentage of households that received wage income. Stats SA Quarterly Labour Force Survey (QLFS) reported the Eastern Cape to be among the provinces that experienced the biggest gain in employment between 2015 and 2016 (Stats SA 2016c).

In Limpopo province, SID increased from 2010 to 2014 and then declined in 2017. There was a similar trend in the North West province. However, the decline was relatively small in North West compared to Limpopo. According to Limpopo treasury, the Limpopo province experienced a sharp decline in growth across all its districts between 2015 and 2016 (Limpopo Treasury 2018). At the same time, the province also recorded an improvement in employment between 2015 and 2016 (Stats SA 2016c). This chapter also observed this improvement, with an increase in the percentage of panel households that received wage income between 2014 and 2017. However, this observed increase was relatively small. The number of income sources among households in Limpopo declined and SID also declined by 2017. Relative to the Total SID average, SID of households in Limpopo and North West provinces was high with the exception of the period 2014 to 2017 in North West.

Figure 4.2 also indicates that the average SID in Limpopo was higher in each year compared to that of the North West. This was the case even though North West had the highest household income throughout the period. There is a similar observation between the North West and KwaZulu-Natal, with the exception of the SID in 2008. Thus, the higher average household income in the North West did not translate to the highest degree of diversification. Similarly, the Eastern Cape had the lowest average household income throughout the period and the lowest degree of diversification, except in 2017 when the province had the highest SID. Mathebula et al. (2016) also found the Eastern Cape to have the lowest degree of diversification among three provinces in 2010. These findings differ from some other studies, where the level of diversification was highest in areas with the highest income and/or in areas with the least income (Xu 2017; Loison 2019; Djido and Shiferaw 2018). In this study, this was only in 2017 when the Eastern Cape, which had the lowest income, also had the highest degree of diversification.

What Figure 4.2 also indicates is that the trend in SID in all the provinces was upward. Thus, by 2017, households were diversifying more than in 2008. This reflected the increase in the number of income sources, and the total income, observed from 2008 to 2017. Although increasing over time, the degree of diversification in all provinces and over the entire period was relatively low being no greater than 0.25. Therefore, even though some degree of diversification occurred, the relatively low SID indicated that, generally, these households relied on few income sources. Indeed, this was the case when, out of the six income sources identified, the households concentrated on only four sources. Even among these four sources, the highest percentage was on social grants while relatively few households received wages, remittance, and income from agricultural activities.

4.3.1 Test of variation in the degree of diversification

A single factor ANOVA was used to test whether there was a difference in the degree of diversification observed. The null and alternative hypotheses were stated as follows:

- H_0: $\mu_1 = \mu_2 = \mu_3... = \mu_{21}$

- H_a: $\mu_1 \neq \mu_2 \neq \mu_3... \neq \mu_{21}$

The results are shown in Table 4.3. The Table shows the results of the between groups and within groups mean, as well as the total for the group.

Table: 4.3 Results of the test of variation in the degree of income diversification

ANOVA						
Source of Variation	*Sum of Squares*	*Degrees of Freedom*	*Mean Square*	*F-ratio*	*P-value*	*F- critical value*
Between Groups	6.0027	21	0.2858	2.3666	0.0005	1.5649
Within Groups	140.2306	1161	0.1208			
Total	146.2333	1182				

Source: Microsoft Excel output ANOVA Single factor

The results indicate that the p-value of the mean of the degree of diversification between groups was lower than the alpha (α) value of 0.05. This indicated that the null hypothesis that there is no difference between the means can be rejected. It can therefore be concluded that there is a difference in the mean value of the degree of diversification. This finding points to what was observed by Mathebula et al. (2016) that the degree of income diversification differed by locality.

4.4 Purpose of income diversification

Having observed the pattern and degree of household income diversification, tests were conducted to determine whether the majority of households diversified their income within the sample, and to further determine whether their diversification was for survival or for accumulation.

The following hypotheses were tested using Stata 14.0 software:

- Hypothesis 1: The majority of rural households adopt income diversification.
- Hypothesis 2: The majority of households that diversified their income did so to reduce poverty or used income diversification as a strategy for survival.

The results are reported below.

- Hypothesis 1: The majority of rural households adopt income diversification.

The hypothesis was tested using a t-test to determine whether within the entire sample more than 50% of the households diversified income. The null and alternative hypotheses were stated as follows:

- H_0: $\mu \geq 0.5$
- H_1: $\mu < 0.5$

This was a left-tailed test. Table 4.4 indicates the results. The variable that was tested, the number of observations, the mean, standard error and deviation, as well as the confidence interval are shown in Table 4.4. The t-statistic and the degrees of freedom are also reported. The Table also indicates the p-values under the null and alternative hypotheses.

Table 4.4: Results of the test of the hypothesis that the majority of rural households adopt income diversification

Variable	Observations	Mean	Std. Err.	Std. Dev	[95% Conf. Interval]	
Diversifying	2555	0.4638	0.0099	0.4988	0.4444	0.4831
mean = mean (diversifying)					t = -3.6689	
H_0: mean = 0.5					degrees of freedom=2554	
H_a: mean < 0.5		H_a: mean! = 0.5			H_a: mean > 0.5	
Pr (T < t) = 0.0001		Pr (|T| > |t|) = 0.0002			Pr (T > t) = 0.9999	

Source: Stata 14 output
H_0 mean: mean under the null hypothesis
H_A mean: mean under the alternative hypothesis
t: t-statistic

Pr (T < t), Pr (T > t): one tail p-values that the mean is less than 0.5 (left test) and greater than 0.5 (right test)
Pr (|T| > |t|): two-tailed p-value that the mean is not equal to 0.5

The results indicate a test statistic of -3.6689 and 2554 degrees of freedom. The p-value of 0.0001 is less than the alpha value of 0.05. This indicated a rejection of the null hypothesis that most households in the sample diversified their income. This is also evident from the results with 46% of households diversifying and the remaining 54% not diversifying in the entire sample. From these results, the conclusion is that the majority of households in this sample were not diversifying their income. Literature indicates diversification of income to be the norm among rural households (Wan et al. 2016; Wuepper, Ayenew and Sauer 2018; Ma and Maystadt 2017; Chuang 2019), as also stated in the null hypothesis. The finding here does not seem to align with those previous findings. This could be pointing to differences in location and opportunities for diversification among households in the context of this study. Ellis (1998) indicates that in practice, diversification is differentiated by location, income, and opportunities amongst others; and is manifested in different ways under different circumstances.

- Hypothesis 2: The majority of households that diversified their income did so to reduce poverty or used income diversification as a strategy for survival.

The test was done using a one-sample t-test to determine whether more than 50% of the households diversifying their income were poor. The assumption was that if the households were poor, their diversification was used to reduce poverty, or it was for survival. The null and alternative hypotheses were stated as follows:

- H_0: $\mu \geq 0.5$
- H_1: $\mu < 0.5$

This was also a left-tailed test and the results are shown in Table 4.5.

Table 4.5: Results of the test of the hypothesis that the majority of households that diversified their income did so to reduce poverty

Variable	Observations	Mean	Std. Err.	Std. Dev	[95% Conf. Interval]	
Poor	1185	0.5030	0.0145	0.5002	0.4744	0.5315
mean = mean (poor)					t = 0.2033	
H_0: mean = 0.5					degrees of freedom=1184	
H_a: mean < 0.5		H_a: mean! = 0.5			H_a: mean > 0.5	
Pr (T < t) = 0.5805		Pr (|T| > |t|) = 0.8390			Pr (T > t) = 0.4195	

Source: Stata 14 output
H_0 mean: mean under the null hypothesis

H_A mean under the alternative hypothesis
t: t-statistic
$Pr\ (T < t),\ Pr\ (T > t)$: one tail p-values that the mean is less than 0.5 (left test) and greater than 0.5 (right test)
$Pr\ (|T| > |t|)$: two-tailed p-value that the mean is not equal to 0.5

The t-statistic is t = 0.2033 and the degrees of freedom equalled 1184. The left-tailed p-value was 0.5805. This value is greater than the alpha (α) value of 0.05. Therefore, this indicated a failure to reject the null hypothesis that the majority of households that diversified their income did so to reduce poverty or diversified for survival. This is also seen from Table 4.5 with the mean of poor households of 50.3%, although not that greater than 50%. The result indicated that there was no evidence in the dataset to support the alternative hypothesis. The finding indicated that among the households that were diversifying income, the strategy was used for survival or to reduce poverty. This aligned with evidence in the literature (Reardon, Delgado and Matlon 1992; Chuang 2019; Dev, Sultana and Hossain 2016) that income diversification is used by poor households as a strategy for survival.

4.5. Summary

This chapter analysed rural household income diversification patterns across four provinces over the period 2008 to 2017, as well as the purpose for diversification. The findings of the study point to the importance of temporal and spatial disaggregation when analysing household income diversification. The degree of income diversification in each province differed from the aggregated total. Limpopo, KwaZulu-Natal and North West provinces had relatively higher SIDs than the aggregated total, while the Eastern Cape had a relatively lower degree of income diversification. In addition, the findings indicated that, although North West had the highest average income overall, it did not have the highest degree of income diversification. Similarly, the Eastern Cape had the lowest average income and the lowest level of diversification, except in 2017.

The findings also indicated that households were diversifying more with time in each province, with the SID increasing on average from 0.16 in 2008 to 0.23 in 2017. The guiding principle with the SID is that the closer it is to one, the higher the degree of diversification. Thus, an index ranging between 0.16 and 0.23 was still relatively low, indicating a high reliance on a few income sources by the households. Among the six income sources identified, it was observed that there was more reliance on four sources, with higher percentages of households receiving income from them. These sources were wage income, social grants, remittances, and income from agricultural activities. Although there was a concentration on these four sources,

not all households earned income from all four, but rather from some combination of these sources. This contributed to the relatively low degree of diversification observed. Some households earned income from only one of these sources, other households earned from two sources, others earned from three, and in a few cases from all four sources. The spatial and temporal differences in household income diversification observed in this chapter suggest that strategies should take into account differences that exist within provinces.

Lastly, the results indicated that among these rural households, less than 50% diversified income, with the majority of households not diversifying. This pointed to differences in opportunities for diversification among these households. Among the households that engaged in diversification, the results revealed that there was an almost equal split between the poor and non-poor households that were diversifying for survival and for income growth respectively.

CHAPTER FIVE

RESULTS: RURAL POVERTY AND POVERTY TRANSITIONS[7]

5.1 Introduction

The previous chapter presented the results on the temporal and spatial variations of rural household income diversification and their purpose for diversification. The current chapter presents the results on poverty and poverty transitions of those rural households over time at district municipal level. This adds to existing literature by providing spatially disaggregated analysis of rural poverty in South Africa. The chapter firstly reports and discusses the results on per capita income of rural households. This is followed by the results and discussion of the poverty headcount and poverty gap ratios, estimated using the FGT poverty measures. The last section of the results presents the poverty transition matrices. The chapter ends with a summary.

5.2. Rural household income per capita

This section describes the district distribution of average income per capita over the period 2008 to 2017. It also gives an indication of changes in income per capita from 2008 to 2017. The households generated income from six income sources over the period. These were social grants, wages, capital income, remittance income, income from agricultural activities and investment income. The per capita income results in this section were determined based on these income sources and are shown in Table 5.1. The figures were converted to real prices using Stats SA CPI with December 2016 as the base year. The per capita income is presented from lowest to highest based on the average over the period of the five waves.

A modified version of this chapter is under review with the *African Journal of Science, Technology, Innovation and Development* as Mamabolo, M., Chaminuka, P., and Machethe, C, titled District analysis of poverty dynamics in rural South Africa.

Table 5.1: Per capita average income of households among district municipalities from 2008 to 2017

District	Per capita average Income (R)					5-wave Average (R)
	2008	**2010**	**2012**	**2014**	**2017**	
Zululand[KZN]	468.00	207.00	415.00	619.00	670.00	475.80
Vhembe[LP]	485.00	518.00	290.00	835.00	917.00	609.00
Umgungundlovu[KZN]	591.00	445.00	777.00	834.00	520.00	633.40
Waterberg[LP]	613.00	523.00	654.00	688.00	867.00	669.00
Greater Sekhukhune[LP]	472.00	780.00	594.00	736.00	807.00	677.80
Amajuba[KZN]	843.00	562.00	872.00	827.00	433.00	707.40
Ugu[KZN]	562.00	575.00	739.00	910.00	795.00	716.20
iLembe[KZN]	579.00	769.00	728.00	848.00	707.00	726.20
Umzinyathi[KZN]	556.00	621.00	762.00	867.00	944.00	750.00
Chris Hani[EC]	613.00	637.00	806.00	847.00	875.00	755.60
Mopani[LP]	591.00	509.00	765.00	1,033.00	1,174.00	814.40
Uthungulu[KZN]	618.00	745.00	985.00	1,102.00	1,208.00	931.60
Capricorn[LP]	851.00	1,005.00	995.00	1,124.00	1,097.00	1,014.40
Sisonke[KZN]	663.00	788.00	1,093.00	1,249.00	1,311.00	1,020.80
Alfred Nzo[EC]	862.00	854.00	1,171.00	1,123.00	1,365.00	1,075.00
Dr Ruth Segomotsi Mompati[NW]	820.00	788.00	1,137.00	1,424.00	1,278.00	1,089.40
OR Tambo[EC]	736.00	748.00	1,377.00	1,320.00	1,467.00	1,129.60
Uthukela[KZN]	643.00	1,026.00	1,110.00	1,451.00	1,558.00	1,157.60
Umkhanyakude[KZN]	847.00	753.00	1,445.00	1,361.00	1,465.00	1,174.20
Joe Gqabi[EC]	690.00	1,301.00	1,383.00	1,199.00	1,625.00	1,239.60
Ngaka Modiri Molema[NW]	1,766.00	2,377.00	2,079.00	2,721.00	2,318.00	2,252.20
Bojanala[NW]	1,582.00	2,407.00	2,284.00	3,502.00	2,738.00	2,502.60

Source: Authors' compilation from NIDS data 2008-2017
Provinces: KZN= KwaZulu-Natal, NW=North West, EC= Eastern Cape, LP= Limpopo

Table 5.1 indicates that Zululand had the lowest average per capita income among all the districts. This was less than R500 per month. From Table 5.1, the per capita income in about 55% of the districts was less than R1000 per month, while the remaining 45% of the districts had per capita income of between R1014 and R2500. Bojanala district had the highest per capita income over the period, with a difference of around R2000 with the district that had the lowest per capita income.

With the exception of Umgungundlovu and Amajuba districts, all other districts had higher per capita income in 2017 than in 2008. Thus, there was a general increase in real per capita income over the period. The greatest increase was in Bojanala district, followed by Joe Gqabi and then Uthukela. The smallest increase was in iLembe district, followed by Zululand and then Ugu districts.

The per capita incomes among some of these districts compared well with what Finn, Leibbrandt and Levinsohn (2014) found in 2008 and 2010, using 2008 real prices. The study found the mean per capita income in rural formal areas was R1132 in 2008 and R1228 in 2010. In the tribal authority areas, the amounts were lower at R527 in 2008 and R624 in 2010. These amounts were within the same range as was observed among these districts in those years, even when taking into account the difference in base years.

Overall, real average per capita income in the districts increased from 2008 to 2017, although there were some fluctuations in some of the years. *Ceteris paribus*, using this income per capita measure, households were generally better off in 2017 than in 2008. From the six income sources identified, the percentage of households receiving income from social grants, wages and remittance income increased in the period 2008 to 2017. This contributed to the general increase in per capita income observed in Table 5.1.

Having this picture of district income per capita, the next section reports the poverty status of these districts. The poverty status was determined by comparing household income per capita in each district with the national poverty line.

5.3. Poverty headcount

The per capita income reported in the previous section represented the average income per capita for each district over the period 2008 to 2017. In this section, the actual income per capita of each household in each district was used to determine the poverty headcount. The poverty headcount was estimated using the FGT_0 (α equal 0). Table 5.2 shows the poverty headcount ratios for the districts.

Table 5.2: Average headcount poverty at district municipality level: 2008 to 2017

District	Average headcount poverty ratio					5-wave Average
	2008	**2010**	**2012**	**2014**	**2017**	
Zululand[KZN]	0.8475	0.9302	0.9268	0.7540	0.6885	0.8294
OR Tambo[EC]	0.8120	0.8912	0.8000	0.7891	0.7192	0.8023
Sisonke[KZN]	0.8512	0.8413	0.7397	0.6960	0.8523	0.7961
Greater Sekhukhune[LP]	0.8750	0.8889	0.8851	0.6417	0.5256	0.7633
Uthungulu[KZN]	0.7862	0.8293	0.7200	0.6575	0.7959	0.7578
ILembe[KZN]	0.8333	0.9200	0.5584	0.6203	0.7763	0.7417
Vhembe[LP]	0.6923	0.7813	0.9524	0.7903	0.4038	0.7240
Umkhanyakude[KZN]	0.9737	0.9740	0.6082	0.5000	0.5342	0.7180
Mopani[LP]	0.8182	0.8617	0.703	0.5686	0.63	0.7163
Amajuba[KZN]	0.7031	0.7660	0.5930	0.6000	0.9121	0.7148
Umgungundlovu[KZN]	0.8485	0.7901	0.7000	0.4557	0.7500	0.7089
Waterberg[LP]	0.8416	0.6514	0.768	0.6286	0.5758	0.6931
Uthukela[KZN]	0.8841	0.7716	0.7256	0.5563	0.4867	0.6849
Umzinyathi[KZN]	0.7576	0.7407	0.5794	0.6320	0.7016	0.6823
Ugu[KZN]	0.6783	0.7965	0.6938	0.4452	0.7515	0.6731
Alfred Nzo[EC]	0.8085	0.8019	0.6863	0.4945	0.5543	0.6691
Dr Ruth Segomotsi Mompati[NW]	0.6111	0.7200	0.7639	0.4091	0.6835	0.6375
Chris Hani[EC]	0.8198	0.6606	0.5143	0.537	0.5727	0.6209
Capricorn[LP]	0.6875	0.4754	0.6574	0.5657	0.5532	0.5878
Joe Gqabi[EC]	0.7167	0.625	0.5507	0.5	0.4667	0.5718
Ngaka Modiri Molema[NW]	0.4737	0.8462	0.5691	0.3613	0.4537	0.5408
Bojanala[NW]	0.3333	0.2188	0.3158	0.4074	0.3279	0.3206

Source: Authors' compilation from NIDS data 2008-2017
Provinces: KZN= KwaZulu-Natal, NW=North West, EC= Eastern Cape, LP= Limpopo

Table 5.2 is arranged from the district with the highest headcount poverty ratio to the district with the lowest headcount poverty. Zululand had the highest average headcount poverty among all the districts. There was over 82% of households in that district living below the poverty line over the period. The districts of OR Tambo and Sisonke followed this with an average poverty headcount of 80% and 79% respectively. Zululand district also had the least per capita income among all of the districts, as was observed in the previous section. This coincided with the high headcount poverty recorded.

Table 5.2 also indicates that Bojanala district had the lowest headcount poverty among all the districts. This was the only district that had less than 50% of the households living below the poverty line in all the waves. This district also had the highest per capita income over the period, as observed in the previous section.

The results also indicate that headcount poverty declined by 2017 from what it was in 2008 in 77% of the districts, indicating a general decline in the sample. Five of the districts however had relatively more households living below the poverty line in 2017 than in 2008. These were Sisonke, Uthungulu, Amajuba, Ugu and Dr Ruth Segomotsi Mompati. These districts are located in KwaZulu-Natal, except Dr Ruth Segomotsi Mompati, which is in the North West province. The relative increase in household size observed among households in these provinces between 2008 and 2017, could have been a contributing factor.

Among these, the greatest percentage increase in headcount poverty was in the Amajuba district, at around 29%. This district had the lowest per capita income in 2017 among all the districts in the sample, at R433 per month. This income was low in comparison to the poverty line of R758 in that year.

The poverty headcount ratios observed among these districts were relatively higher than the headcount ratios reported by Stats SA (2017c) for rural areas at the national level in the years, 2006, 2009, 2011 and 2015 using the Lower Bound Poverty Line. Stats SA reported around 60% of households living below the poverty line in 2006 at the national rural level. This percentage declined to around 41% in 2011, and increased slightly, to around 46%, in 2015. The aggregated poverty figures for the districts in this study indicate a poverty ratio of around 76% in 2008 with a decline to around 68% in 2012. This further declined to 62% of households in these districts living below the poverty line by 2017.

The general decline in the percentage of households living in poverty at the national level for rural areas as reported by Stats SA (2017c) was evident in this study at the district level, although the magnitude of the decline differed. The 2016 community survey also reported a decline in headcount poverty among the majority of these districts between the period 2011 and 2016 (Stats SA 2016b). The exception was in four districts of the Limpopo province (i.e. Mopani, Capricorn, Waterberg and Greater Sekhukhune) and Chris Hani district, where poverty increased in that period, although the increase was relatively small and no more than 2.5% in the districts (Stats SA 2016b). Over the period 2008 to 2017, Zizzamia, Schotte and Leibbrandt (2019) also reported a decline in poverty in South Africa. This was observed using both the Upper Bound and the Food Poverty lines.

The overall decline in headcount poverty observed is positive. However, the results indicate that in the majority of these districts over 50% of households still lived below the LBPL and were unable to afford the basic required food and non-food items.

5.4. Poverty gap

The poverty headcount reported in section 5.3 gave an indication of the proportion of households living below the poverty line. In this section, the poverty gap was determined using the FGT_1 (α equal 1). The World Bank defines the poverty gap as 'the mean shortfall in income or consumption from the poverty line, counting the non-poor as having zero shortfall. It is expressed as a percentage of the poverty line and reflects the depth of poverty as well as its incidence' (World Bank 2018). Figure 5.1 and Figure 5.2 give the poverty gap ratios for the districts, grouped in their respective provinces.
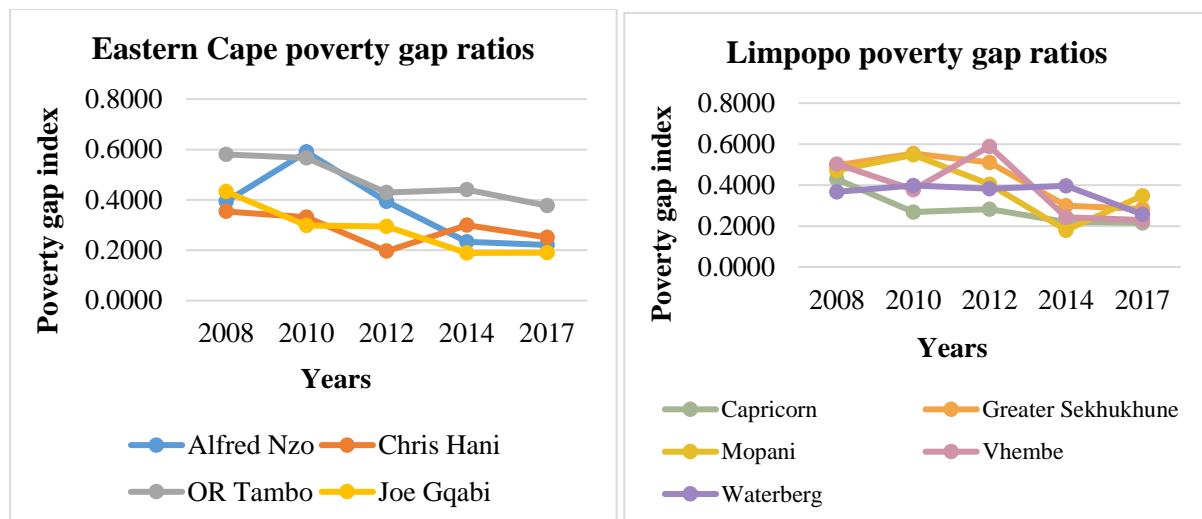
Figure 5.1: Poverty gap ratios of districts in Eastern Cape and Limpopo provinces
Source: Own compilation from NIDS data

Within the Eastern Cape, the poverty gap was highest in OR Tambo district. This indicated that relatively more households in the district were further away from the poverty line compared to households in other districts in the same province. Households in Alfred Nzo district followed this with a gap ratio of 0.59 and 0.39 in 2010 and 2012 respectively. Joe Gqabi and Chris Hani districts had the lowest poverty gap ratios throughout the period. Figure 5.1 shows these poverty gap ratios.

Figure 5.1 also gives the poverty gap ratios for the districts in Limpopo province. The figure shows that households in Capricorn district were relatively closer to the poverty line compared to households in other districts in the province. By 2017, the poverty gap in all the districts of the province had converged, with relatively small differences observed among the districts.

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This was similar to the year 2008, although the level of the gap in that year among the districts was relatively higher (between 0.4 and 0.5). In 2017, the poverty gap had declined to around 0.2 in all the districts, with the exception of Mopani district at around 0.3.

Within the North West province, Dr Ruth Segomotsi Mompati had the highest poverty gap ratio over the period as seen in Figure 5.2. As noted in the previous section, this district had the highest poverty headcount ratio in the province. Thus, not only did the district have a high percentage of households living below the poverty line, but also the average income of those households was furthest from the poverty line. Households in Bojanala district had the lowest poverty gap ratio.
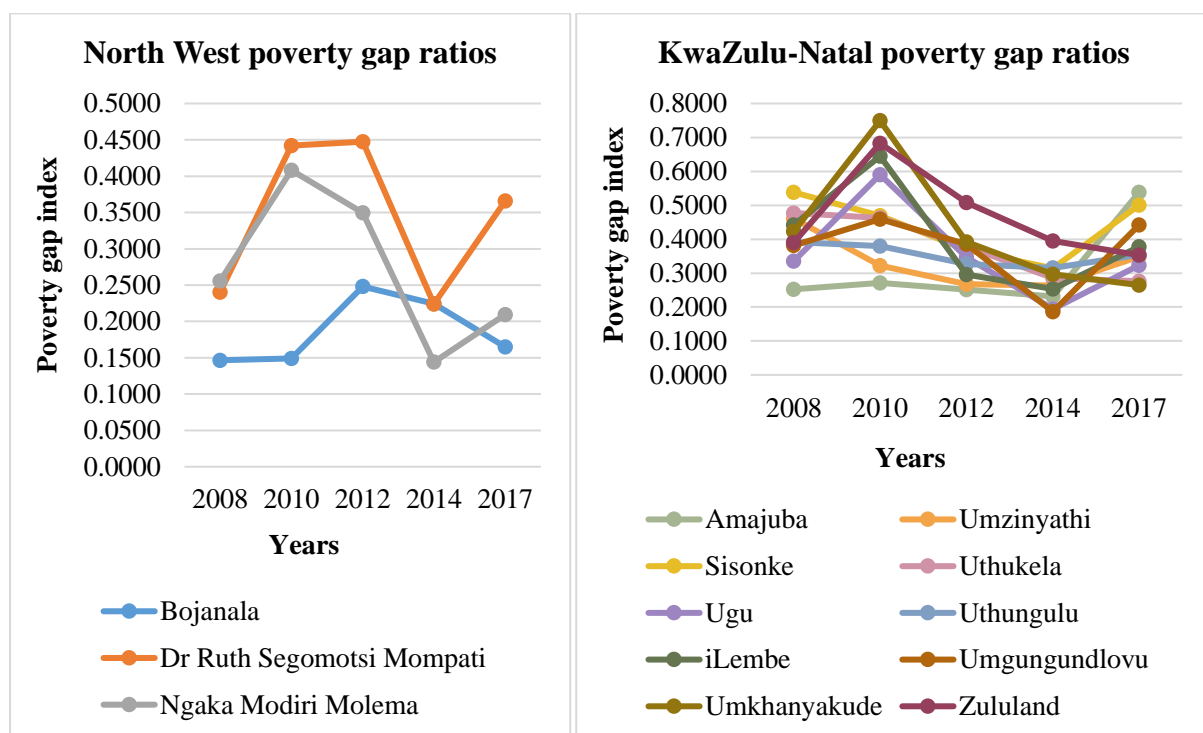
Figure 5.2: Poverty gap ratios of districts in North West and KwaZulu-Natal provinces
Source: Own compilation from NIDS data

Figure 5.2 also shows that the Amajuba district in KwaZulu-Natal had the lowest poverty gap ratio from 2008 to around 2014. However, in 2017, this district had the highest poverty gap in the province, indicating that the per capita income of households was falling further and further below the poverty line. From the previous section, this district also had the highest poverty headcount in 2017. What was also evident among the districts in KwaZulu-Natal was that the poverty gap ratio among some of the districts converged, particularly between the years 2012 and 2017.

In general, the lowest poverty gap was in Bojanala district, followed by Ngaka Modiri Molema and Joe Gqabi districts. These districts had the highest per capita income compared to the other

districts as observed in section 5.2. To some extent, it would be expected that the poverty gap of the poor households in these districts would be relatively low or closer to the poverty line compared to other districts. On the other hand, OR Tambo had the highest poverty gap ratio, followed by Zululand and Sisonke districts. The difference in the poverty gap ratios among these districts was relatively small, with one percent between OR Tambo and Zululand districts and four percent between OR Tambo and Sisonke districts. The relatively high poverty gap among these districts implied that relatively more resources would be required in these districts to pull households above the poverty line or at least to the poverty line for them to be able to acquire basic food and non-food items.

5.5. Poverty transitions of households in rural districts

This section presents the results of how households have been transitioning in and out of poverty between two consecutive waves, (i.e. wave (t) and wave ($t+1$)) as a result of changes in household income. The results show the percentage of households that transitioned from being poor to not poor, not poor to poor, as well as the percentage of those that retained the same status between two consecutive waves. Table 5.3 up to Table 5.8 show these poverty transition matrices. The districts are grouped by province in each table and where there are more districts within a province, for example in KwaZulu-Natal, the districts are grouped by similarity or patterns observed in the transitions where such similarities were observed.

Table 5.3 shows the poverty transition matrices for Alfred Nzo, Chris Hani OR Tambo and Joe Gqabi districts. The pattern observed among these districts was that the majority (refers to more than 50%) of households did not transition or experience change in their status between two consecutive waves over the period. In other words, the majority of those who were poor remained poor and the majority of those who were not poor remained not poor between (t) and ($t+1$) waves. The exception was in OR Tambo district when among the households that were not poor in 2012, 54% became poor by 2014; and in Joe Gqabi district when 55% of those that were poor in 2014 became non-poor by 2017.

Table 5.3: Percentage of poor and non-poor households in Alfred Nzo, Chris Hani, OR Tambo and Joe Gqabi districts in consecutives waves between 2008 and 2017*

		Alfred Nzo		Chris Hani		OR Tambo		Joe Gqabi	
		2010							
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2008	Poor	80.00	20.00	65.00	35.00	90.91	9.09	57.14	42.86
	Not poor	14.29	85.71	33.33	66.67	14.29	85.71	12.50	87.50%
		2012							
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2010	Poor	76.47	23.53	68.75	31.25	85.71	14.29	55.56	44.44
	Not poor	20.00	80.00	15.38	84.62	0.00	100.00	30.77	69.23
		2014							
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2012	Poor	66.67	33.33	69.23	30.77	77.78	22.22	66.67	33.33
	Not poor	16.67	83.33	18.75	81.25	54.55	45.45	23.08	76.92
		2017							
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2014	Poor	58.33	41.67	58.33	41.67	75.00	25.00	44.44	55.56
	Not poor	26.67	73.33	35.29	64.71	33.33	66.67	30.77	69.23

Source: Authors' compilation from NIDS data 2008-2017
*Totals add to 100% for each district

In OR Tambo, the percentage of households earning capital income, remittances and income from agricultural activities declined between 2012 and 2014, while the percentage of households earning wages and agricultural income increased between 2014 and 2017 in Joe Gqabi. These changes in income contributed to the transitions observed in these districts during these periods.

Table 5.4 shows the transition matrices for districts in the Limpopo province. Capricorn and Mopani districts had similar results to those among the districts in the Eastern Cape. The majority of households in these two districts did not experience a change in their poverty status between waves (*t*) and (*t+1*).

Table 5.4: Percentage of poor and non-poor households in Capricorn, Mopani, Greater Sekhukhune, Waterberg, and Vhembe districts in consecutive waves between 2008 and 2017*

		Capricorn		Mopani		Greater Sekhukhune		Waterberg		Vhembe	
2010											
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2008	Poor	62.50	37.50	85.00	15.00	92.86	7.14	62.50	37.50	80.00	20.00
	Not poor	11.11	88.89	40.00	60.00	25.00	75.00	50.00	50.00	66.67	33.33
2012											
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2010	Poor	90.91	9.09	78.95	21.05	85.71	14.29	84.62	15.38	91.67	8.33
	Not poor	21.43	78.57	16.67	83.33	50.00	50.00	44.44	55.56	100.00	0.00
2014											
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2012	Poor	84.62	15.38	56.25	43.75	71.43	28.57	60.00	40.00	80.00	20.00
	Not poor	0.00	100.00	22.22	77.78	25.00	75.00	42.86	57.14	0.00	100.00
2017											
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2014	Poor	81.82	18.18	90.91	9.09	72.73	27.27	58.33	41.67	50.00	50.00
	Not poor	14.29	85.71	35.71	64.29	14.29	85.71	30.00	70.00	25.00	75.00

Source: Authors' compilation from NIDS data 2008-2017
*Totals add to 100% for each district

Although the transitions for Greater Sekhukhune and Waterberg districts had similar results, there were slight differences. Fifty percent of households that were not poor in 2010 in Greater Sekhukhune became poor by 2012, and the remaining 50% of households that were not poor in 2010 kept their non-poor status in 2012. For households that became poor in that district, the percentage of those earning wages and capital income decreased between 2010 and 2012. The same was observed in the Waterberg district, although this transition was between the years 2008 and 2010.

In the Vhembe district, 66% of households that were not poor in 2008 became poor by 2010, and all the household that were initially not poor in 2010 became poor by 2012. This resulted from the decline in remittances received and income from agricultural activities from 2008 to 2010. While between 2010 and 2012, the decline was in wages earned, social grants and other

forms of government income in the district. These were the only periods when the majority of households in Vhembe district experienced transition in their status. In all other waves, relatively few households transitioned between wave (*t*) and wave (*t+1*). The transition matrices for the Greater Sekhukhune, Waterberg and Vhembe districts are also shown in Table 5.4.

In Bojanala district of North West province, the majority of households that were not poor remained non-poor. This was the case throughout all the waves. Among the households that were poor in that district, 71% become non-poor between 2008 and 2010. This was because of the increase in social grants received and relatively more households earning investment income between 2008 and 2010. Table 5.5 gives these results.

Table 5.5: Percentage of poor and non-poor households in Bojanala, Dr Ruth Segomotsi Mompati and Ngaka Modiri Molema districts in consecutive waves between 2008 and 2017*

Bojanala				Dr Ruth Segomotsi Mompati		Ngaka Modiri Molema	
2010							
		Poor	Not poor	Poor	Not poor	Poor	Not poor
2008	Poor	28.57	71.43	70.00	30.00	92.31	7.69
	Not poor	16.67	83.33	37.50	62.50	42.11	57.89
2012							
		Poor	Not poor	Poor	Not poor	Poor	Not poor
2010	Poor	50.00	50.00	90.00	10.00	70.00	30.00
	Not poor	26.67	73.33	37.50	62.50	0.00	100.00
2014							
		Poor	Not poor	Poor	Not poor	Poor	Not poor
2012	Poor	50.00	50.00	50.00	50.00	42.86	57.14
	Not poor	23.08	76.92	0.00	100.00	16.67	83.33
2017							
		Poor	Not poor	Poor	Not poor	Poor	Not poor
2014	Poor	66.67	33.33	66.67	33.33	77.78	22.22
	Not poor	15.38	84.62	58.33	41.67	21.74	78.26

Source: Authors' compilation from NIDS data 2008-2017
*Totals add to 100% for each district

In Dr Ruth Segomotsi Mompati district, the main transition was between 2014 and 2017, when 58% of households that were not poor became poor. What was observed over that period in the district was that income from wages and social grants declined, thus contributing to households moving below the poverty line. In all the other waves the majority of households in that district remained in the same status, see Table 5.5. Similarly, in Ngaka Modiri Molema district, in more than 50% of the households, the poverty status did not change between waves, except between 2012 and 2014, when among the households that were poor, 57% transitioned out of poverty. There was an increase in remittances received by households between 2012 and 2014, which aided households out of poverty.

Among the districts of KwaZulu-Natal province, Umkhanyakude and Uthukela districts showed a similar pattern, with the majority of households retaining the same status between waves (*t*) and (*t+1*). Table 5.6 shows the transition matrices for these two districts.

Table 5.6: Percentage of poor and non-poor households in Umkhanyakude and Uthukela districts in consecutive waves between 2008 and 2017*

Umkhanyakude				Uthukela	
2010					
		Poor	Not poor	Poor	Not poor
2008	Poor	100.00	0.00	80.00	20.00
	Not poor	0.00	100.00	22.22	77.78
2012					
		Poor	Not poor	Poor	Not poor
2010	Poor	63.64	36.36	81.82	18.18
	Not poor	0.00	100.00	16.67	83.33
2014					
		Poor	Not poor	Poor	Not poor
2012	Poor	85.71	14.29	55.00	45.00
	Not poor	0.00	100.00	21.43	78.57
2017					
		Poor	Not poor	Poor	Not poor
2014	Poor	66.67	33.33	57.14	42.86
	Not poor	42.86	57.14	20.00	80.00

Source: Authors' compilation from NIDS data 2008-2017
*Totals add to 100% for each district

What was observed in Umkhanyakude between 2008 and 2010 was that there was no transition at all between the waves within this sample of households. All the households that were poor in 2008 were still poor in 2010 and all the households that were not poor in 2008 remained so by 2010. This was observed again in the same district between 2012 and 2014 among the non-poor households.

Table 5.7 shows the transition matrices for the districts of Amajuba, Umzinyathi, Uthungulu and Zululand. The results also indicated that in most of the survey periods the majority of households did not change their poverty status between wave (*t*) and wave (*t+1*), with only a few transitions being observed in some years.

Table 5.7: Percentage of poor and non-poor households in Amajuba, Umzinyathi, Uthungulu and Zululand districts in consecutive waves between 2008 and 2017*

Amajuba				Umzinyathi		Uthungulu		Zululand	
2010									
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2008	Poor	88.89	11.11	71.43	28.57	78.23	21.74	100.00	0.00
	Not poor	55.56	44.44	40.00	60.00	50.00	50.00	66.67	33.33
2012									
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2010	Poor	69.23	30.77	57.89	42.11	73.91	26.09	94.12	5.88
	Not poor	40.00	60.00	25.00	75.00	10.00	90.00	0.00	100.00
2014									
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2012	Poor	72.73	27.27	100.00	0.00	72.22	27.78	81.25	18.75
	Not poor	42.86	57.14	100.00	0.00	40.00	60.00	0.00	100.00
2017									
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2014	Poor	90.91	9.09	51.61	48.39	78.95	21.05	76.92	23.08
	Not poor	71.43	28.57	0.00	0.00	35.71	64.29	40.00	60.00

Source: Authors' compilation from NIDS data 2008-2017
*Totals add to 100% for each district

The results show that the periods when more than 50% of the households in the district experienced a transition was between 2008 and 2010 as well as between 2014 and 2017 in Amajuba. Between 2008 and 2010, 56% of the households transitioned into poverty and between 2014 and 2017, 71% of households became poor. In the Zululand district, the transition took place between 2008 and 2010, when 67% of households that were not poor in 2008 were poor in 2010. The decline in wages, income from agricultural activities, remittances and social grants in these districts were the reason for households falling below the poverty line during these years. The results of the Umzinyathi district indicate that between 2012 and

2014, there was no transition at all by the households, neither into poverty nor out of poverty. In addition, the district had zero percent of households that were not poor according to the lower bound poverty line definition in this sample between 2014 and 2017, hence no households were observed that were not poor in that period. In the Uthungulu district, there was a transition to poverty by 50% of the households in 2010 from being non-poor in 2008. The district is also shown in Table 5.7.

What was evident among the remaining districts of KwaZulu-Natal (Umgungundlovu, Ugu, iLembe and Sisonke), in addition to the similar transition patterns already observed in the other districts was that, there were also 50/50 splits among the non-poor households. In other words, among the households that were not poor, 50% remained non-poor and the other 50% became poor. Table 5.8 shows these results of the Umgungundlovu, Ugu, and iLembe and Sisonke districts.

Table 5.8: Percentage of poor and non-poor households in Umgungundlovu, Ugu, iLembe and Sisonke districts in consecutive waves between 2008 and 2017*

Umgungundlovu				Ugu		iLembe		Sisonke	
2010									
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2008	Poor	83.33	16.67	78.26	21.74	90.00	10.00	80.00	20.00
	Not poor	50.00	50.00	66.67	33.33	25.00	75.00	57.14	42.86
2012									
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2010	Poor	66.67	33.33	70.83	29.17	50.00	50.00	70.00	30.00
	Not poor	75.00	25.00	50.00	50.00	25.00	75.00	42.86	57.14
2014									
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2012	Poor	54.55	45.45	57.14	42.86	66.67	33.33	70.59	29.41
	Not poor	40.00	60.00	45.45	54.55	25.00	75.00	40.00	60.00
2017									
		Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
2014	Poor	100.00	0.00	64.71	35.29	83.33	16.67	75.00	25.00
	Not poor	50.00	50.00	53.33	46.67	50.00	50.00	63.64	36.36

Source: Authors' compilation from NIDS data 2008-2017

*Totals add to 100% for each district

This 50/50 split among the non-poor households in Umgungundlovu district was observed between 2008 and 2010 as well as between 2014 and 2017. In the Ugu district, this was observed between 2010 and 2012, while in the iLembe district, this was observed between 2010 and 2012 as well as between 2014 and 2017. This was not observed however in the Sisonke district. What was seen in Sisonke district were transitions from non-poverty to poverty by the majority of households between 2008 and 2010 as well as between 2014 and 2017.

The results revealed that more than 50% of the households in these districts maintained their status between waves. Relatively few households experienced transition. At the national level, Zizzamia, Schotte and Leibbrandt (2019) also found that the majority of households kept their status between waves. The study used the FPL and the UBPL. Finn and Leibbrandt (2016) also obtained similar results, with the majority of the panel not experiencing a change in their status. Thus, these provided an indication that what was happening at the national level, as was found in those studies, was to some extent mirrored in these districts.

When observing poverty transition between 2008 and 2017 only, the results indicate that in 18 out of 22 districts, there was a decline in poverty by 2017. In other words, poverty decreased in 82% of the districts between 2008 and 2017. On the other hand, in about 13% of the districts, poverty increased between 2008 and 2017. Among the remaining 4% of the districts, the level of poverty remained unchanged between 2008 and 2017. This view however does not consider changes that took place in-between waves as reported above.

This section revealed that when tracing changes in poverty status between wave (*t*) and wave (*t+1*), the majority of households in the districts did not change their status. This finding was positive for those households that were not poor and remained non-poor, indicating their resilience to poverty. However, for those households that were poor and remained poor, this was an indication that their welfare was not improving between waves, *ceteris paribus*. However, when considering 2008 and 2017 only, the results indicated that in about 82% of the districts poverty declined, with households transitioning out of poverty, while in 13% of the districts, poverty increased. This general decline coincided with the overall decline in poverty headcount observed over the period as reported in section 5.3.

5.5.1 Test of rural household incomes above the lower bound poverty line

This chapter revealed very high poverty rates and relatively few transitions out of poverty or into poverty, as the majority of households across the districts were observed to remain in the status, they were initially in (i.e. wave *t*.) The hypothesis for the chapter was that "most rural

households who engaged in income diversification have remained above the poverty line over time". This was tested using a one-sample t-Test. The test was limited to households that were diversifying their income.

The null and alternative hypotheses are stated below:

- H_0: $\mu \geq 0.5$
- H_1: $\mu < 0.5$

The test was a left-tailed test. The results of this test are shown in Table 5.9. The Table indicates the variable that was tested, the number of observations, the mean, standard error and deviation, as well as the confidence interval. The t-statistic and the degrees of freedom are also indicated. Table 5.9 also indicates the p-values under the null and alternative hypotheses.

Table 5.9: Results of the test of the hypothesis that most rural households who engage in income diversification have remained above the poverty line over time

Variable	Observations	Mean	Std. Err.	Std. Dev	[95% Conf. Interval]	
Non-poor	1185	0.4970	0.0145	0.5002	0.4685	0.5256
mean = mean (non-poor)					t = -0.2033	
H_0: mean = 0.5					degrees of freedom=1184	
H_a: mean < 0.5		H_a: mean! = 0.5			H_a: mean > 0.5	
Pr (T < t) = 0.4195		Pr (|T| > |t|) = 0.8390			Pr (T > t) = 0.5805	

Source: Stata 14 output
H_0 mean: mean under the null hypothesis
H_A mean under the alternative hypothesis
t: t-statistic
Pr (T < t), Pr (T > t): one tail p-values that the mean is less than 0.5 (left test) and greater than 0.5 (right test)
Pr (|T| > |t|): two-tailed p-value that the mean is not equal to 0.5

The results indicate a t-statistic of -0.2033 with 1184 degrees of freedom. The left-tailed p-value was 0.4195. The value is greater than 0.05. This result indicated failure to reject the null hypothesis that the most households that diversified their income remained above the poverty line. This is also seen from Table 5.9 with the mean of non-poor households being around 50%. There was, therefore, no evidence to support the alternative hypothesis in the dataset. This finding seemed to align with studies that indicate that diversification is undertaken by non-poor households for income growth and accumulation (Abdulai and CroleRees 2001; Agyeman, Asuming-Brempong and Onumah 2014).

5.6 Summary

The purpose of this chapter was to present the results on poverty and poverty transitions of rural households over time at district municipal level. Evidence from previous studies have provided aggregated results on poverty in the country. The results of this chapter provide a spatially disaggregated view.

The results indicated that the Zululand, OR Tambo and Sisonke districts had the highest poverty headcount throughout the period. This was on average, 80% of households not able to afford basic food and non-food items in these districts. Zululand also had the lowest per capita income among all the districts.

With the exception of the districts in the North West province, the results indicated that, by 2017, the poverty gap ratio in each district in the other provinces converged. In other words, the majority of households in each district were relatively close to each other in terms of their distance from the poverty line. Further investigation of the poverty gap ratio without the provincial cluster, revealed that OR Tambo had the highest poverty gap ratio. Zululand and the Sisonke districts followed this. These same districts had the highest headcount poverty. This indicated that, not only were there relatively more poor households in these districts compared to others, but the households were also furthest from the poverty line compared to other districts. The Bojanala, Ngaka Modiri Molema and Joe Gqabi districts had the lowest headcount poverty, as well as the lowest poverty gap ratios.

The poverty transition matrices between 2008 and 2017 indicated that in around 82% of the districts, poverty declined by 2017, and while in 13% of the districts, poverty increased. This general transition out of poverty between 2008 and 2017 coincided with the decline in headcount poverty observed. This, however, was not mirrored between waves. The results between wave (t) and wave ($t+1$) indicated that the majority of households in the districts retained their initial status. This indicated resilience for those that were not poor and remained so in the following wave. However, the outcome was not favourable for those households that were poor and remained poor in the following wave. The chapter also tested whether the majority of these households were above or below the poverty line. The results revealed that around 50% of the households were above the lower bound poverty line and the remaining 50% of the households were below the poverty line.

CHAPTER SIX

RESULTS: THE RELATIONSHIP BETWEEN INCOME DIVERSIFICATION AND RURAL HOUSEHOLD POVERTY TRANSITIONS

6.1 Introduction

The previous chapter presented the results on poverty status and transitions of rural households over time. The poverty status of the households was relatively high, above 50% on average, in all but one district. In addition, there were minimal transitions out of poverty between waves, with more than 50% of households retaining the same poverty status across districts. Given that income diversification is an important coping strategy for rural households, the purpose of this chapter is to present the results of the effect of this strategy on household poverty transitions. This was done to determine whether this strategy could aid rural households' transition out of poverty or prevent households from entering into poverty.

The chapter has two broad sections. The first section reports the results of the survivor functions and the Kaplan-Meier diagrams. The second section reports the results of the Cox proportional hazard model.

6.2 Survivor Functions

The survival function is a function that indicates the probability of survival beyond a specified date (Emmert-Streib and Dehmer 2019). It gives the probability that a subject will survive past time t (Tian and Olshen ND). The Kaplan-Meier estimate also estimates the probability of survival at different time intervals (Lira, Antunes-Foschini and Rocha 2019). The Kaplan-Meier curve illustrates this probability over time (Lira, Antunes-Foschini and Rocha 2019). The functions are estimated separately for poverty entry and poverty exit. The year 2008 was not included in the results because, as mentioned previously, left-censored spells have not been included in the analysis because the application of the model requires that the first year of the spell be observed. These spells could not be observed prior to 2008 as that was the first year of the study period.

6.2.1 Poverty Entry

The survivor function for poverty entry indicates the percentage of households that do not experience or enter into poverty in each year of the study. Table 6.1 presents the survivor function of non-poor households into poverty entry from 2010 to 2017. The table indicates the time of observation in years. The years 2010, 2012, 2014 and 2017 are represented respectively as Time 1, 2, 3 and 4. Table 6.1 also indicates the beginning total of households in each year, the failure number (which represents the number of households that fall into poverty in the respective year) and the Net Lost, which is the number of households that did not fall into poverty in that year. Table 6.1 also indicates the survivor function and the standard errors.

Table 6.1: Survivor function of non-poor households of poverty entry

Time	Beginning Total	Fail	Net Lost	Survivor Function	Std. Error
1	2044	342	169	0.8327	0.0083
2	1533	293	218	0.6735	0.0107
3	1022	271	240	0.4949	0.0122
4	511	231	280	0.2712	0.0128

Source: Author's compilation from Stata

Table 6.1 shows that the survivor function decreased from 2010 to 2017. This indicated that the percentage of households that survived poverty declined each year from 2010 to 2017. Specifically, Table 6.1 shows that in the first year (2010), 83% of households did not enter into poverty. The percentage declined to 67% in 2012 and further to 49% in 2014. By the end of 2017, only 27% of households were non-poor or survived poverty entry. The declining poverty entry survivor function meant that fewer and fewer households survived the event 'poverty entry'. This implied that more and more households experienced the poverty entry event in each year over the period 2010 to 2017.

Table 6.1 also indicates the net lost households, that is, the number of households that did not experience poverty in that year. The 'net lost' of 280 in year 4 (2017), indicates that these households were right-censored or were not found to be poor by the end of the survey period. This was around 14% of the total 2044 households.

These results are also presented in Figure 6.1 by the Kaplan-Meier survival estimate. Figure 6.1 shows the survivor estimate on the vertical axis and the analysis time on the horizontal axis.
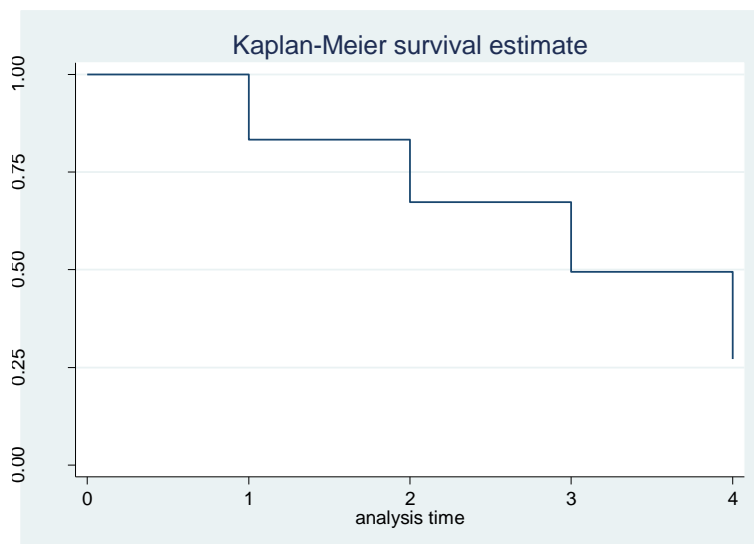
Figure 6.1: Kaplan-Meier poverty survival estimate
Source: Author's compilation from Stata

It is seen from Figure 6.1 that between year one and year two, the poverty survival rate was 83%, between year two and three, it was 67% and between year three and four the rate was around 49%. This declined further to 27% by the end of year four. The downward sloping survival estimate again indicated that fewer and fewer households did not experience poverty entry over time.

6.2.2 Poverty Exit

The survivor function for poverty exit shows the percentage of households that were poor that "survive" the event "poverty exit". In other words, it gives the percentage of households that did not experience poverty exit. Table 6.2 shows this survivor function of poor households for poverty exit. Table 6.2 indicates that in 2010 (time 1) about 91% of the households did not exit poverty. This function decreased in year two, with about 78% of households not exiting poverty. By year four, the percentage had declined to 30% of households not exiting poverty. A declining poverty exit survivor function is optimistic because it implied that fewer and fewer households survived the event "poverty exit", or did not experience poverty exit, in each year from 2010 to 2017.This meant that over time more and more households did experience a poverty exit. This aligned with what was observed in Chapter 5 that there was a general decline in poverty from 2008 to 2017 from the FGT analysis.

Table 6.2: Survivor Function of poor households of poverty exit

Time	Beginning Total	Fail	Net Lost	Survivor Function	Std. Error
1	2044	181	330	0.9114	0.0063
2	1533	217	294	0.7824	0.0097
3	1022	263	248	0.5811	0.0129
4	511	246	265	0.3013	0.0145

Source: Author's compilation from Stata

Table 6.2 also shows that 265 of the households were right censored in 2017 and did not exit poverty by the end of the study period. This was about 13% of the total 2044 spells. The Kaplan-Meier estimate for poverty exit is also shown in Figure 6.2. It represents the poverty exit survivor function in graphical form. Similar to the poverty entry function, Figure 6.2 is downward sloping indicating that the survivor estimate declined in each year, with fewer households not exiting poverty over time.
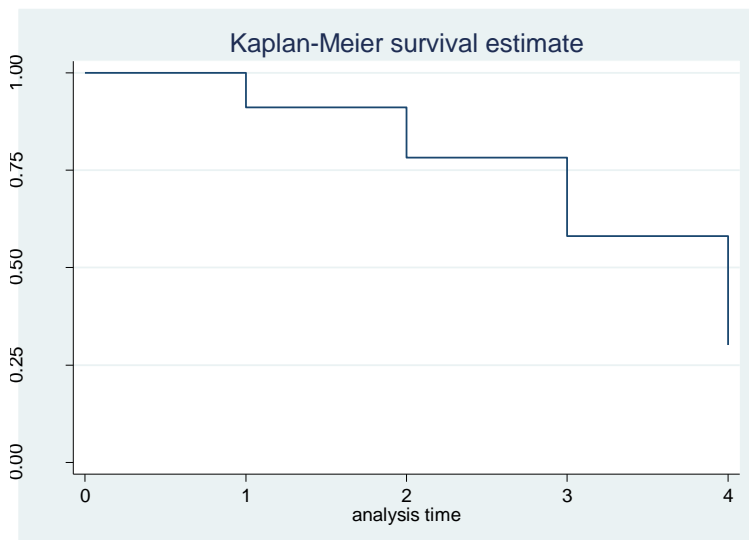
Figure 6.2: Kaplan-Meier poverty exit estimate
Source: Author's compilation from Stata

The poverty exit survivor function, as shown in Figure 6.2, is relatively steeper than the poverty entry function represented in Figure 6.1. This suggested that it was relatively easier for the non-poor households in this sample to survive poverty entry than for the poor households to survive poverty exit. On the other hand, in Russia Denisova (2007) found the Kaplan-Meier survivor estimate for poverty entry to be relatively steeper than the survivor estimate for poverty exit. The same was observed when the sample was divided by settlement type into urban and rural. For the rural subsample, the survivor estimate for poverty entry was relatively steeper than the survivor estimate for poverty exit. This was the opposite of what was observed in the South

African case. The factors contributing to these poverty entry and poverty exit functions are discussed in the next section.

The following section discusses the results of the Cox regression model and the factors that affect the probability of getting in (entry) and probability of getting out (exit) of poverty.

6.3 Cox regression results

Two separate cox regression models were estimated. One for poverty entry and another for poverty exit. In both regressions, the same covariates or explanatory variables were used. This was done to determine whether these factors affect the conditional probability of poverty entry and exit in the same way, because these two dynamic states tend to differ. The reference group used for each variable was also the same for the two regressions. These are listed in Table 6.3.

Table 6.3: Variables of the reference groups in the Cox regression models

Variable	Reference group
Gender	Male
Age	Adult category (36-59 years)
Education	No school
Marital status	Widow/widower
District	Bojanala
Level of diversification	No diversification
Household size	Single member household
Employment status	Employed

Source: Author's compilation

6.3.1 Poverty Entry

The results of the Cox proportional hazard model for poverty entry are reported first and are shown in Table 6.4. Table 6.4 shows factors affecting the conditional probability of poverty entry. Table 6.4 also shows the coefficients and the p-values of those variables, as well as the standard errors. A positive coefficient increases the probability of the event occurring and, in this case, the probability of a household entering into poverty. On the other hand, a negative coefficient decreases the probability of a household entering into poverty. The p-value of the chi2 test (Prob>chi2) in Table 6.4 is significant at 0.0000 and indicates overall statistical significance of the poverty entry model. The estimated model therefore fits the data better than the model without the covariates.

Table 6.4 indicates that having a female head of a household does not significantly increase the probability of a household entering into poverty. Baulch and McCulloch (2002) observed the same in Pakistan, where the gender of the household head had no significant on the

probability of households entering poverty. Previous cross-sectional studies have found that female-headed households are likely to be poorer than male-headed households (Rogan 2014; Maja and Oluwatayo 2018). However, evidence has also been found in other studies where female-headed households were less likely to be poorer than male-headed households (Oginni, Ahonsi and Ukwuije 2013; Liu, Esteve and Trevino 2017). The results also indicate that if the head of the household is in the retirement age group and beyond, this significantly reduces the probability of that household entering into poverty. The old age grant received by household heads who were beyond retirement age could be an explanation for this result. Denisova (2007) in Russia made a similar observation, with households headed by retired males and females less likely to enter into poverty compared to adult male and female-headed households. On the other hand, having a household head who is a youth had a positive effect on the probability of entering poverty, although not significantly so. The finding supports, what has been observed in some studies, that the poverty status of households is only significantly affected the older the household head becomes (Twerefou, Senadza and Owusu-Afriyie 2014; Baiyegunhi and Fraser 2010).

Table 6.4: Factors affecting the conditional probability of poverty entry

Cox regression - - Breslow method for ties				
No. of subjects	2, 044	Number of obs	2, 044	
No. of failures	1137			
Time a risk	5110			
		LR chi2 (**44**)	826.25	
Log likelihood	-7661.478	Prob > chi2	0.0000	
	Variable	**Coefficient**	**P Value**	**Standard Error**
Gender	Female	.1764966	0.108	.1098532
Age	Youth category	.2494527	0.102	.1526308
	Retirement age category	-.5075934	0.000***	.0937151
	Beyond retirement age	-.6306317	0.000***	.0802086
Education	Primary education	.0270618	0.717	.0745535
	Secondary education	-.0573108	0.569	.1006985
	Certificate with less than matric	-.5950888	0.406	.7162588
	Matric	-.5231754	0.004***	.1809891
	Diploma beyond matric	-.9418112	0.110	.5889939
	Bachelor's degree	-33.00213	1.000	9338403
	Higher degree	.7585363	0.457	1.020266
	Married	-.0024432	0.980	.0982754

Marital status	Divorced or separated	-.0037873	0.977	.1289861
	Never married	.0292103	0.736	.0867184
	Living with partner	.1914001	0.393	.2239091
Household size	Between 2-3 members	1.148757	0.000***	.1735385
	Between 4-6 members	1.653311	0.000***	.1696111
	More than 6 members	1.840257	0.000***	.1742759
Employment status	Not economically active	.1352328	0.083*	.078068
	Unemployed	.2080077	0.087*	.1215194
Districts	Alfred Nzo[EC]	.405167	0.143	.2769633
	Chris Hani[EC]	.319149	0.253	.2794269
	Joe Gqabi[EC]	.353871	0.234	.2971434
	OR Tambo[EC]	.5919819	0.028**	.2688956
	Amajuba[KZN]	.6630228	0.018**	.2798923
	iLembe[KZN]	.4603805	0.130	.3042601
	Sisonke[KZN]	.4724682	0.084*	.2735375
	Ugu[KZN]	.6320835	0.018**	.2662943
	Umgungundlovu[KZN]	.5163517	0.076*	.2907655
	Umkhanyakude[KZN]	.2683639	0.374	.3021209
	Umzinyathi[KZN]	.3959498	0.151	.2757861
	Uthukela[KZN]	.3212268	0.241	.2737228
	Uthungulu[KZN]	.6390079	0.017**	.2682773
	Zululand[KZN]	.2376246	0.397	.2806872
	Capricorn[LP]	.5718364	0.047**	.2884161
	Greater Sekhukhune[LP]	.528154	0.063*	.2844237
	Mopani[LP]	.5212182	0.060*	.2766933
	Vhembe[LP]	.7838946	0.006***	.2832432
	Waterberg[LP]	.4602795	0.100*	.2799015
	Dr Ruth Segomotsi Mompati[NW]	.3204872	0.272	.2920414
	Ngaka Modiri Molema[NW]	.2324	0.406	.2795337
Simpson index of diversification	Level 1	-.1214839	0.188	.0923007
	Level 2	-1.592941	0.000***	.0981521
	Level 3	-2.244474	0.000***	.1659069

***Indicates significance at 1%; **indicates significance at 5% and * indicates significance at 10%. Provinces: KZN= KwaZulu-Natal, NW=North West, EC= Eastern Cape, LP= Limpopo. Source: Author's compilation from Stata output

Having a household head with an education level that is less than matric does not significantly affect the probability of a household entering into poverty, while a matric qualification on the other hand, significantly reduces the probability of the household entering into poverty. A contributing factor to this could be that a matric qualification is a pre-requisite to access employment opportunities, while those without matric are unable to access such opportunities (Stats SA 2017c). Higher levels of education are generally associated with improved poverty status, while lower levels of education are associated with increased likelihood of poverty. This result aligns with what has been observed in other studies (Botha 2010; Twerefou et al. 2014; Bilenkisi et al. 2015). However, in Ghana and Turkey (Twerefou, Senadza and Owusu-Afriyie

2014; Bilenkisi, Gungor and Tapsin 2015) education was poverty reducing at all levels (i.e. from basic/primary to tertiary education), different to what has been observed in the current study.

The results also indicate that having a household head with an education level beyond matric (diploma beyond matric, Bachelor's degree and higher degree) did not significantly affect the probability of a household entering poverty. This result did not seem to align with other empirical findings (Denisova 2007; Twerefou, Senadza and Owusu-Afriyie 2014; Bilenkisi, Gungor and Tapsin 2015), that the higher the level of education, the less likely it is for a household to enter poverty, *ceteris paribus*. This is because education enables individuals to access better return opportunities compared to opportunities that can be accessed by individuals who are less educated or not educated at all. The insignificant results found in this study could be explained by the fact that only a few of the household heads in the sample had higher education, with the majority having between no schooling and matric qualification. Thus, the effect of that could make the covariates insignificant.

The marital status of the household head did not seem to significantly increase or decrease the probability of a household entering into poverty in comparison to a household headed by a widow/widower. A similar observation was made in Ghana, where the marital status of the household head, both female and male, was not significant in affecting the poverty status of the household (Twerefou, Senadza and Owusu-Afriyie 2014). In the Bophelong township of South Africa, Sekhampu and Muzindutsi (2014) also found marital status of the household head to have no significant effect on household poverty.

The household size variable indicated significant difference compared to the single member households. Specifically, living in a household with between two and three members significantly increased the probability of entering poverty compared to a single member household. This probability increased with the number of households members. As seen in Table 6.4, a household with more than six members had the greatest effect of increasing the probability of a household entering poverty. Sekhampu and Muzindutsi (2014) made a similar observation in the Bophelong Township where household size positively affected poverty. This was because a large household size was associated with a high dependency ratio and, therefore, increased competition for limited household resources (Sekhampu and Muzindutsi 2014). Meyer and Nishimwe-Niyimbanira (2016) in the Northern Free State region of South Africa made the same observation.

A household head that was not economically active or one that was unemployed significantly increased the probability of a household entering poverty. This probability was highest for household heads that were unemployed than those that were not economically active. Unemployed household heads included those who had searched for work and had not found work as well as those who were discouraged job seekers. Those who were not economically active could find work but were not seeking work for some or other reason. Thus, the former group of household heads would be expected to have a higher effect on increasing the probability of a household entering poverty. Bilenkisi, Gungor and Tapsin (2015) in Turkey found the poverty risk of households headed by an unemployed head higher than the poverty risk of households headed by employed heads. Poverty was also found to lessen in households headed by employed heads versus unemployed heads. This however was only observed among female-headed households (Sekhampu and Muzindutsi 2014). Similarly, in Australia, employed household heads, either part-time or full-time also reduced the probability of households entering poverty (Buddelmeyer and Verick 2007).

The geographic variables indicated a combination of significant and insignificant relationships. The results indicated that residing in the OR Tambo district significantly increased the probability of a household entering poverty. This was the only district in the Eastern Cape (within the study sample) that reported such significant results. A contributing factor to this was that the district was found to be among those that were inefficient in terms of its spending and not utilizing its resources as efficiently as it could between 2008 to 2013 (Ncube and Vacu 2018). At the same time, the municipality had the largest population size among all rural districts of the province, thus having to spread resources among a large population of over 1.4 million by 2016 (Local Government Handbook SA 2021).

Similarly, residing in the Amajuba, Sisonke, Ugu, Umgungundlovu and Uthungulu districts in KwaZulu-Natal province significantly increased the probability of a household falling into poverty. The size of the coefficients of this probability were relatively higher in the Amajuba, Ugu and Uthungulu districts. Ncube and Vacu (2018) also found these three districts to be inefficient in their spending, with efficiency scores below the efficiency frontier.

Residing in the Capricorn, Greater Sekhukhune, Mopani, Vhembe and Waterberg districts significantly increased the probability of a household entering into poverty. These represented all the districts in the Limpopo province. This indicated that regardless of the district a household resided in, there was an increased probability of the household entering into poverty

in the province. Over the period 2010 to 2016, there was a general decline in growth in all the districts of the province (Limpopo Treasury 2018). In addition, Greater Sekhukhune, Mopani and Vhembe districts were also identified as inefficient over the period 2008 to 2013 (Ncube and Vacu 2018). Thus, these factors could contribute to increasing the probability of households entering poverty. There was a difference however in the magnitude of the probability. The results indicated that Vhembe district had the highest positive coefficient and Waterberg the least positive coefficient among the districts of the province. In the North-West province, for a household in Dr Ruth Segomotsi Mompati and Ngaka Modiri Molema districts, there was an insignificant but positive probability of entering poverty compared to a household that resided in the Bojanala district. A contributing factor to this was that households in these two districts (Dr Ruth Segomotsi Mompati and Ngaka Modiri Molema) had relatively high unemployment rates and low education levels compared to households in Bojanala district (Massyn et al. 2015; 2017).

Table 6.4 also indicates the relationship between income diversification by the households and the probability of making a transition into poverty. The results indicate that at level 1 degree of diversification (i.e. a household having two income sources), there was a reduction in the probability of entering poverty, but not significantly, compared to a household that did not diversify its income sources at all. When the degree of diversification increased to level 2 (i.e. having three income sources) or to level 3 (i.e. having four income sources), the probability of entering poverty reduced significantly. The reduction was greater the higher the level of diversification, as seen with the size of the coefficient for a household having four income sources.

This finding aligned with what was expected from economic theory, that the higher the number of income sources, the lower the probability of poverty entry, *ceteris paribus*. However, in addition to the number of income sources, the amount of income derived from those sources is also important. In this study it was found that the higher the level of diversification, the higher the average household income. The correlation between the level of diversification and average household income was found to be positive and high, indicating that these two variables moved in tandem. From this, it can be deduced that the average income associated with each level of diversification indicated in Table 6.4 would have a similar effect on the conditional probability of poverty entry. This implied that average income associated with having four income sources would have the highest probability of reducing poverty entry compared with average income associated with having three or two income sources.

Woolard and Klasen (2005) observed that a decrease in income as a result of a decline in income sources such as a job loss, decline in remittance income, loss of social grants and/or income from agricultural activities were a significant contributor to households entering poverty in South Africa. In Southern Nigeria, Etim and Edet (2016) found that households with three income sources had the lowest percentage of poverty compared to households with one income source and those that diversified with two sources. This indicated that fewer income sources increased the chance of households entering poverty. Awotide, Awoyemi and Diagne (2012) also found income diversification to be poverty reducing, although the number of income sources or the degree of diversification were not disaggregated.

6.3.2 Poverty Exit

This section reports the results of the Cox proportional hazard model for poverty exit. These are reported in Table 6.5, which shows the factors affecting the conditional probability of poverty exit. Table 6.5 also shows the coefficients, p-values and standard errors for each variable. A positive coefficient increases the probability of a household exiting poverty, while a negative coefficient decreases the probability of a household exiting poverty. The p-value of the chi2 test (Prob>chi2) for the poverty exit model is 0.0000. This is significant and indicated that the estimated model fits better than the model without covariates.

Table 6.5 indicates that the coefficient of the gender variable in this model was negative. This implied that having a female head of a household reduced the probability of a household exiting poverty compared to a male-headed household. This, however, was not statistically significant. Nwosu and Ndinda (2018) found female headship to be positively associated with non-employment and non-employment to be positively associated with poverty using the same NIDS data, which could also explain the reduced probability of poverty exit among female headed households in this sample. Baulch and McCulloch (2002) in Pakistan as well as Denisova (2007) in Russia also observed the same, where gender negatively affected the conditional probability of households exiting poverty, also not significantly so. The age variable indicated that households headed by an individual in the retirement age or beyond retirement age category significantly increased the probability of that household exiting poverty, while a household headed by a youth also increased the probability of poverty exit, but not significantly so. This could be because of the old age social transfers received by those in retirement age and beyond, in addition to other income sources they may have. The effect

of such pension transfers on households exiting poverty has been noted in other studies (Denisova 2007; Bello et al. 2007).

Table 6.5: Factors affecting the conditional probability of poverty exit

Cox regression - - Breslow method for ties				
No. of subjects	2, 044	Number of obs	2, 044	
No. of failures	907			
Time a risk	5110			
		LR chi2 (**44**)	335.96	
Log likelihood	-6160.021	Prob > chi2	0.0000	
	Variable	**Coefficient**	**P Value**	**Standard Error**
Gender	Female	-.0397706	0.639	.0847975
Age	Youth category	.2268793	0.137	.1526463
	Retirement age category	.4366438	0.000***	.1087425
	Beyond retirement age	.2497244	0.010***	.0963258
Education	Primary education	-.0176338	0.844	.0897719
	Secondary education	-.1051935	0.368	.1169477
	Certificate with less than matric	.7755822	0.025**	.3469093
	Matric	.1814769	0.212	.1453444
	Diploma beyond matric	1.534487	0.000***	.2491085
	Bachelor's degree	1.567299	0.000***	.4066776
	Higher degree	1.458573	0.157	1.030504
Marital status	Married	.2137765	0.051*	.1096772
	Divorced or separated	-.1491907	0.265	.1337434
	Never married	.2860742	0.003***	.09587
	Living with partner	.4475865	0.066*	.2435762
Household size	Between 2-3 members	-.3775469	0.000***	.0935956
	Between 4-6 members	-.9886544	0.000***	.1036479
	More than 6 members	-1.349562	0.000***	.1375005
Employment status	Not economically active	-.1680579	0.035**	.0798376
	Unemployed	-.3796829	0.023**	.1675153
Districts	Alfred Nzo[EC]	-.300985	0.134	.2009393
	Chris Hani[EC]	-.1637984	0.404	.1962251
	Joe Gqabi[EC]	-.2670257	0.189	.20341
	OR Tambo[EC]	-.5299092	0.017**	.2219672
	Amajuba[KZN]	-.606481	0.018**	.2573192
	iLembe[KZN]	-.2075857	0.412	.2532186
	Sisonke[KZN]	-.3796953	0.090**	.2239038
	Ugu[KZN]	-.4404913	0.036**	.2097327
	Umgungundlovu[KZN]	-.2936814	0.273	.2677263
	Umkhanyakude[KZN]	-.3988524	0.137	.2682973
	Umzinyathi[KZN]	-.2217669	0.270	.2012521

	Uthukela[KZN]	-.2334446	0.220	.1902335
	Uthungulu[KZN]	-.4373418	0.033**	.2046884
	Zululand[KZN]	-.6464556	0.039**	.3124867
	Capricorn[LP]	-.2246198	0.259	.1991007
	Greater Sekhukhune[LP]	-.448467	0.078*	.2546909
	Mopani[LP]	-.4443936	0.043**	.2192689
	Vhembe[LP]	-.8122569	0.004***	.2801479
	Waterberg[LP]	-.2196734	0.319	.220437
	Dr Ruth Segomotsi Mompati[NW]	-.2855285	0.209	.2271876
	Ngaka Modiri Molema[NW]	-.3329947	0.076*	.1875106
Simpson index of diversification	Level 1	.3847417	0.000***	.0750985
	Level 2	.49614	0.000***	.1299303
	Level 3	.7880564	0.062*	.4225428

***Indicates significance at 1%; **indicates significance at 5% and * indicates significance at 10%. Provinces: KZN= KwaZulu-Natal, NW=North West, EC= Eastern Cape, LP= Limpopo. Source: Author's compilation from Stata output

In Table 6.5, a matric qualification for a household head was not significant in increasing the probability of poverty exit, while it was significant in reducing the probability of entering poverty. Being headed by an individual with a certificate with less than matric, a diploma beyond matric or a bachelor's degree increased the probability of that household exiting poverty. This was because higher education is positively associated with the probability of poverty exit (Denisova 2007); although in Pakistan the education level of the household head did not significantly affect the probability of poverty exit (Baulch and McCulloch 2002).

Having a household head who was married or living with a partner significantly increased the probability of exiting poverty. This could be as a result of additional resources (income) that a partner provides to the household. Baiyegunhi and Fraser (2010) found the incidence of poverty to be higher among households with single heads than those with married heads. The results also show that having a household who was never married also increased the probability of exiting poverty.

Household size ranging from between two and three members to more than six members significantly decreased the probability of exiting poverty compared to single-member households. The magnitude of the decrease differed, with the greatest magnitude observed among households having more than six members. This may be explained by the fact that household resources were shared among more members in larger households. This finding supported what has been found in other studies that the larger the household, the higher the probability of the household being poor (Finn and Leibbrandt 2013; Finn and Leibbrandt 2016; Meyer and Nishimwe-Niyimbanira 2016). However, in Russia, Denisova (2007) found the

opposite, with larger household size increasing the probability of households exiting poverty. This could be attributed to more adults being attached to the labour force and having a job in the sample (Denisova 2007).

Not economically active and unemployed household heads significantly reduced the probability of a household exiting poverty, as expected from economic theory. The magnitude of the reduction was highest for households whose head was unemployed. The same was observed in the Netherlands, where an unemployed household head reduced the probability of poverty exit (Nordholt 1996), while McKernan and Ratcliffe (2005) found that employment gained by a household head increased the likelihood of poverty exit.

Like the poverty entry model, the geographic variable indicated that OR Tambo was the only district in the Eastern Cape that significantly reduced the probability of exiting poverty. The other districts, Alfred Nzo, Chris Hani and Joe Gqabi did not significantly reduce the probability of exiting poverty. The geographic variable also indicated that the same districts in KwaZulu-Natal that significantly increased the probability of a household entering poverty, also significantly reduced the probability of a household exiting poverty. The only exceptions were the Umgungundlovu and Zululand districts. While residing in Umgungundlovu significantly increased the probability of entering poverty, residing in that district did not reduce the probability of a household exiting poverty. On the other hand, residing in Zululand did not significantly increase the probability of entering poverty, but it did significantly reduce the probability of exiting poverty for poor households.

Among the districts in Limpopo, residing in either the Greater Sekhukhune, Mopani or Vhembe districts significantly reduced the probability of exiting poverty. These same districts were also among those that significantly increased the probability of entering poverty. In contrast, residing in the Capricorn and Waterberg districts significantly increased the probability of a household entering poverty, but did not significantly reduce the probability of a household exiting poverty.

Table 6.5 also indicates that living in the Ngaka Modiri Molema district reduced the probability of a household exiting poverty, while living in the Dr Ruth Segomotsi Mompati did not. Residing in these two districts did not significantly increase the probability of a household entering poverty.

The districts associated with a lower probability of households exiting poverty were found to be allocating resources inefficiently (Ncube and Vacu 2018). In addition, Stats SA (2014)

identified these districts to be among the poorest twenty districts in South Africa using the 2001 and 2011 censuses. These could explain why living in these districts reduced the probability of exiting poverty.

Lastly, Table 6.5 also reports the effect of the level of income diversification on the probability of exiting poverty. The results indicate that all levels of diversification increased the probability of exiting poverty relative to not diversifying income sources at all. This result aligned to studies that have shown that income diversification is poverty reducing (Awotide, Awoyemi and Diagne 2012; Etim and Edet 2016; Maja and Oluwatayo 2018), and in this case, having at least two income sources improved the chance of households exiting poverty. The higher the number of income sources, the greater the magnitude or economic significance of the increase. In other words, the higher the average household income, the higher the probability of exiting poverty because of the strong correlation observed between the level of diversification and average household income. A household with a level 3 degree of diversification or four income sources had the highest magnitude as reflected by the size of the coefficient. This level of diversification corresponded with the highest household average income.

6.4 Summary

The purpose of this chapter was to present the results on the effect of income diversification on rural household poverty transitions to determine whether this strategy could aid rural households out of poverty or prevent households from entering into poverty. Other factors that also affect poverty, as identified in the literature, were also included. The chapter used the poverty spell approach to analyse the duration of poverty and determine the factors that affect the conditional probability of poverty entry and poverty exit. The probability was on condition that a household entered poverty at time t, given that it had not been poor until time t (poverty entry model), or that a household exited poverty at time t given that it had been poor until time t (poverty exit model).

The results of the survivor function for both poverty entry and poverty exit indicated a decline over time. For the survivor function of poverty entry, this implied that fewer and fewer households "survived" entering poverty or did not enter into poverty over time. For the survivor function of poverty exit, this indicated that fewer and fewer households "survived" the event exiting poverty or they did not exit poverty over time. This implied that relatively more households did experience a poverty exit. This finding aligned with the general decline in poverty observed in the FGT analysis over time.

The results of the Cox proportional hazard models reported above highlight some important differences between the conditional probability of entering poverty after having been non-poor and of exiting poverty after having been poor. Some of the covariates affected the probability of entry and exit differently, while others had a reinforcing effect on poverty, and still others had no effect on either poverty entry or poverty exit.

Specifically, having a household head that was in retirement age or beyond reduced the probability of a household entering poverty and increased the probability of exiting poverty. This was because individuals in this category had access to old age grants particularly in the context of the rural sample investigated in this research. With regards to education, having a household head with a matric qualification reduced the probability of a household entering poverty, while to increase the probability of a household exiting poverty required an education level beyond matric by the household head. The marital status of a household head did not have any effect on the probability of a household entering poverty, but did affect a household exiting poverty.

A household with two or more members was found to have a reinforcing effect on poverty status, by increasing the probability of poverty entry and reducing the chance of poverty exit. Similarly, having either an unemployed or an economically inactive household head increased the probability of a household entering poverty and reduced the probability of a poor household exiting poverty. Both these findings were as expected and supported what has been found in other studies.

The district variables gave different results, which indicated a spatial component to poverty entry and poverty exit. Apart from the Capricorn, Waterberg, Umgungundlovu, Zululand and Ngaka Modiri Molema districts, all the districts that were found to increase the probability of a household entering poverty were also found to reduce the probability of exiting poverty. Several factors contributed to this, including the finding that these districts were among those identified as inefficient in their resource allocation as well as declining growth over time, particularly in the districts of Limpopo province. The districts were also among the poorest twenty districts in South Africa according to Stats SA.

The index of diversification variable gave results that were consistent with what was observed in previous studies and theories about income diversification. The results indicated that there was no difference in the probability of entering poverty for a non-poor household that had two income sources (level 1 diversification) and a non-poor household that was not diversifying at

all. However, when income sources increased to three and four sources, the probability of entering poverty reduced significantly for non-poor households. On the other hand, diversification of income with at least two income sources increased the probability of poverty exit for a poor household. This probability increased with an increase in the number of income sources and average income associated with each level of diversification.

CHAPTER SEVEN

RESULTS: EFFECTIVENESS OF INCOME DIVERSIFICATION AS A STRATEGY FOR POVERTY REDUCTION AND FACTORS AFFECTING ITS EFFECTIVENESS

7.1 Introduction

The previous chapter reported the results of the relationship between income diversification and rural household probabilities of poverty entry and exit. The results indicated that income diversification influenced rural household poverty transitions. The purpose of this chapter is to present the results on the effectiveness of income diversification as a strategy for poverty reduction and the factors that affect its effectiveness. Thus, the chapter addresses two specific objectives.

7.2 Effectiveness of income diversification

In this study effectiveness of income diversification as a strategy for poverty reduction referred to income diversification enhancing poverty reduction or income diversification having a negative effect on poverty. Therefore, effectiveness of income diversification was measured by determining the effect of income diversification on households' probabilities of poverty entry and poverty exit. Income diversification was considered effective if it negatively affected poverty entry and/or positively affected poverty exit.

The results of the effectiveness of income diversification were observed in the previous chapter from the Cox proportional hazard models for poverty entry and poverty exit. Specifically, the poverty entry model indicated that for non-poor households that diversified with two income sources, the strategy did not affect the probability of entering poverty. When income sources increased to three and four income sources diversification was found to have a negative effect on the probability of poverty entry. Thus, at those levels of diversification, the strategy was effective in reducing the probability of poverty entry.

For poor households, the results indicated that having two income sources had a positive effect on the probability of exiting poverty. Thus, at that level of diversification, the strategy was

found to be effective in enhancing the probability of poverty exit. The same was observed when income sources increased to three and four, the strategy was effective in enhancing the probability of poverty exit for poor households.

7.3 Factors affecting the effectiveness of income diversification

The literature on income diversification indicates several factors that affect household income diversification or the determinants of household income diversification (Debesai 2020; Agyeman, Asuming-Brempong and Onumah 2014; Javed et al. 2015; Diep and Vien 2017; Maja and Oluwatayo 2018). These factors affect income diversification positively or negatively, although varied results have been reported in the literature (Debesai 2020), highlighting the importance of different contexts.

To determine the factors that affect the effectiveness of income diversification in this study, it was assumed that those factors that positively and significantly affect income diversification also positively affect its effectiveness and those factors that negatively and significantly affect income diversification negatively affect its effectiveness.

An ordered probit model was used to determine the relationship between income diversification and these factors. The dependent variables were the different levels of diversification as determined in the previous Chapter in the Cox proportional hazards models. These were grouped based on the number of income sources as follows; one income source (no diversification), two income sources (level 1 diversification), three income sources (level 2 diversification) and four income sources (level 3 diversification). The independent variables were age, education level, marital status, and employment status of the household head, as well as household size, district of residence and the income generating activities from which households earned a living. Two separate ordered probit models were estimated, one for households that were poor and another for households that were not poor.

7.3.1 Factors affecting effectiveness of income diversification among poor households

Table 7.1 shows the factors affecting the level of income diversification among poor households. The coefficients and p-values of those factors, as well as the standard errors are also reported in Table 7.1. The sign of the coefficient indicates whether the latent variable income diversification (y^*) increases with the independent variables. A positive sign indicates that the independent variable was more likely to be in the higher category than in the lower category of the dependent variable. In this context, a positive sign indicated that the

independent variable was more likely to be in the higher level of income diversification. A negative sign indicated the opposite. Table 7.1 also shows the performance of the model. The Prob>chi2 of 0.0000 was significant and indicated that the independent variables were jointly significant in explaining changes in the categories of income diversification. The McFadden Pseudo R^2 of 0.2095 also indicated a good fit for the model as it fell within the range of 0.2 and 0.4, which is regarded as excellent for maximum likelihood estimations (McFadden 1977; Lee 2013).

Table 7.1 shows that a poor household headed by a female was more likely to be in the lower level diversification, although not significantly so. In Eritrea, Debesai (2020) also observed no significant effect of gender on income diversification. Other studies, however, have found that female-headed households diversified more than male-headed households (Javed et al. 2015). In other studies, it was found that men rather than women diversified into high-return activities (Alemu 2012; Babatunde and Qaim 2009). For the age variable, the results indicated that a poor household headed by an individual beyond retirement age was more likely to be in the lower level of income diversification compared to the adult reference category. This could be because the household heads were older, they engaged in less diversified income generating activities. Some studies have indicated a negative relationship between diversification of income and age of the household head (Agyeman, Asuming-Brempong and Onumah 2014; Debesai 2020). The other age categories did not have any significant effect. The education of the household head in a poor household did not affect the likelihood of being in any category of income diversification. The expectation, based on the relationship between income diversification and education was that this variable would significantly and positively affect the likelihood of a household being in a higher level of income diversification. In this study, however, this result could be explained by the fact that among the poor households observed, the majority had an education level less than matric, which could make the effect of education on income diversification insignificant when compared to education levels higher or beyond matric. This was because more and better income generating opportunities are more accessible to individuals with higher education levels (Diep and Vien 2017; Oluwatayo 2009; Abdulai and CroleRees 2001, Babatunde and Qaim 2009).

Table 7.1: Factors affecting the level of income diversification among poor households

Number of obs	963	
LR chi2(46)	345.67	
Prob > chi2	0.0000	
Pseudo R^2	0.2095	
Log likelihood	-652.10382	

	Variable	**Coefficient**	**P-value**	**Standard Error**
Gender	Female	-.024004	0.847	.12402
Age	Youth	-.1127012	0.623	.2293345
	Retirement age	-.1822092	0.164	.1310495
	Beyond retirement	-.2292348	0.040**	.1118824
Education	Primary education	-.0178535	0.864	.1040323
	Secondary education	.0839551	0.558	.1434909
	Certificate with less than matric	-.0628931	0.942	.8574045
	Matric	.0551051	0.838	.2695429
Marital status	Married	-.0133408	0.914	.1241458
	Divorced/separated	-.1618976	0.398	.1916071
	Never married	-.043473	0.727	.1243597
	Living with partner	.0330491	0.911	.2971309
Household size	Between 2-3 members	1.011105	0.008***	.3806655
	Between 4-6 members	1.4645	0.000***	.376898
	More than six members	1.671021	0.000***	.3816537
Employment status	Not economically active	-.2115577	0.106	.1310124
	Unemployed	-.4614771	0.018**	.1958348
District	Alfred Nzo[EC]	.3526472	0.434	.4510196
	Chris Hani[EC]	.4441079	0.322	.4487193
	Joe Gqabi[EC]	.1501548	0.747	.4658837
	OR Tambo[EC]	.61306	0.150	.4256758
	Amajuba[KZN]	.535301	0.226	.4421548
	iLembe[KZN]	.647852	0.173	.475068
	Sisonke[KZN]	.57207	0.184	.4308612
	Ugu[KZN]	.6397983	0.136	.4286134
	Umgungundlovu[KZN]	.3184025	0.480	.4510349
	Umkhanyakude[KZN]	.253208	0.596	.4780697
	Umzinyathi[KZN]	.5730237	0.185	.4319797
	Uthukela[KZN]	.3535556	0.418	.4361074
	Uthungulu[KZN]	.5150269	0.225	.4245995
	Zululand[KZN]	-.0679696	0.882	.456607
	Capricorn[LP]	.4517227	0.314	.4485219
	Greater Sekhukhune[LP]	.0547879	0.902	.4449679
	Mopani[LP]	.2982454	0.495	.4369904
	Vhembe[LP]	.6956939	0.119	.4462828
	Waterberg[LP]	.1660455	0.713	.4509271
	Dr Ruth Segomotsi Mompati[NW]	.2413453	0.603	.4644933

	Ngaka Modiri Molema[NW]	.2616983	0.555	.4437171
Income sources	Wages	.9966099	0.000***	.116705
	Social grants	.7450273	0.000***	.1353284
	Other government income	1.084079	0.228	.8983206
	Investment income	.8845587	0.000***	.2204761
	Capital income	.1624203	0.600	.310145
	Remittance	1.010469	0.000***	.1017103

***Indicates significance at 1%; **indicates significance at 5% and * indicates significance at 10%. Provinces: KZN= KwaZulu-Natal, NW=North West, EC= Eastern Cape, LP= Limpopo. Source: Author's compilation from Stata output

Table 7.1 also indicates that for poor households, all the categories of the household size variable were statistically significant. This implied that a household with these respective numbers of household members was more likely to be in the higher level of income diversification compared to a single member household. This could be because more household members could engage in more income generating activities and increase diversification (Oluwatayo 2009; Debesai 2020), given that the household members were working adults (Alemu 2012). When the household head in a poor household was unemployed, it was more likely for the household to be in the lower level of income diversification than when the household head was employed. This was because an unemployed household head decreased the number of income sources of the household and therefore its income diversification. The results also indicated that a poor household that earned wages, social grants investment income and/or remittance income, was more likely to be in the higher level of income diversification than a household that earned income from agricultural activities. Other government income made up of UIF and workmen's compensation as well as capital income were not significant. This reflected that these income sources were relatively less important among this group of households. This was also reflected by the relatively few households observed to earn income from these sources in Chapter 4.

What is also observed from the results in Table 7.1 is that none of the districts were statistically significant in affecting the likelihood of income diversification among the poor households, either in the lower or higher levels of diversification. Thus, the finding indicated that for poor households, the district of residence did not seem to matter or affect their levels of income diversification.

The following section reports the results of the ordered probit regression of the non-poor households to determine if there are differences from what was observed with the results of the poor households.

7.3.2 Factors affecting effectiveness of income diversification among non-poor households

The results reported in this section are shown in Table 7.2. Table 7.2 reports the factors affecting the level of income diversification among non-poor households. The coefficients, p-values and standard errors of those variables are also shown in Table 7.2. In addition to these, Table 7.2 also reports the performance of the model. The Prob>chi2 of 0.0000 indicates that, jointly, the independent variables significantly explained changes in the categories of income diversification among these non-poor households. The McFadden Pseudo R^2 of 0.2270 fell within the range of 0.2 to 0.4, and thus indicated a good fit for the model (McFadden 1977; Lee 2013).

Table 7.2 indicates that the female variable of a non-poor household was significant and negative. This meant that, a non-poor household that was headed by a female was more likely to be in the lower level of income diversification. The finding aligned to what was observed in other studies, where female-headed households were observed to diversify less than male-headed households did or in lower income generating activities (Alemu 2012; Babatunde and Qaim 2009). The education variable indicated that a non-poor household headed by an individual with primary education or with secondary education was more likely to be in the higher level of diversification than a household headed by a household head with no schooling. In contrast, matric qualification indicated that a non-poor household was more likely to be in the lower level of income diversification. A possible explanation could be that because the household was non-poor, even with a relatively higher education level, there was relatively little diversification undertaken by the household for growth or accumulation. The household may be specializing or relying on a few income sources only. Similarly, the marital status indicated that a non-poor household with a married head was more likely to be in the lower level of income diversification than a widowed household head. This again could be pointing to more specialization of income sources among such non-poor households rather than diversification.

Table 7.2: Factors affecting the level of income diversification among non-poor households

Number of obs		901		
LR chi2(46)		393.08		
Prob > chi2		0.0000		
Pseudo R^2		0.2270		
Log likelihood		-669.20227		
	Variable	**Coefficient**	**P-value**	**Standard Error**
Gender	Female	-.2150615	0.058*	.1133896
Age	Youth	.0027612	0.990	.2106759
	Retirement age	-.0639883	0.633	.1341148
	Beyond retirement	-.0013279	0.991	.119152
Education	Primary education	.1945119	0.092*	.1153076
	Secondary education	.2525074	0.086*	.1471732
	Certificate with less than matric	-.4157154	0.345	.4401626
	Matric	-.3731787	0.042**	.183312
	Bachelor's degree	-.1387159	0.786	.5121018
	Higher degree	.604772	0.603	1.162215
Marital status	Married	-.2681824	0.057*	.1411701
	Divorced/separated	-.0115792	0.944	.1641356
	Never married	-.1859001	0.112	.1170602
	Living with partner	-.4438478	0.147	.3063866
Household size	Between 2-3 members	.860716	0.000***	.1233914
	Between 4-6 members	1.588555	0.000***	.135668
	More than six members	1.669323	0.000***	.1779554
Employment status	Not economically active	-.167124	0.198	.1299033
	Unemployed	-.0321899	0.885	.2225726
District	Alfred Nzo[EC]	-.4202651	0.088*	.2463172
	Chris Hani[EC]	-.3919197	0.107	.2434742
	Joe Gqabi[EC]	.0063248	0.980	.2493513
	OR Tambo[EC]	-.5546559	0.050**	.2827557
	Amajuba[KZN]	.0223086	0.943	.3143153
	iLembe[KZN]	-.5116786	0.104	.3145764
	Sisonke[KZN]	-.1113998	0.688	.2770476
	Ugu[KZN]	-.3824284	0.130	.2522547
	Umgungundlovu[KZN]	-.4998676	0.118	.3199531
	Umkhanyakude[KZN]	-.3475622	0.314	.3451634
	Umzinyathi[KZN]	-.5607117	0.030**	.2584866
	Uthukela[KZN]	-.4564324	0.057**	.2402838
	Uthungulu[KZN]	-.149853	0.551	.2511532
	Zululand[KZN]	-1.178164	0.003***	.3967555
	Capricorn[LP]	-.2156041	0.382	.2467557
	Greater Sekhukhune[LP]	-.2377576	0.457	.3195979
	Mopani[LP]	.0473861	0.863	.2747417
	Vhembe[LP]	-.5206558	0.135	.3483492
	Waterberg[LP]	-.241563	0.363	.265624

	Dr Ruth Segomotsi Mompati[NW]	-.664355	0.021**	.28874
	Ngaka Modiri Molema[NW]	-.2825784	0.225	.2329489
Income sources	Wages	.4301286	0.000 ***	.1158707
	Social grants	.5517105	0.000***	.1204383
	Other government income	2.177979	0.002***	.7010327
	Investment income	.8365563	0.000***	.1971041
	Capital income	.4104262	0.231	.3425838
	Remittance	.7014948	0.000***	.1024746

***Indicates significance at 1%; **indicates significance at 5% and * indicates significance at 10%. Provinces: KZN= KwaZulu-Natal, NW=North West, EC= Eastern Cape, LP= Limpopo. Source: Author's compilation from Stata output

Household size on the other hand, was observed to indicate relatively higher levels of diversification. Specifically, a household with between two and three members, four and six members as well as having more than six members were more likely to be in the higher level of income diversification than single member households. The finding aligned with expectation as well as with what was observed in other studies (Oluwatayo 2009; Debesai 2020), that more household members can engage in more income generating activities and thus increase diversification.

The district variable indicated a combination of significant and insignificant findings. The significant results were observed in six out of the 22 districts or in 27% of the districts. The remaining 73% did not indicate significant results. The six districts were, Alfred Nzo, OR Tambo, Umzinyathi, Uthukela, Zululand and Dr Ruth Segomotsi Mompati. The results indicated that a non-poor household that resided in any of these six districts was more likely to be in the lower level of income diversification compared to the reference district Bojanala.

This finding pointed to participation in relatively few income generating activities in these districts. In the Alfred Nzo and OR Tambo districts of the Eastern Cape, this reflected what was observed in Chapter 4, that there could be barriers of entry into high-return activities, which restricted diversification of incomes into high-return activities in these districts. Similarly, the Umzinyathi district has been identified as a predominantly rural district (Department of agriculture and rural development 2014), with agriculture being an important sector. The role of the non-farm sector (secondary and tertiary sectors) in job creation and employment was less significant (HSRC 2013). This therefore contributed to the result observed of the likelihood of participation in lower-level income diversification among the non-poor households in the district. In Zululand district, the primary sector, comprising mining

and agriculture, was the main economic sector in the district. However, the mining industry has dwindled over the years with agriculture playing a relatively more important role (Zululand Municipality 2014), also contributing to participation in lower-level income diversification. Similarly, the Uthukela district was predominantly rural, with households engaged in agricultural activities (Sinyolo, Mudhara and Wale 2017). Dr Ruth Segomotsi Mompati in the North West was also a predominantly agricultural district, made up of a majority of commercial and communal or subsistence farms (Van Riet 2012). Livelihood sources in the district were largely from commercial and communal cattle farming (Van Riet 2012).

From empirical findings, the non-farm sector is a source of high-return activities (Barret, Bezuneh and Aboud 2001a; Alemu 2012), thus the absence of such sectors or minimal participation in such sectors in these districts could result in the relatively higher likelihood of participation in low-level income diversification observed in Table 7.2. In addition, all these districts, except Dr Ruth Segomotsi Mompati, were observed to be below the efficiency frontier in their resource spending as indicated previously (Ncube and Vacu 2018). This could also be a contributing factor to the relatively higher likelihood of participation in low-level income diversification in these districts. What was observed overall with the district variable was that the district of residence seemed to matter in terms of the likelihood of participation in income diversification for non-poor households rather than for poor households.

Lastly, Table 7.2 indicates that all income sources, with the exception of capital income, were significant. This implied that a non-poor household that received income from these sources was more likely to be in the higher level of income diversification than a household participating in agricultural activities. Capital income was also insignificant among poor households, again reflecting that this income source was relatively less important among households in these districts as observed in the country over time (Prinsloo 2000; Kasongo and Ocran 2017).

7.4 Summary

The purpose of this chapter was to report the results on the effectiveness of income diversification as a strategy for poverty reduction and the factors that affect its effectiveness. Effectiveness of income diversification referred to the strategy enhancing poverty reduction. The results revealed that for non-poor households, the strategy was effective when households had at least three income sources, while for poor households, the strategy was effective when there were at least two income sources.

An assumption was made in the chapter that factors that positively affected income diversification also positively affected its effectiveness, while those that affected it negatively also negatively affected its effectiveness. The results were presented separately for poor and non-poor households and varying results were found.

A female household head was observed to be insignificant in the likelihood of poor households being in the lower level of income diversification, while this same variable was significant for the non-poor households. Similarly, education was found to be significant in affecting the likelihood of income diversification for non-poor households but not so among poor households. The same was observed for marital status of the household head among the non-poor compared to the poor households. Age and employment status, on the other hand, were significant in affecting the likelihood of lower-level diversification for poor households and less so for the non-poor households.

The variables household size and income activities were found to be significant and had the same effect on the likelihood of income diversification for both poor and non-poor households. These variables indicated a higher likelihood to participate in higher-level income diversification by both poor and non-poor households. The exception among the income sources was capital income, which did not have a significant effect on the level of income diversification for either poor or non-poor households. This indicated that this income source was relatively less important among these households.

The district variables indicated different results for poor and non-poor households. Specifically, all the district variables were insignificant for poor households. This indicated that a poor household's location of residence did not seem to affect its likelihood of income diversification, neither low nor high-level income diversification. On the other hand, the location of residence mattered for non-poor households. Districts that were predominantly rural with livelihood activities revolving around agriculture, significantly affected the likelihood of non-poor households being at lower-level income diversification. This pointed to minimal participation in non-farm economic activities of high returns in these districts.

CHAPTER EIGHT

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

This chapter presents the summary and conclusions of the research. The chapter also presents recommendations from the findings made and highlights the limitations of the study. The last section of the chapter points out areas of further investigation for future research.

8.2 Summary of the study

8.2.1 Background and problem statement

Poverty remains a major challenge globally, including in South Africa. In South Africa, poverty is most prevalent in rural areas with households trapped in a vicious cycle of poverty. Poverty is dynamic and households can transition in and out of poverty over time as opportunities and resources change. At the same time, poverty differs spatially due to economic activities, proximities to markets and availability of infrastructure.

To reduce poverty and vulnerability to shocks, households adopt various coping strategies such as risk pooling, savings and credit transactions and income diversification. Risk pooling as well as savings and credit transaction coping strategies have rarely been observed among rural households, with income diversification seen to be the most common and important strategy. This strategy has also been found to differ spatially and over time. Rural households in South Africa have also been observed to adopt this strategy. However, poverty remains high at around 53.5% in rural areas. Studies have indicated that in the past most households in rural areas generated their living from agriculture and agriculture-related activities. However, in recent years, agriculture no longer constitutes the main source of income in most rural households in South Africa.

Current literature in South Africa investigates poverty at aggregated national level, with distinctions between urban and rural areas also at the national level. At the same time, investigations of household income diversification strategies have been conducted over one period without analysing the effect of this strategy on poverty of rural households.

An understanding of the pattern of rural household income diversification strategies over time is important, because not understanding the strategies risks the implementation of development policies and programmes, which seek to reduce rural poverty but are blind to what households are doing. Such policies end up missing their targets by not providing rural communities with the kind of support and the conducive environment they require. The highly diversified portfolio of activities among rural households has been noted as a distinguishing feature of these households that have implications for poverty reduction in these areas because it means conventional approaches aimed at increasing single occupations may be missing their targets.

In South Africa, investigations at disaggregated levels are important because of the participatory (integrated) approach to development that the state has adopted. This involves local government and communities in development planning processes that identify programmes and initiatives to be implemented to alleviate poverty and other challenges faced by rural communities.

8.2.2 Purpose of the study

This study therefore investigated the pattern of rural household income diversification and its effect on rural poverty over time across localities in South Africa. This was achieved through the following specific objectives:

1. Analyse temporal and spatial variations of income diversity of rural households.
2. Identify whether income diversification among rural households is for survival or income growth.
3. Analyse the poverty status of households and the related poverty transitions over time.
4. Determine whether income diversification has assisted rural households to transition out of poverty over time.
5. Evaluate the effectiveness of income diversification as a strategy for poverty reduction.
6. Investigate factors affecting effectiveness of income diversification as a strategy for poverty reduction.

8.2.3 Methods and procedures

The study used secondary data from the NIDS covering the years 2008 to 2017. The study was based on a panel of 2555 observations over that period. These were in four provinces, KwaZulu-Natal, Eastern Cape, Limpopo and North West across 22 district municipalities. The study used a combination of household information, including household income, household

income generating activities and household size as well as the characteristics of the household head, namely gender, age, education level, marital status and employment status. The district of residence was also included in the analysis as a dummy variable. All the data was obtained from NIDS. Stats SA Lower Bound Poverty Lines for the years 2008, 2010, 2012, 2014 and 2017 were used as the poverty lines in the study.

To analyse the temporal and spatial variations of income diversification, the study used the SID over the period 2008 to 2017. In profiling rural household poverty and determining poverty transitions, the study followed an income approach. This was done to maintain consistency with the Simpson Index of Diversity, which was developed using household income sources and household income. A combination of the Foster-Greer-Thorbecke poverty measure (Pα) and transition matrices were used to determine the poverty status and transitions of rural households. To evaluate the relationship between household income diversification and poverty transitions, a spells approach, using the Cox proportional hazards model, was followed. Separate models were estimated for poverty entry and poverty exit to determine if the covariates of poverty had the same or differing effects on the conditional probability of poverty entry and poverty exit. The covariates included in both models were marital status, age, employment status, education, gender, household size as well as a dummy variable for the district of residence.

Lastly, to analyse the effectiveness of income diversification as a strategy for poverty reduction and to identify factors that affect its effectiveness, the study used an ordered probit model. The ordered probit model allowed for the categorization of different levels of income diversification. The model was estimated separately for poor and non-poor households to determine whether differences existed between the two groups. The same factors included in the Cox models were also included in the ordered probit models. In addition to these, however, households' income sources were also included in the ordered probit models.

8.2.4 Hypotheses tests

The study had four hypotheses:

1. The majority of rural households adopt income diversification.
2. Most rural households who engaged in income diversification did so to reduce poverty or used income diversification as a strategy for survival.

3. Most rural households who engaged in income diversification have remained above the poverty line over time.

4. The effectiveness of income diversification as a strategy for poverty reduction will depend on factors such as locality, economic activities, and household characteristics.

The results of the first hypothesis test indicated that the majority of these rural households were not diversifying their income. This equalled about 54% of the households, with the remaining 46% diversifying. Therefore, the null hypothesis that the majority of rural households adopt income diversification was rejected in the context of this study. The second hypothesis revealed that among the households that were diversifying their income, most did so for poverty reduction or for survival. At the same time, the results of the third hypothesis indicated that most households that engaged in income diversification remained above the poverty line. In other words, these households were not poor.

The results obtained from the second and third hypotheses seemed contradictory at first, because failure to reject both null hypotheses meant that 'most households that diversified their income sources did so to reduce poverty or for survival (hypothesis 2), which implied that most households were poor. At the same time however, the third hypothesis that "most rural households that engaged in income diversification have remained above the poverty line" implied that most households were non-poor. Thus, these results seemed contradictory. However, a closer look at the data of the households that were diversifying indicated 1185 diversifying households. From this number, 596 (50.2954%) were poor or fell below the poverty line, while 588 (49.7046%) were non-poor or above the poverty line. These numbers revealed a 50/50 split between the two groups of households that were diversifying their income, thus resulting in a failure to reject both hypotheses. The evidence from the study was therefore that both poor and non-poor rural households diversified their income, with an equal distribution among the poor and non-poor households.

The effectiveness of income diversification as a strategy for poverty reduction was observed to differ based on various factors. These factors were age, employment status, education level of the household head, marital status and household size (household characteristics), locality (district of residence) and economic activities (agricultural versus non-farm activities) in an area. These factors contributed to the likelihood of households participating in low-level diversification by diversifying less, or households participating in high-level diversification by diversifying more, and thus affecting the effectiveness of income diversification.

8.3 Major findings of the study

8.3.1 Temporal and spatial variations of income diversification strategies

The results revealed six income sources from which these households derived income. These were wage income, social grants, investment income, capital income, remittances, and income from agricultural activities. Wage income included income from formal employment, casual work, self-employment, 13th cheque, bonus payments, profit shares, income from friends as well as any extra piece-rate income. Social grants included disability grants, child support grants, foster care grants and care dependency grants.

The average monthly income derived from these sources of income was highest in the North West province and lowest in the Eastern Cape Province. This reflected the relatively high percentage of households earning wage income in the North West province compared to other provinces.

What was observed among the six income sources was that there was a concentration on four sources, namely wage income, social grants, remittances, and income from agricultural activities. However, the degree of diversification was relatively low, not more than 0.3 in any period. The temporal analysis revealed that the degree of diversification increased in each province over time from an average of 0.16 in 2008 to an average of 0.23 in 2017.

The spatial analysis of income diversification by province revealed that Limpopo province consistently had the highest degree of diversification except in 2012, when KwaZulu-Natal had the highest degree of diversification. Although the difference between the two provinces in that year was small. KwaZulu-Natal had the second highest degree of diversification throughout the study period, followed by North West province. The Eastern Cape province had the lowest degree of diversification overall, except in 2017, when the percentage of households receiving income from wages, investment income, remittances and income from agricultural activities increased. A single factor ANOVA test further supported that there was a difference in the mean degree of diversification observed spatially.

The results indicated that the North West province, which had the highest level of income among all the provinces, and the Eastern Cape, which had the lowest average income, were not diversifying the most. This finding differed from what other studies have found, where income diversification was mainly used by relatively wealthy households and/or poor households as a strategy for income growth and survival respectively.

8.3.2 Rural poverty and poverty transitions

Among the 22 districts observed, the study found average income per capita to be less than R1000 per month in 55% of the districts, while in the remaining 45%; the per capita income was over R1000 per month in real prices. The lowest income per capita was observed in the Zululand district at an average of R475 and the highest per capita income was observed in the Bojanala district with an average of R2502. Thus, the average per capita income of the wealthiest district was about 5.3 times that of Zululand. The analysis revealed that the districts in the North West were relatively wealthier even when taking into consideration household size.

The overall results revealed poverty headcounts that were very high in all the districts, although there was a general decline over time. The decline was observed in 77% of the districts, while in 23% of the districts, poverty increased. Specifically, Zululand, OR Tambo and Sisonke districts had the highest poverty headcount throughout the period. This equalled on average 80% of households not being able to afford basic food and non-food items in these districts.

The results from the poverty gap ratio revealed that the OR Tambo district had the highest poverty gap ratio, followed by Zululand and Sisonke districts, although the difference among these districts was small. These same districts had the highest headcount poverty. This indicated that, not only were there relatively more poor households in these districts compared to others, but the households were also furthest from the poverty line compared to households in the other districts. On the other hand, the Bojanala district had the lowest poverty gap ratio. This was followed by the Ngaka Modiri Molema and Joe Gqabi districts, which had the highest income per capita among all the districts over the time period. The general finding was therefore that the districts that had the highest poverty rates also had the highest poverty gap ratios, while those that had the lowest poverty rates also had the lowest poverty gap ratios.

Analysis of poverty transition was conducted to determine how households were transitioning in and out of poverty between survey waves. The results revealed transitions between wave (t) and wave (t+1). These results indicated that the majority of households in the districts remained in their initial status. In other words, for households that were poor in wave (t), over 50% of those households remained poor in wave (t+1). Similarly, among those household that were non-poor in wave (t), over 50% of those households remained non-poor in the following wave. This was observed across districts and waves. By observing the same households over time, the finding was that the majority of those who were poor in one wave remained so in the

following wave. This implied that some households were consistently poor throughout the waves showing minimal transitions. Similarly, among the non-poor households, this implied that some were continually non-poor throughout the waves because the majority did not transition.

8.3.3 Relationship between income diversification and poverty transitions

Although the chapter sought to investigate the relationship between poverty transitions and income diversification, other factors such as gender, age, education, marital status, employment status, household size as well as the district of residence were also included in the poverty entry and poverty exit models.

The results of the survivor functions for poverty entry and poverty exit indicated that both functions were decreasing over time. This indicated that fewer and fewer households were surviving poverty entry and poverty exit. The poverty entry function gave a pessimistic view, while the poverty exit function was positive.

The results of the Cox proportional hazards models revealed differences in how the selected variables affected the probability of poverty entry and poverty exit. The results indicated that some of the variables had a reinforcing effect on poverty, in that they increased the probability of poverty entry and reduced the probability of poverty exit. Other variables were found to affect either poverty entry or poverty exit, but not both, while still others had no effect on either probability of poverty entry or poverty exit. Specifically, having a household head that is in retirement age or beyond retirement age reduced the probability of a non-poor household entering poverty and increased the probability of a poor household exiting poverty. This was the only variable that had such a hindering effect on poverty in both entry and exit models.

On the other hand, household size was found to have a reinforcing effect on poverty status, by increasing the probability of a non-poor household entering poverty as well as reducing the chances of a poor household exiting poverty. In particular, a household size of two and above six members, increased the probability of a non-poor household entering poverty and reduced the probability of a poor household exiting poverty. Similarly, having either an unemployed or an economically inactive household head increased the probability of a non-poor household entering poverty and reduced the probability of a poor household to exit poverty.

With regards to education, having a household head with a matric qualification reduced the probability of a non-poor household entering poverty, while to increase the probability of a

poor household exiting poverty required an education level beyond matric by the household head. The marital status of a household head did not have any effect on the probability of a non-poor household entering poverty, but it did affect a poor household exiting poverty.

The district of residence also had varying effects on the probability of poverty entry and poverty exit. Residing in the OR Tambo, Amajuba, Sisonke, Ugu, Uthungulu, Greater Sekhukhune, Mopani and Vhembe districts reinforced the probability of poverty. The probability of entering poverty increased for non-poor households in these districts, and at the same time, the probability of exiting poverty decreased for poor households in these districts. The poverty entry model also indicated that residing in Umgungundlovu, Capricorn and Waterberg also increased the probability of poverty entry but had no effect on the probability of poverty exit. What these results implied was that the non-poor households in these districts that had been non-poor until time t, had a significantly increased probability of entering poverty. On the other hand, the poverty exit model indicated that residing in the Zululand and Ngaka Modiri Molema districts reduced the probability of poverty exit but had no effect on the probability of poverty entry. The finding here indicated that poor households in these districts which were poor until time t, had a significantly reduced probability of exiting poverty.

A contributing factor to the findings in these districts in both the poverty entry and poverty exit models above was that they were found to be inefficient in their resource allocation or financial spending, with efficiency scores below the efficiency frontier. In addition, there was a decline in growth in the districts of the Limpopo province Capricorn, Greater Sekhukhune, Mopani, Vhembe and Waterberg districts over the period 2010 to 2016. The study also found that the majority of these districts had an average per capita income that was below R1000 per month and relatively high headcount poverty ratios. These districts were also among the poorest twenty districts in the country.

Lastly, the income diversification variable was found to give significant results in both models of poverty entry and poverty exit. There was a strong and positive relationship between the level of diversification and average household income in the study, with a correlation coefficient of 0.9993. Average household income increased with an increase in the level of diversification. The effect of income diversification was as expected from economic theory.

The results of the poverty entry model indicated that a non-poor household that only had two income sources (level one diversification) was not statistically different from a non-poor household that had one income source. Such a diversification strategy (of two income sources)

did not seem to have an effect on the probability of a non-poor household entering poverty. When the income sources were increased to three (level two diversification) and to four sources (level three diversification), this significantly reduced the probability of a non-poor household from entering poverty. Similarly, the poverty exit model indicated that a household that was poor and diversifying their income with two income sources had a significantly increased probability of exiting poverty than a poor household that only had one income source. The same was observed for households with three and even four income sources. Their probability of exiting poverty was significant. The probability of exiting poverty for these households increased the higher the number of income sources available, reflecting the higher average income associated with higher levels of diversification.

8.3.4 Effectiveness of income diversification as a strategy for poverty reduction and factors affecting its effectiveness

This chapter had two parts. The first part was to evaluate whether income diversification was effective as a strategy for poverty reduction and the second part was to identify the factors that affected its effectiveness. Income diversification was considered effective as a strategy for poverty reduction if it enhanced poverty reduction or if it had a negative effect on poverty. The results of the first part were observed in addressing the fourth objective as summarised in section 8.3.3 above. The Cox proportional hazard models for poverty entry and poverty exit gave these results.

The poverty entry model indicated that for a non-poor household that diversified with two income sources only, the strategy did not affect its probability of entering poverty and such a household was not different from a non-poor household that had only one income source and did not diversify. At three or more income sources, the strategy was found to reduce the probability of a non-poor household entering poverty. This probability was observed to increase with an increase in the number of income sources.

For poor households, the results of the probability of poverty exit model indicated that when a household diversified with at least two income sources, this increased its probability of exiting poverty compared to a household that only had one income source and was not diversifying. This probability increased with the number of income sources or the degree of diversification.

The second part of the chapter was to identify factors that affected the effectiveness of income diversification strategy. It was assumed that the factors that positively affect income diversification strategy also affect its effectiveness positively. At the same time, those factors

that negatively affect income diversification were assumed to affect its effectiveness negatively. The results indicated that some variables affected the likelihood of income diversification significantly and positively, while others did not.

For poor households, age and employment status of the household head significantly affected the likelihood of income diversification into lower-level diversification. Specifically, households headed by an individual beyond retirement age and those headed by an unemployed individual were more likely to be in the lower level of income diversification. The finding aligned with studies that found negative relationships between income diversification and age, as well as income diversification and unemployment status.

On the other hand, household size variables and income activities were significant in affecting the likelihood of income diversification of the poor households into higher-level diversification. The household size variables indicated that households with larger sizes were more likely to be in the higher-level income diversification compared to single member households. This indicated that income diversification increased with household size. The income activities also indicated that a poor household receiving income from wages, social grants, investment income and remittances was more likely to be in the higher-level income diversification than a poor household engaged in agricultural activities.

The findings for the non-poor households varied from those of the poor households. A female household head, education (specifically matric qualification) and marital status were significant in affecting the income diversification of non-poor households. Specifically, a non-poor household headed by a female, or an individual with a matric qualification or one that was married was more likely to be in the lower-level income diversification.

A non-poor household headed by an individual with primary or secondary education was more likely to be in the higher-level income diversification compared to a household headed by an individual with no schooling. In addition, household size and income activities were also significant for non-poor households. A non-poor household with at least two members was more likely to be in the higher-level diversification than a non-poor household with a single member. In the same way, a non-poor household that earned income from wages, social grants, government income such as UIF and workmen's compensation, investment income and remittances was more likely to be in the higher-level income diversification than a non-poor household earning income from agricultural activities.

The district variables were significant only for the non-poor households in only six districts out of 22. The districts were Alfred Nzo, OR Tambo, Umzinyathi, Uthukela, Zululand and Dr Ruth Segomotsi Mompati. The results indicated that a non-poor household in any of these districts was more likely to be in the lower-level diversification compared to the reference district, Bojanala.

The literature indicates that activities in these districts are focused on agriculture. In the Alfred Nzo and OR Tambo districts possible barriers to entry into high-return activities could be the restriction of higher-level diversification in these districts. These districts are located in the Eastern Cape Province, where relative income levels were the lowest among all the provinces. From income diversification literature, it would be expected that households in these districts would diversify more than other districts. However, this was not observed in this study. Thus, indicating the possible existence of barriers to entry into high-return activities for the households. Similarly, in the Umzinyathi, Uthukela, Zululand and Dr Ruth Segomotsi Mompati districts minimal participation in non-farm activities, as identified in the literature, was a contributing factor to participation in low-level income diversification in these districts. This was because the literature indicates the non-farm sector to be a source of high-return activities which would improve the level of diversification.

8.5 Conclusions

8.5.1 Rural household income sources

The analysis of household income sources revealed that an average of 75% of households received social grants in all the provinces over the period of five waves. From this, the conclusion is that this source of income is important among these households and the social wage policy has had a wide reach in these provinces. On the hand, the percentage of households participating in agricultural activities was relatively low at 14%. This leads to the conclusion that this source of income has become relatively less important among rural households, contrary to what was observed previously in rural households of South Africa.

8.5.2 Temporal and spatial variations of income diversity

The temporal analysis revealed that, over time, the degree of diversification among these households was increasing, although relatively low. From this, the conclusion is that households were becoming less vulnerable over time as their income sources were becoming more diversified *ceteris paribus*. This was because evidence showed that income

diversification has a negative relationship with vulnerability to poverty, while also enhancing economic stability of households.

From the spatial analysis, the Eastern Cape Province, which had the lowest monthly income and the North West province, which had the highest average monthly income were seen not to be diversifying the most, deviating from what was observed in other studies. From this, the conclusion is that there could be entry barriers to high-return diversification opportunities and possible capacity constraints for households in the Eastern Cape, as also reflected by the low percentage of households earning wage income in that province. In the North West province, the finding pointed to relatively wealthy households that were generally specializing rather than growing their income through diversification.

8.5.3 Spatial variation of poverty status

The analysis on district poverty revealed that Zululand, OR Tambo and Sisonke districts had, on average, the highest headcount poverty and poverty gap ratios among all the districts over the period of five waves. This finding meant that not only were relatively more households poor in these districts, compared to others, but these households were also furthest from the poverty line. From this, the conclusion is that relatively more resources would be required to get households in these districts above the poverty line compared to households in other districts.

8.5.4 Temporal poverty transitions

The poverty transition results revealed that the majority of households, or over 50% of the households across the districts, remained in their poverty status between waves (*t* and *t+1*). Those that were poor remained poor in the subsequent wave and those that were non-poor remained non-poor in the subsequent wave. From this, it is concluded that the non-poor households have been resilient to poverty between waves. However, for the poor households, the conclusion is that the welfare of these households, as measured by their poverty status, was not improving between waves *ceteris paribus*.

8.5.5 Poverty survival functions

The survivor functions and the Kaplan-Meier results indicated that fewer households were surviving poverty entry and poverty exit over time. This implied that by 2017 some households that were non-poor had entered poverty and some that were poor had experienced poverty exit. From the FGT analysis, it was observed that there was a general decline in poverty in 77% of

the districts between 2008 and 2017. It is therefore concluded that the net outcome of the survivor functions was a decline in poverty among the households.

8.5.6 Key factors affecting household poverty transitions

The Cox regression results indicated that a household head that was in retirement or beyond retirement age had a hindering effect on poverty. This leads to the conclusion that the social wage policy through the old age pension transfers has had a lowering effect on households' poverty status, as many of these households received social grants. The Cox regression results also lead to the conclusion that education beyond matric and employment are important for reducing poverty entry and increasing poverty exit as these were significant factors in both models. Female headship was found to increase the probability of non-poor households entering poverty and reduce the probability of poor households exiting poverty. Although the variable was not statistically significant, it is regarded as an important factor in explaining the poverty status of households. The marital status was an important factor for poverty exit, because of additional resources that a partner can contribute to assist a household out of poverty, such as additional income.

The geographic variables indicated that some districts reinforced poverty by increasing the probability of poverty entry and reducing the probability of poverty exit. These districts were OR Tambo, Amajuba, Sisonke, Ugu, Uthungulu, Greater Sekhukhune, Mopani and Vhembe. Other districts only affected probability of poverty entry (Umgungundlovu, Capricorn and Waterberg) or probability of poverty exit (Zululand and Ngaka Modiri Molema). From these results, it is concluded that location is an important factor that affects poverty and that there are spatial variations in poverty. The spatial variations also affect household probabilities of poverty entry and poverty exit.

8.5.7 Income diversification and poverty

A significant negative relationship was observed between income diversification and household poverty. From this, the study concludes that income diversification has a reducing effect on poverty, in that it reduced the probability of non-poor households entering poverty and increased the probability of poor households exiting poverty. The study also concludes from those findings, that income diversification is an effective strategy for reducing poverty, *ceteris paribus*. This holds for non-poor households that diversified with at least three income sources and for poor households that diversified with at least two income sources.

8.5.8 Factors affecting effectiveness of income diversification

From the ordered probit results, it is concluded that among poor households, a household head beyond retirement age as well as an unemployed household head hindered the effectiveness of income diversification as a strategy for poverty reduction. This was because these factors contributed to the likelihood of poor households diversifying less. It is also concluded that a large household size and earning income from various sources such as wages, social grants, investment income and remittances in relation to agriculture enhanced the effectiveness of income diversification as a strategy for poverty reduction among poor households. These factors contributed to the likelihood of these households diversifying more.

Among the non-poor households, female headship, matric qualification, and a married household head are concluded as factors that hindered the effectiveness of income diversification. These factors contributed to households diversifying less. Secondary education, large household size and earning income from wages, social grants, government income such as UIF and workmen's compensation, investment income and remittances in relation to agriculture enhanced the effectiveness of income diversification as a strategy to prevent non-poor households entering poverty.

The effectiveness of income diversification as a strategy was observed to differ across districts only among non-poor households. Residing in the Alfred Nzo, OR Tambo, Umzinyathi, Uthukela, Zululand or Dr Ruth Segomotsi Mompati districts contributed to the likelihood of non-poor households diversifying less. Income activities in these districts predominantly revolved around agriculture, with minimal participation in the non-farm sector. From this, the study concludes that there were spatial variations in the effectiveness of income diversification as a strategy and this was affected, among others, by economic activities dominant in an area.

8.6 Recommendations

The study makes the following recommendations:

Provincial governments in KwaZulu-Natal, Eastern Cape, Limpopo and North West should target Zululand, OR Tambo, Sisonke, Amajuba, Uthungulu, Greater Sekhukhune, Mopani, Vhembe, Umgungundlovu, Capricorn, Waterberg and Ngaka Modiri Molema districts in their poverty alleviation efforts. This was because poverty rates were relatively high in some of these districts, while residing in others (Capricorn, Waterberg and Umgungundlovu) significantly increased the probability of poverty entry, whereas in districts such as Zululand and Ngaka

Modiri Molema the probability of poverty exit was reduced. This, however, does not imply that other districts in the provinces be ignored, as poverty was also relatively high in those other districts as well. The recommendation is that more effort be channelled to the identified districts in the study.

Promote and support education in these rural districts. Education was found to be a significant factor among poor and non-poor households, particularly education beyond matric level. Education reduced the probability of non-poor households entering poverty, while also increasing the probability of poor households exiting poverty. In addition, education contributed to higher levels of household income diversification. Thus, promoting education in these districts would go a long way in reducing poverty and improving household income diversification.

Prioritising female-headed households in poverty alleviation interventions. The study found female-headed households to have an increased probability of entering poverty and a reduced probability of exiting poverty. In addition, households headed by females were more likely to diversify less. This was further supported by national level statistics that female-headed households were more likely to be poorer than male-headed households. Although this study did not explicitly find this variable to be significant, within the broader context of poverty alleviation interventions, it is the recommendation of this study that female-headed households in these districts be prioritised.

Rural households should be supported in their efforts to diversify income as this is an effective strategy to reduce the probability of poverty entry and increase the probability of poverty exit. The effectiveness of this strategy was found to be affected by factors such as unemployed household heads, type of income generating activities, education level and the district of residence for non-poor households. These findings provide further support for the recommendation that efforts be channelled towards encouraging and supporting higher education, creating employment opportunities in rural areas, and promoting participation in income generating activities beyond agriculture.

The non-farm sector in the rural areas should be developed and promoted to create high-return opportunities for rural households in addition to agriculture. This is because the district results on income diversification indicated a high likelihood of participation in low-level income diversification within districts that were predominantly rural, with livelihood activities revolving around agriculture. Household participation in the non-farm-sector is another

pathway through which diversification of income reduces poverty and literature indicates the non-farm sector to be a source of high-return activities and opportunities. A combination of this pathway and farming activities can improve household poverty status, as these pathways are complementary. Promotion of the non-farm sector will require providing support to rural households through skills development and training, as well as business education to participate in non-farm sector activities. These can be self-employment opportunities through small, medium, and micro enterprises (SMMEs) and various public works projects. A conducive environment for business growth through access to start-up capital or access to credit and markets will be required. The North West province had a relatively high percentage of households earning wage income, which included; income from formal employment, casual work, self-employment, 13th cheque, bonus payments, profit shares, as well as any extra piece-rate income. Efforts to encourage this could also be channelled to districts in other provinces of KwaZulu-Natal, Eastern Cape and Limpopo, the three provinces that are known to be poor in South Africa.

8.7 Research contribution

The novelty of this research lies in combining temporal and spatial variations of poverty dynamics and household income diversification strategies at disaggregated district municipal level. Research on poverty dynamics has been done in South Africa, though at an aggregated national level, while income diversification has been investigated over single periods. Therefore, the current study adds to existing literature by providing insights on income diversification trends and poverty dynamics through an analysis at disaggregated levels over a nine-year period. The study contributes to rural household income diversification literature in South Africa by revealing the pattern of this strategy over time and across localities. The study also adds to poverty dynamics literature, particularly within rural districts, revealing household poverty statuses and transitions over time within these districts. Knowledge of the effect of income diversification on households' probability of poverty entry and poverty exit also represents another contribution to the literature.

The study explored the full set of the most recent NIDS data, focusing on the rural component at district municipal level. This had not previously been done. The study made use of analytical techniques that have not been previously used in the South African income diversification and poverty dynamics literature. The approach followed, particularly the application of the Simpson Index of Diversity and the poverty and non-poverty spells approach through the

proportional hazard models, represents a novel approach and contribution to the body of knowledge in South Africa. The research models the levels of diversification into categories, which enable the use of an ordered probit model; this is a different approach to what has been done before in South African studies.

8.8 Limitations of the research and areas of further research

The initial intention of the research was to investigate income diversification and poverty dynamics at local municipal level in rural areas of South Africa. The data at that disaggregated level are held secured at DataFirst's Secure Research Data Centre in the School of Economics, at the University of Cape Town. Access to the data is subject to approval and only allowed at DataFirst facilities (http://www.nids.uct.ac.za/nids-data/secure-data). Efforts to access the data were made, but due to travel restrictions and the national lockdown as a result of COVID-19, the data could not be obtained. Therefore, the publicly available district level data was used and the study was adjusted.

The study sought to investigate income diversification patterns of rural households and their effect on rural poverty. The unit of analysis was the household, although there were limitations because of the nature of the data used. The NIDS data follows a panel of individuals and not a panel of households. Therefore, the analysis in this research, though based on some household information such as household size and household income, did not fully explore the household dynamics because of the possible changes in household composition from wave to wave. The study thus relied more on information of the household heads, which was consistent throughout the waves. This, therefore, limited the analysis on household dynamics in this current research.

The focus of the study on rural districts and household heads that were consistently in the panel throughout all the waves meant that those who were not consistently interviewed, though in rural districts, were not included in the study. Exclusion of these could mean the current study may have missed some elements of income diversification and poverty dynamics that were unique to that group of households.

The income generating activities, specifically wage income could not be disaggregated further because the publicly available NIDS data does not provide further details on this variable. The disaggregated detail of this variable is kept secured by NIDS with minimal access at DataFirst's Secure Research Data Centre in the School of Economics, at the University of Cape Town. Due to the COVID-19 pandemic that prohibited traveling, this variable could not be

disaggregated further to determine the specific non-farm income sources in which households engaged. An area of further research is exploring the nature of the non-farm activities contained in this variable to better understand rural income diversification. Studies have indicated that the non-farm sector has become relatively important in several African countries. Some studies in South Africa also indicate that agriculture is no longer the mainstay of the rural areas and even this current research also points to this, with relatively less participation in agricultural activities in some of the provinces. Thus, further investigation into the details of the non-farm sector would enhance understanding in this area in rural South Africa.

Lastly, future research can explore the dynamics of income diversification and rural poverty at local municipal level, including investigation in those provinces not covered in this research such as the Free State, Mpumalanga and Northern Cape which could not be undertaken because of data challenges.

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