POTENTIAL IMPACT OF LAND REDISTRIBUTION ON THE SOUTH AFRICAN ECONOMY

by

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DECLARATION

I declare that "**POTENTIAL IMPACT OF RURAL LAND REDISTRIBUTION ON THE ECONOMY OF SOUTH AFRICA"** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

MUKARATI JULIUS .28 August 2023

Full names **Date**

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ABSTRACT

Natural resource ownership programmes are introduced as a way of improving income distribution and alleviating poverty in rural areas that are mostly in developing countries. These ownership programmes range from fishing rights ownership to rural land redistribution programmes under which rural land redistribution is the most dominant and common policy in developing countries. In the case of South Africa, land redistribution policies are still being implemented in line with the national development plan targeting extreme poverty alleviation and reduction of wide income disparities by the year 2030. Although the policies can be regarded as effective, they may have diverging effects on economic growth, poverty, and income distribution mostly in developing countries.

Land redistributive policies can be viewed as effective tools for reducing rural poverty mainly because agriculture continues to be a major source of rural livelihood and a contributor to rural economic growth. Theoretically, agricultural land reform significantly contributes towards poverty alleviation through increased average income, improved income distribution, increased crop yield, and demand for export-oriented agricultural products, thereby increasing the overall welfare of smallholder farmers. Empirically, in most developing countries, the impacts of redistributive policies have mostly been analysed using static economy-wide computable general equilibrium (CGE) models. Although these models are widely used in assessing the impacts of these economic policies, the potential overall policy impacts comprising short-run, long-run and detailed distribution effects and the over-time behavioural response to policy shifts are not adequately captured. The economic structural changes and economy-wide impacts need to be assessed and captured over time. A South African Social Accounting matrix can be used as a data base to construct a dynamic CGE model to simulate the potential impact on household welfare in South Africa. A dynamic model will be appropriate because rural land redistribution is a long-term investment, while simulation is essential for detailed distributional analysis of poverty.

Although several studies have been conducted on the impacts of rural land redistribution policies in South Africa, in the researcher's knowledge, none of them have applied a dynamic CGE model to assess the poverty impacts, especially of the proposed government rural land redistribution policy. Essentially, the empirical rural land redistribution studies accounted for neither the dynamics nor distributive effects for a detailed poverty analysis of the rural land redistribution programme due to the static nature of the model. Therefore, this study seeks to assess how government redistributive policies may affect household welfare in the short and long-run, focusing on poverty and income distribution in South Africa by applying a dynamic CGE model.

The empirical results showed that there is a strong connection between the agriculture sector and household income as rural households mostly derive their income from agricultural activities. This implies that any policy that targets the agriculture sector will have an impact on rural household income.

Contrary to the general view that rural land redistribution in developing countries is disinclined to poverty and income inequalities, the study established that properly implemented rural land redistribution coupled with government support is an important strategic policy in poverty reduction with long-term economic benefits. The study also identified the various channels through which rural land redistribution impacts rural household income. It can be noted that poorer households are the net direct beneficiaries of rural land redistribution, particularly through factor returns. It can be foreseen that improving household access to productive land could be key to sustainable and inclusive economic growth in South Africa. The results support the claim that rural land redistribution coupled with agriculture investment and government support can be effective in improving household welfare. It is recommended that the South African government should increase investment towards land beneficiaries as a way of boosting agriculture production.

KEY WORDS: Computable general equilibrium, Microsimulation, Poverty, Income distribution

LIST OF ACRONYMS

CES	Constant Elasticity of Substitution
CGE	Computable General Equilibrium
IFPRI	International Food Policy Research Institute
GDP	Gross Domestic Product
HSRC	Human Sciences Research Council
MDGs	Millennium Development Goals
NGOs	Non-Governmental Organisations
PEP	Partnership for Economic Policy
SAM	Social Accounting Matrix
SSA	Statistics South Africa
UN	United Nations
DFID	Department for International Development
IFAD	International Fund for Agricultural Development
DoA	Department of Agriculture
DLA	Department of Land Affairs
LRAD	Rural land redistribution for Agricultural Development
SLAG	Settlement and Land Acquisition Grant
FAO	Food and Agriculture Organisation
CASP	Comprehensive Agriculture Support Program
NDP	National Development Plan

GAMS General Algebraic Modelling Systems

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CHAPTER 1

ORIENTATION TO THE STUDY

1.1 Introduction and background

Natural resource ownership plays an important role in promoting economic growth, reducing income distribution inequalities, and alleviating poverty, especially in developing countries. Recent empirical research has demonstrated that equality in natural resource ownership can have significant impacts on poverty alleviation and income distribution among citizens (Deninger *et al*., 2000; World Bank, 2003; Lahiff and Cousins, 2005; Boccanfuso *et al*., 2006). With agricultural land being viewed as a key natural resource for wealth generation in many developing countries, rural land redistribution can be an important strategy for alleviating poverty and improving household welfare mainly because poor people have strong ties to agriculture. The rationale behind poverty alleviation is that poor households can now share in profits as co-owners of the land rather than only as wage workers. In light of this, several developing countries (e.g., Zimbabwe, Malawi, Namibia and South Africa, as highlighted in Lahiff (2007)) have recently started the redistribution of natural resources, especially land, to create opportunities for higher incomes and employment for resource-poor households.

The focus of these redistribution policies is the agriculture sector because the importance of this sector for growth and poverty alleviation is widely recognised (Cockburn, Disoou, Duclos and Tiberti, 2013). Access to productive land improves the asset base and income of poor households who are intended beneficiaries of the rural land redistribution programme. Thus, agriculture rural land redistribution reform is widely viewed as an effective and most important way to reduce poverty, especially in developing countries where poverty and income inequalities are often the norm rather than the exception (Datt and Ravallion, 1996).

The inequalities in land ownership and inefficient resource use can be primarily attributed to increased rural poverty and widespread income inequalities in most developing countries (World Bank, 2001). With high rates of inequalities in land ownership associated with low agricultural productivity, high long-term rural poverty and large income inequalities, agriculture rural land redistribution can increase agriculture productivity, thereby reducing rural poverty among rural households. In addition, lack of productive resources implies that poor people are unable to utilise resources and hence lack the economic means to improve their welfare (Keswell and Carter, 2013).

Empirical findings have shown that to reduce rural poverty, growth in the agriculture sector must be inclusive in a manner that poor rural households participate and benefit from the growth process. This inclusive agriculture growth can help increase the positive impact on rural poverty, and income inequalities as it can reduce existing poverty, increase the impact of current growth on current poverty and future growth (Cockburn *et al.,* 2013). Thus, as a way of reducing poverty in rural areas of these developing countries where agriculture is the source of livelihood and poverty is increasing (Meyer, 2009:7), the most frequently advocated poverty reduction tool is rural land redistribution. An important reason for this has been the attribution of poverty to land resource ownership inequalities as most rural people have limited access to production means to improve their livelihoods.

With widespread agreement on the need to reduce poverty in rural areas, it is important to address inequalities in land resources ownership in most developing countries urgently. As agriculture land is the primary means for generating livelihoods in developing countries, its ownership can help in increasing household investment, wealth accumulation and reducing poverty (Deininger *et al.,* 2000). Thus, several developing countries now emphasise equalities in land ownership as a way of reducing rural poverty and promoting agricultural growth. Farmers with access to land are likely to invest their efforts and make long-term investments or use the land entitlements as collateral security to access loans for investment. This means that rural land redistribution may improve agricultural growth, increase supply food products, and

decrease rural poverty through increased consumption and income (Burgess and Beasley, 1998; Deininger *et al.,* 2000*)*.

Though it is widely agreed that South Africa is an upper-middle income country by international standards, the country has exceptionally high levels of income inequalities and poverty rates in the world (May, 2002:2), with 57% of the population living in poverty (HSRC, 2004). This suggests that the country is still faced with the challenge of a significant proportion of the population living in poverty as there are large income disparities among the different groups of the population. This makes reducing income inequalities and eradicating high poverty rates, especially among rural households, the primary target of the South African government. Hence, long-term strategies are required that focus mainly on increasing employment and boosting food security in rural areas (du Toit, 2005; Bhorat and Kanbur, 2006). These strategies should promote sustainable employment creation, reduce poverty, foster economic growth and remove structural impediments in the economy. In addition, rural communities should also participate fully in economic activities. To this end, the government must increase its spending towards pro-poverty policies, especially those that promote rural agriculture such as rural land redistribution (Deininger, 2003).

The South African agriculture sector is highly dualistic with around 86% of total agricultural land, comprising highly developed large-scale commercial farmland, owned by about 10.9% of the population, and around 13 million black majorities occupying the subsistence-oriented rural land (Levin and Weiner, 1991:92). This means that there are large disparities in land ownership among different population groups in the country. These disparities mean that only a limited number of rural people may secure a fair living from agriculture, resulting in a large majority of the population being poverty-stricken in rural areas (World Bank, 2006:162). Though it is evident that the production technology employed by the land beneficiaries will differ from that of commercial farmers, agriculture rural land redistribution in South Africa would still be an important strategy for reducing poverty and improving income distribution for the poor (May, 2000:2, IFAD, 2001:71 Deininger, 2003:18). Owing to this, since 1994 the South African government has been progressively engaged in agricultural land policies to address

past imbalances as a way of trying to improve the living standards of the rural population (Seekings and Nattrass, 2005).

Given that more resources and efforts are deployed for agriculture by the South African government, it can be expected that agricultural land reform policy will have non-negligible effects on productivity growth and rural poverty reduction. However, detailed accumulative and welfare analysis of land reform has been hampered by the lack of empirical evidence on the impact of the programme on livelihoods of the intended beneficiaries (van den Brink *et al.,* 2006).

Increasing population growth, the need to increase economic productivity and reduce rural poverty, and an increasing demand for land resources are raising a growing concern about the efficiency of natural resource use in the country. As the population growth continues to outpace economic growth, the competition for resources among economic agents has increased, while their supply has remained inelastic. This has increased the need for rural land redistribution considering the benefits from efficient agricultural resource policies even in developing countries like South Africa (Deininger and Binswanger, 1999:249). These agricultural rural land redistribution policies are meant to address past land imbalances and improve resource use, thereby promoting sustainable economic growth and poverty reduction. Despite its importance, rural land redistribution in South Africa has not been fully implemented and articulated (Lahiff, 2005).

Numerous empirical studies have shown that equality in land ownership can be an effective tool in fighting poverty and promoting growth [International Fund for Agricultural Development (IFAD), 2001; Department for International Development (DFID), 2003; World Bank, 2003; Borras, 2006; World Bank, 2006; Civardi *et al.,* 2010]. With several developing countries now emphasising rural land redistribution, there has been an increased interest in the relationship between land ownership, agriculture productivity, poverty reduction, and income distribution. An analysis of whether and how these redistributive policies impact on the overall economy, poverty and income distribution provides a better understanding of the long-term effects. Rural land redistribution programmes can be potentially attractive policies for poverty reduction

and improvement of income distribution; hence, an empirical demonstration of the effectiveness of these programmes is of great importance. In addition, the empirical demonstration of the welfare effects will provide the government with evidence and tools to assess the relevance and effectiveness of these alternative poverty reduction policies in the country.

However, the question of whether these rural land redistribution policies are justified and can be effective as tools for reducing unemployment and poverty by contributing to the overall improvement of rural household welfare still remains unanswered. Therefore, this study applies a dynamic Computable General Equilibrium (CGE) model in an attempt to answer this question by assessing the impact of rural land redistribution on the economy. A CGE model is an effective method of simulating the impact of policy implementation on an economic system (Decaluwe *et al.,* 2000). A dynamic CGE model can account for the accumulation and distributive effects, and can enable poverty and inequality analysis over time. This dynamic model is crucial as land redistribution is a long-term investment while a microsimulation model is for distribution analysis.

1.2 Statement of the problem

Policy objectives of governments in African countries are largely targeted at reducing rural poverty and income distribution inequalities of its citizens. However, these targets have increasingly become difficult to meet. Several studies have attributed this failure mainly to limited access to productive resources and limited government support to small scale farmers. In many developing countries, long-term rural poverty and larger income inequalities are associated with large land inequalities (Deininger, 2003). Though most of the rural population depends on agriculture for its livelihood, a large part of this population does not have access to productive land (Keswell and Carter, 2013). In this context, a rural land redistribution policy as a tool for improving access to productive resources should receive considerable attention. Rural poverty is associated with land inequalities in South Africa, and hence poverty elasticities are very high in most parts of the country. With several economic strategies emphasising rural land redistribution for rural poverty reduction, there has been a growing interest to analyse the relationship between rural land redistribution and poverty. That being the case,

literature review has revealed that there is a relatively limited volume of empirical literature on land redistribution and its impacts on growth, poverty and income inequality in South Africa. Apart from contribution to policy formulation, this study also intends to contribute to the advancement of knowledge to the area of land redistribution.

Numerous empirical studies have shown that rural land redistribution can be an effective tool in fighting poverty and promoting agricultural growth (Marais, 1998; Deininger, 2003; IFAD, 2001; DFID, 2003; World Bank, 2006). However, there is neither strong evidence about improvement in income distribution through rural land redistribution nor a guarantee that the latter would benefit the poor. Specifically, empirical evidence linking rural land redistribution and poverty in South Africa is still limited (Chimhowu, 2006; Lahiff, 2007).

Empirical studies done in South Africa made use of comparative statistics and static CGE models. Essentially, these studies do not consider the dynamic feedbacks and dimension of the transmission mechanisms of rural land redistribution into the economy (Thurlow and van Seventer, 2002). This has been evidenced by the failure of these models to provide insights into the path of adjustment of the government rural land redistribution policies over time and track empirically the changing inequalities and poverty dynamics due to government policies over time (Humphreys, 2000). Based on these arguments, these static models seem to be inadequate for long-run analysis of poverty and inequalities impacts of government rural land redistribution policies. These conclusions seem to suggest that evidence from a particular period must be obtained empirically.

In addition, empirical research mostly in developing countries have adopted either a purely microeconomic or macroeconomic modelling approach. Principally, the micro effects of macroeconomic policies are often considered ambiguous approaches because these models lack the ability to identify individual winners or losers of these policies. Thus, models and empirical evaluations are required to assess the real impact of such complex structural changes on households. Combining micro and macro models can provide a richer analysis of the effects of macroeconomic policies on

household poverty and income distribution. Thus, empirical work should adopt a recursive dynamic CGE model and multiplier decomposition specification to capture the detailed aspects of poverty and distributional effects of the economic policy. In addition, government rural land redistribution is a macroeconomic policy whereas poverty and inequality are household-based. Therefore, a CGE microsimulation specification is necessary to enable a detailed poverty and inequality analysis. Basically, to enable a detailed poverty and inequality analysis over time, this study adopted a dynamic CGE model to analyse the impact of rural land redistribution policy. Therefore, the aim of this study is to investigate the impact of rural land redistribution on growth, poverty, and income distribution in South Africa. To achieve this, the study will analyse the distributive effects of rural land redistribution policies on poverty reduction to simulate the full distributional impact of a rural land redistribution policy, and to generate counterfactual scenarios in South Africa.

1.3 Research aim and objectives

The present study has been necessitated by the aforementioned gaps in the existing literature.

1.3.1 Aim

The aim of the study is to investigate the impact of rural land redistribution on growth, poverty reduction and income distribution in South Africa.

1.3.2 Objectives

The objectives are organised under the following broad themes:

- To analyse the distributive effects of rural land redistribution policies on household poverty reduction in South Africa.
- To simulate the full distributional impact of a rural land redistribution policy and generate counterfactual scenarios in South Africa.

1.4 Research questions

- What is the potential impact of land redistributive policies on poverty and household welfare in South Africa?
- What is the full distributional impact of a rural land redistribution policy and counterfactual scenarios in South Africa?

To be able to address these objectives and research questions, the study is divided into two methodology chapters, namely Chapters 3 and 5. The first objective is addressed in Chapter 3, which provides a sectorial decomposition and structural path analysis of poverty and income inequalities dynamics in South Africa. This entailed the use of the social accounting matrix (SAM) multiplier decomposition techniques with a view to establish and provide an understanding of the possible linkages between poverty and income inequalities in South Africa. These techniques are explained in chapter 3 of this study and the results are presented in chapter 4. Data was analysed using Microsoft excel and Stata package.

Furthermore, the second objective is addressed in Chapter 5, where the study provides the growth analysis and examines the behaviour of the linking aggregate variables due to rural land redistribution. This analysis is based on the dynamic CGE microsimulation analysis. The dynamic CGE microsimulation framework was explained in chapter 5 and the results are presented in chapter 6 of the study. The data was analysed using the GAMS package.

1.5 Definition of concepts

Rural land redistribution

Rural land redistribution is defined as the process where previously disadvantaged people are given an opportunity to access land for productive purposes in order to improve their welfare (Vermeulem, 2005). The redistribution process is mostly designed to assist the rural poor, farm workers and would-be farmers.

Land ownership

According to Zahir (1975), Land ownership is defined as the state of exclusive rights and control over agricultural and residential land which involves multiple rights usually referred to as title deeds.

Livelihood

World Bank (2000) define livelihood as the means of securing support and the necessities of life.

Agricultural Productivity

It is defined as a measure of the agricultural output produced for a given amount of inputs (Weiner and Levin, 19930. This is calculated as an index of agricultural inputs to an index of output.

Output growth

According to Ravallion (2001), Output growth refers to an increase in the capacity of the economy to produce commodities over a given period of time. Economic growth can be real after adjusting to inflation or nominal (not inflation adjusted). It can also be defined as a measure of the aggregate increase in productivity.

Poverty reduction

Poverty reduction is defined as a short hand for promoting economic growth that will permanently lift the population over a poverty line. According to the World Bank (1990), poverty reduction is a process of enabling poor people to create wealth for themselves as a means for improving their welfare.

Income distribution

Income distribution can be defined as how a nation's total income is distributed amongst its population as is calculated as the percentage of income to percentage of the country's population (World Bank, 2008).

1.6 Significance of the study

The study is envisaged to provide essential information on the effects of government land redistributive policies on poverty and income inequalities in South Africa. It intends to apply a dynamic CGE model which makes it possible to distinguish between short-run and long-run effects of the policies and can also help to assess the impacts of a policy over time. The impacts on employment, poverty and inequalities can be evaluated in detail by using a dynamic CGE model (Thurlow, 2004:13: Annabi *et al.,* 2005:1). The study also intends to provide a sound basis for future research by the scientific community.

The contribution of the study is to analyse the short and long-term economy-wide and distributional impacts of rural land redistribution in South Africa. The study will evaluate whether 30% rural land redistribution can be successful in reducing poverty and improving household welfare, especially among rural households. In South Africa, a lot of attention was given to the evaluation of the impact of rural land redistribution in the last two decades (Lahiff, 2005; Seekings and Nattrass, 2005). Although there was a significant focus on the analysis of the impact of rural land redistribution on economic growth over the last decade, the topic remains a topical issue, especially in the South African context (Bernstein, 2008). The focus in previous studies has been either to estimate the impacts of rural land redistribution using a static CGE model or to give theoretical insights into the impact of rural land redistribution (Thurlow, 2002; Van Rooyen, 2008). Most of these studies did not make deliberate efforts to examine empirically the changing poverty and inequality dynamics, and thereby ignored the overall economy impacts and the distributional effects of the policy for detailed poverty analysis (Ahmed and O'Donoghue, 2004).

Therefore, the novelty of this study is twofold. It will use the SAM multiplier decomposition techniques with a view to establish and provide an understanding of the possible linkages between rural land redistribution, poverty, and income inequalities in South Africa. Furthermore, a dynamic recursive CGE models combined with microsimulation analysis is applied to analyse both the short and long-term impact of rural land redistribution in South Africa by focusing on poverty and distributional effects.

The study also seeks to determine whether further rural land redistribution is justified in South Africa. Since the main target of rural land redistribution is improved household welfare through reduced poverty and improved income distribution, evaluating the impacts will help policy makers to determine whether to continue with the rural land redistribution programme. The study will also evaluate whether the desired outcome of rural land redistribution policy is being realised in South Africa. If the outcomes are not realised, policy makers may decide on additional and/or complimentary policies to facilitate poverty and inequality reduction initiatives in South Africa.

1.7 Organisation of the study

The first chapter introduces the study, discusses the problem statement, and presents the purpose, objectives of the study, and the significance of the study. The second chapter discusses the theoretical framework of the study and subsequently reviews relevant empirical literature before presenting a chapter summary. In chapter 3, the methodology of the SAM multiplier decomposition analysis is explained and discussed. Chapter 4 provides a discussion and explains the multiplier decomposition results. Chapter 5 gives a comprehensive methodological explanation of the analytical framework of the CGE microsimulation approach. Chapter 6 deals with the analysis and interpretation of results based on the CGE microsimulation approach. The last chapter presents brief summaries of findings from the preceding chapters and draws policy recommendations from findings.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The previous chapter introduced the background information to the study. This chapter was aimed at laying a theoretical foundation for the evaluation of the impact of rural land redistribution on the South African economy. It reviews the relevant empirical literature on rural land redistribution on poverty with specific reference to poverty alleviation. Lastly, a brief outline of the poverty profile of South Africa is discussed. This is followed by the chapter summary.

2.2 Theoretical framework

There is a limited volume of theoretical works in economics on land reform, mostly concerning the impacts of the economy on growth, poverty and income inequality. The main theoretical argument being supported by the land redistribution program is that a lack of access to land and appropriate tenure systems among the poor are an obstacle to poverty alleviation (FAO, 2003). As such, the widely acclaimed aim of land reform is to redress the unequal distribution of land ownership and rights of access to the land resource-base of the country. The question on the extent to which land reform can be assumed to be a means by which poverty in developing countries could be alleviated has many answers. Land reform encompasses redistribution of land to the poor, who possess little or no land as land is the primary means of generating a livelihood and a main vehicle for investing, accumulating wealth, and transferring it between generations. Access to land and land tenure relations are critical where communities depend on control of land to ensure food security (Duclos et al., 2003).

Land reform usually involves three components: (a) land tenure reform, which is the establishment of secure and formalized property rights; (b) land redistribution, which entails the transfer of land from large- to small-scale farmers; and (c) restitution, which enables the forcibly displaced to return home or be compensated (Van den Brink, et al, 2006:1). Due to lack of access to land as well and inputs, a large number of rural people are not able to achieve the minimum food security and family welfare. However, because of the many potential gains of land reform, considerable prospects exist. With regards to land redistribution, the unit of production is seen as the problem to be resolved, through expropriation from those with too much land and its transfer to those with little or without and is therefore likely to involve land re-settlement as well (Deininger, 2003). The point by Deininger (2003) is that an ideal land reform programme must meet a range of needs, including the restoration of historical rights to land, the provision of additional land for both residential and production purposes and the securing of land tenure rights for the inhabitants of both commercial farms and communal areas (Feltenstein, 2013).

2.3 Land reform Theories and Tenure systems

2.3.1 Land reform Theories

Since independence, African governments have adopted policies and programmes aimed at increasing land tenure security for farmers, to foster agricultural investment and productivity. These policies have often ignored existing customary and local institutions and disregarded the distributive issues underlying tenure security (Ranger, 1983). In most of these developing countries, land is the most important asset in rural areas, and also it is considered as the main determinant of the poor's livelihoods. Land reform seeks to change the institutional structure of human-land relations by changing the ownership right, control, and land use (Ali, 2003). In this way, land distribution has the same meaning as land reform, because it focuses on the amendment of land-ownership laws, regulations, or customs. As a result of increased poverty and insecurity of land tenure, new generation of land policies and laws in Africa presents important innovations compared to its predecessors. Explicit efforts have been made to capture all land rights in records as many recent laws protect customary land rights. Use/lease

rights over state-owned land may also be registered for example in Ethiopia and Namibia). Where customary rights are protected, contrary to the systematic land registration and titling programmes of the past, customary right holders usually may obtain land titles e.g. in Mozambique and Tanzania. An implication of this is that land acquisition by the state for a public purpose entails compensation at the same rates for the different forms of land holding, thus reversing the widespread practice of expropriating customary rights with little or no compensation (FAO, 2002). However, it must also be noted that some African countries have maintained or embraced policies abrogating customary systems. (Wily, 2003). Economists have long been concerned with estimating the impacts of land redistribution on household welfare (Annabi et al., 2005). The common and widely applied theory is the neoclassical theory of land reform, which forms the basis of this study.

2.3.1.1 The Neo-Classical Theory of Land Reform

The theory is part of the new school of thought in the field of agricultural development, which views rural land redistribution as an integral part of the strategy and policy of economic development (Zahir, 1975). Land reform is designed to redistribute property rights in land for the benefit of landless peasants, small farmers, and tenure (Zarin and Bujang, 1994). Imperfections in land ownership and distribution are said to impede the incentives needed for accelerating agricultural growth. Hence, in the traditional sense, land reform can be defined as a demand for greater stress on development and improved agricultural productivity. In the neoclassical theory, the land is treated as a marketable commodity, which should be priced and allocated according to its marginal productivity. This implies that the theory is appropriate in dealing with complex practical questions of agricultural productivity and land reform. Improving agricultural productivity and security of tenure is essential for economic growth (World Bank, 2005).

According to the neo-classical theory, land reform is essential for economic growth. In developing countries, agricultural development plays a vital role in economic development because agriculture is not only a major form of employment, but the rural populations also depend on the sector for livelihood (World Bank, 2000). Therefore, an economic growth strategy should focus on the distributional factor of the income

generated by growth. Thus, poverty, unemployment and inequality in the economy should be considered in policymaking. The rural land redistribution and associated growth opportunities have strong implications for long-term development (Lofgren and Diaz-Bonilla, 2005). Access to land reduces vulnerability to hunger and poverty, influences the capacity to invest in production activities and enhances prospects for better livelihoods (World Bank, 2008).

2.3.1.2 State-led reform and market-assisted land reform

Empirical and theoretical findings indicate that there exist various and complementary paths that can secure access to land for the rural poor (de Janvry, 2002). However, the most common approaches to rural land redistribution are state-led and market-assisted land reforms. Under the state-led reform approach, the government/state plays a central role in promoting land re-form programmes (Boyce *et al.,* 2005). This form of land reform consists of a central authority that dispossesses and redistributes land to selected beneficiaries. State-led reforms are most common in countries with high land property concentration, great social and economic inequality, abject rural poverty and widespread landlessness (Ciamarra, 2003).

The market-assisted land reform approach affirms that under certain conditions, markets can endogenously lead to equal and efficient land asset distribution, hence they can be substitutes for state-led reforms (Deininger, 1999). In a market-assisted land re-form, the beneficiaries receive a combination of grants and loans which they use to negotiate the purchase of land from willing sellers. This form of land reform depends on the fact that there exists an inverse relationship between farm size and output per unit of land, and on the fact that the land market is regressive for the resource-poor (Zahir, 1975). By the year 2020, the willing seller, willing buyer concept had not yielded the desired results in South Africa.

2.3.1.3 Radical Populist agrarian reform

The Radical Populist Approach can be defined as policies and a law that allow for easy and crucial modification of the patterns of land ownership and usage through the redistribution of land from one group to another, using methods that may be regarded

as an extrinsic threat to an existing order (Jankielsohn & Duvenhage, 2017). The radical approach usually occurs as peasant-led agrarian reform which assumes that the white minority are protected, thus the only way to achieve effective pro-poor land reforms is for peasant farmers to take the initiative to implement the land reform" (Borras, Kay & Lodhi, 2007). A case in point is the Zimbabwean land reform where liberation fighters rallied communities to support the aggressive third Chimurenga, taking white owned farms and apportioning it to the black majority (Mutondi, 2012). There has been a lot of critique directed at this approach to land reform as it is argued to not only fail in encompassing the diverse conditions characterising local communities, but also reduces transparency and accountability (Gordillo, 1997).

2.3.2 Tenure systems in Africa

Land tenure is the relationship, whether legally or customarily defined, among people, as individuals or groups, with respect to land to regulate behaviour in land use (Newman et al., 2015). Rules of tenure define how property rights to land are to be allocated within societies and these rules define how access is granted to rights to use, control, and transfer land, as well as associated responsibilities and restraints. In simple terms, land tenure systems determine who can use what resources for how long, and under what conditions (Wiig, 2013). Land tenure is central to sustainable natural resource management and can be defined as the way land is held or owned by individuals and groups, or the set of relationships legally or customarily defined amongst people with respect to land (UN-HABITAT 2008). Land tenure is important in rural development interventions which place an emphasis on building people's endowments of assets so they can enjoy sustainable livelihoods.

2.3.2.1 Freehold Tenure

Land under freehold tenure is all land held by or under the authority of a title deed either by a private individual, or institution, in which case it is private land under individual title or it may be held by the state directly or through a state entity under a title deed in which case it is freehold state land. A freehold title deed has no restrictions as to the use or occupation for the land (Moyo, 2000). Under freehold land tenure, absolute ownership rights are envisaged, implying the right to own, control, manage, use, and dispose of

property. Such land rights, while being held in perpetuity, may however be sequestered through State intervention when land is targeted for expropriation in the case of eminent public interest.

2.3.2.2 Customary tenure reforms and tenure security

Customary tenure commonly described as communal refers to that tenure regime under which land rights are acquired and held in terms of customary law. Customary tenure still dominates in much of Africa and customary rights tend to be weak and are often in conflict with statutory laws (Wily, 2011). Various countries have attempted to strengthen and formalize customary land rights by registering customary land rights and providing customary tenure certificates to communities, clans, or kinship groups. Formal recognition of customary land rights may also serve to strengthen tenure security where such customary rights are threatened for various reasons, for example, where certain minority groups' rights are not recognized by more powerful groups that aim to expand their land rights. There is therefore a high risk of elite capture in such customary tenure reforms (Wily, 2011).

2.3.2.3 Leasehold tenure

Leasehold tenure refers to all land occupied in terms of an agreement of lease with the owner whether that owner is the state, a public body, or a private individual. Under leasehold land tenure, ownership of land is based on the notion of rentals for long periods (Moyo, 2000). Land belonging to one entity, by contractual agreement, leased to another entity. Freehold and leasehold land rights have mostly been identified with large-scale farming and elite land ownership regimes. Security of tenure, not ownership, is therefore the decisive factor, because it enables farmers to reap the benefits from their investments.

2.3.2.4 The Permit Tenurial regime

The permit tenurial regime is regulated by permits issued of or made by the state and hence all land occupied and used in terms of a state issued permit falls under this tenurial regime. Resettlement lands which are occupied in terms of permits issued by the state fall under the tenurial regime (Moyo, 2000).

2.3.2.5 Statutory Tenure system

Statutory tenure or allocations apply to all state land held or other statutory bodies under or in terms of specific statutory provisions. Thus, national parks, land, national forests land and game reserves all fall within this tenurial category by virtue of the fact that these lands are vested in or allocated to statutory bodies in terms of Acts of Parliament.

2.3.2.6 The License Tenurial regime

The licence tenurial regime applies to all state lands occupied and used by any individual by virtue of and in terms of a contractual licence applied for and issued by the state under the provisions of some enabling statute and/or regulations (Mukamuri, 1997). State lands occupied and used under licence for safari operations, trophy hunting, etc. fall under this tenurial regime. The essence of the relationship between the state and the licence holder is contractual.

2.4 Land Tenure and Poverty in Africa

The severe land inequalities in many African countries between small and large-scale farming sectors, is noted as an important element in an effective rural poverty reduction strategy (Moyo, 2000). Land in Africa is a critical constraint on poverty reduction because most rural households rely on land for the reproduction of future generations, since the industrial and service sectors do not currently provide alternative opportunities for survival. Apart from its value for agricultural purposes, to realize subsistence production and cash income, land also provides for basic household needs, such as energy, through fuel wood, medicines, housing materials and nutrition (Mukamuri, 1997). Unequal control over land is therefore a critical factor in formulating poverty reduction policy and in the political process of democratic transition in Africa.

2.5 Land Reform to Poverty Alleviation

The land question is central to economic analysis as land is so central to production that the early classical economists such as David Ricardo and Thomas Malthus devoted their enquiry mainly to its study (Stilwell & Jordan, 2004). How to ensure that rural development and land utilisation would lead to redistribution were the main aims of economic development (Arndt, 1989), although policy makers and analysts also thought that effective land management would also lead to improvement in agricultural productivity in developing countries (Todaro & Smith, 2006).

The limited impact made in the alleviation of rural poverty, through the diffusion of new technology and inadequate labour absorption capacity of the non-agricultural sector, means that poverty and landlessness are likely to remain permanent features of developing countries. World Bank reports suggested that equity in land distribution is good for growth, sustained growth and poverty reduction. Moyo (2008) denotes that access to land is of great importance in the African context for the survival of the majority of households, particularly those in the rural areas who do not possess an alternative productive industry and infrastructures for employment in the services sector. This has led to a number of policy initiatives and resource commitments targeted at delivering resources to the poor (Bourguignon & Savard, 2008). The above makes a case for radical agrarian reforms, which are more likely to realize growth in the agricultural sector, while arresting the increase of rural poverty.

There has been a growth spurt in terms of agriculture as witnessed by the development of new high yielding cultivars of seeds associated with the green revolution and other new technologies that has done very little in accommodating the poor and landless. For instance, there has been swift spread of new technology in Asia which marginally reduced the rate of growth of rural poverty. It is argued that an increase in production alone, achieved within a tenure structure of great inequality cannot be an alternative for land redistribution. The effects of poverty have however extended from rural population to cover most of the urban population. The decreasing and shrinking macro-economic conditions lie at the centre of deepening poverty in urban centres. Climatic factors such as droughts, cyclones, floods and global warming remain at the centre stage, averaging every two to three years, causing and perpetuating rural poverty. On the contrary, small-

holder irrigated agriculture has not proved its mettle in poverty alleviation as other macro-economic issues hamper the scale of growth (Sobhan, 1993).

Agrarian reform should create the basis for a more equitable access to land, and through this access to land, to markets and other public resources. Thus, agrarian reform is rationalized by the need for equity in access to productive resources, and the elimination of socio economic and political differentiation within the peasantry. Fair access to land is widely recognized as important for both the pace of agricultural growth and the extent to which such growth will reduce poverty (Deininger and May, 2016).

2.6 Land Reform and the Computable General Equilibrium model

Estimates of the effects of land redistribution on income inequality and poverty derived from linking CGE models to the distribution of income. Early CGE models used to assess the distributional impacts of policy reforms relied mainly on the 'representative household' approach (Adelman & Robinson, 1978). In this case, estimated changes in the incomes of broad household groups (derived from the CGE model) are used to simulate changes in the overall size distribution of income, under the assumption that the distribution of income within each household group remains constant (Lofgren, Robinson, & El-Said, 2003). Clearly, this type of approach can only capture the effects of land redistribution on between-group inequality, and may as a result under-estimate the impact on overall inequality, particularly if the number of groups included in the model is relatively small.

More recently, a range of other approaches have been developed to reflect the distributional effects of policy reforms more accurately. The impact of the land reform on each household can be estimated example by applying the simulated change in the income of the representative household group to which it belongs (Annabi, Khondker, Raihan, Cockburn, & Decaluwe, 2006), or based on the predicted changes in consumer and factor prices faced by the household (Ravallion & Loshkin, 2008). The result is a new simulated distribution of income after the reform, which can be compared with the actual distribution prior to the reform. However, micro-accounting approaches assume that household behaviour is unaffected by land reform, which may again bias the results.

In micro-simulation approaches, the behavioural changes are not fed back into the CGE model, implying that some distributional effects may again be ignored. 'Integrated approaches' seek to overcome this problem, either by a recursive two-way link between the macro and micro-level analysis (e.g., Bourguignon & Savard, 2008), or by a 'fully integrated' CGE model in which each household in the survey is modelled separately within the CGE model itself (Cororaton & Cockburn, 2007). An interesting question therefore is whether these more recent approaches, designed to reflect the distributional effects of policy reforms more accurately. Therefore, this study seeks to assess how government redistributive policies may affect household welfare in the short and long-run, focusing on poverty and income distribution in South Africa by applying a dynamic CGE model.

2.7 Empirical literature

There is a large volume of empirical research on rural land redistribution and poverty, especially in developing countries. However, the findings of these studies produced inconclusive results. This sector begins by giving an overview of rural land redistribution and agriculture production in South Africa. The sector mainly focuses on the studies carried by other researchers with particular emphasis on the CGE model.

2.7.1 Land redistribution in Zimbabwe

In Africa several countries embarked on land redistribution as a way of addressing past land imbalances. Namibia, South Africa, and Zimbabwe are three neighbouring countries in Southern Africa which share a similar history of race-based minority rule characterized by extensive land expropriation that pushed indigenous black populations into unfertile reserves during the colonial era (Mufune, 2010). Land reform in Zimbabwe officially began in 1980 with the signing of the Lancaster House Agreement, the main thrust was to equitably distribute land between black subsistence farmers and white Zimbabweans of European ancestry, who had traditionally enjoyed superior political and economic status. During the colonial era, land was distributed on racial lines, with approximately 4,660 large-scale predominantly white commercial farmers owning about 14.8 million hectares and about 6 million black smallholder farmers owning about 16.4 million hectares in mainly low agricultural potential areas.

Small-scale commercial farmers occupied about 1 million hectares, while state-owned farms occupied about 0.3 million hectares and 6.0 million hectares were reserved for national parks, wildlife, and urban settlements (Rugube and Chambati, 2001:7; UNDP, 1998; CSO, 1998).

The land reform programme's main agenda were to correct the land tenures' imbalance. Land reform has had a negative impact on the Zimbabwe's economy and heavily contributed to its collapse in the 2000s. The Fast track land reform as it is known in literature was characterised by land invasions, which started in the late1990s and intensified after the 2000 benchmark, received widespread condemnation (Hammar et al., 2003; Masiiwa, 2004). Hammar et al., (2003) postulate that the highly political nature of the land occupations and a diplomatic row between Zimbabwe and the United Kingdom overshadowed attempts for an informed analysis of its outcomes. According to GOZ (2003), a total of 127, 192 households were resettled under the A1 model, while 7,260 households were allocated land under the A2 model. In general, the progress and nature of the FTLRP has been extensively varied (Njaya, 2014). The causes and effects of the FTLRP have been intensely debated and there is now a considerable body of literature on the programme (Scoones et al., 2010; Zikhali, 2008). Despite being credited with overhauling the racial distribution of land in Zimbabwe, the programme however, was implemented in a violent manner and was associated with significant losses in agricultural production, productivity, and overall economic collapse (Richardson, 2004) There has been a drop in total farm output, which has led to instances of starvation and famine.

Empirically, Juana (2006) carried out a study on the quantitative analysis of Zimbabwe's land reform policy using the SAM multipliers. The study findings recommended that to successfully implement the land reform programme and to gain economy-wide benefits, the large-scale farmers who offer their land must be adequately compensated and that a more transparent and coordinated institutional structure is instituted to enhance stakeholder participation in the redistribution process. In the study conclusion, Juana (2006) highlighted that the scope of the study was limited to the static economy-wide analysis of land reforms in Zimbabwe. There is still the need to investigate the distributive effects using dynamic models.

2.7.2 Land redistribution in Namibia

Namibia as Zimbabwe also carried out the land redistribution in the year 1993 just after its Independence. Namibia however differs from other British settler colonies, most notably Kenya and Zimbabwe, in that settlers in that country were dispossessed essentially marginal agricultural land (Juana et al., 2005). The objective of land reform in Namibia was set out in major policy and legal instruments seek to address two major issues that were inherited at Independence: poverty and unequal access to land. Under the redistributive land reform programme, the state bought large-scale commercial farms in the freehold sector on a 'willing seller-willing buyer' basis for sub-division and allocation to small-scale farmers. Beneficiaries were expected to pay monthly rentals to the state for their land (Juana and Mabugu, 2005).

Werner (2007) in his empirical study stipulated that poverty reduction through land redistribution and improved access to land has occupied a central stage in public discussions about the successes or failures of land reform. The role of land reform in a wider rural development and poverty reduction programme remains ambiguous in official policy documents. This preoccupation stems from the observation that the majority of beneficiaries are employed and hence not part of the poor. Cross-sectoral policies on poverty reduction are not as unequivocal about the role that land reform can play in poverty reduction strategies as the National Land and Resettlement Policies. The evidence from Namibia shows that people embrace reforms for reasons other than bringing about secure tenure. Thus, although not apparently facing problems of insecure tenure, the prospect of using land to obtain credit is driving the process. It signals that the individualisation of tenure may create a false sense of hope that credit is a panacea for poverty reduction.

The empirical discussion on Namibia land reform suggested that the current model of resettlement on small-scale farms might not be appropriate to accommodate and support the poor. Land reform was expected to play a prominent role in government's efforts to reduce poverty if alternative forms of land utilisation must be developed. However, this assertion needs to be supported and validated using quantitative

techniques as previous studies focused more on qualitative approach. The economic wide impact of land redistribution makes a dynamic CGE model appropriate to simulate the detailed distributional analysis of poverty (Ahmed and O'Donoghue, 2007).

2.7.3 Rural land redistribution in South Africa

Land tenure in the Apartheid days was marked by segregationist policies which concentrated land in the hands of White people. Black South Africans, who constituted about 75% of the population, were crowded on the remaining 13% of land. Segregation existed even within this 13% as blacks who spoke different languages had to live in specific places (Fourie, 2000).

Several attempts have been made in South Africa to remedy the inequities in land management. A land reform programme was adopted in 1994 and consolidated in the 1996 Constitution of South Africa with the primary concern was the correction of 'Apartheid inequalities' by stressing values of redistribution and restitution (Cross & Hornby, 2002; Sihlongonyane, 2005). Some traces of redistribution are contained in the current system too, but they are underpinned by the 'willing buyer; willing seller' model which dictates that redistribution takes the form of minimal state support of poor people in the form of giving subsidies to purchase land rather than direct state acquisition of large tracts of lands concentrated in few hands. So, the state now supports profit-making private groups. As such, large numbers of poor people must pool their resources together to obtain land. This approach is a way by which the state has tendered to support emerging black commercial farmers, rather than the rural poor (Hall, 2004).

Rural land redistribution is considered the 'flagship' of the land reform programme in South Africa (DoA/DLA, 2005). The primary objective of the rural land redistribution programme was to transfer about 24 million hectares of agricultural land to black ownership by 1999. As the bulk of agricultural land in South Africa is held under commercial agriculture, which is dominated by a minority of White people, the expectation was that 3 million Black people would benefit from the redistribution which was based on the willing buyer willing seller principle.

According to DoA/DLA (2005), only 1% of the targeted redistributable land has already been transferred in the first 5 years of the programme This has necessitated the extension of duration of the redistribution excise by a further 15 years. The process of rural land redistribution was deemed to be slow due to the lack of realism in the targeted goal. Various steps were taken which include increasing the levels of cash grants to prospective beneficiaries for them to acquire land and to productively use it. However, farm land prices were above the R16000 per beneficiary household provided by the government. The slow process rendered the Settlement and Land Acquisition Grant (SLAG) unsustainable, leading to the establishment of the on-going Rural land redistribution for Agriculture Development (LRAD) in 2000. The LRAD was however, viewed as limited to previously disadvantaged black individuals since there is no significant improvement in the pace and process of rural land redistribution. The programme did manage to redistribute only about 14.6 % of the target with 4.8% of the target population.

The land reform process in South Africa is largely based on the willing-buyer, willing-seller arrangement where the government assists in the purchase of land (Government of South Africa, Department of Land Affairs, 1997). These arrangements were mainly based on the operations of the existing land market. The rural land redistribution policy has undergone a series of shifts since 1994, but the focus is mainly on agricultural purposes. Until 2000, rural land redistribution was targeting the poorest of the poor. However, the act of providing access to productive land to the poor without farming skills or resources to facilitate productivity and efficiency of these farms was criticised. This led to the introduction of the LRAD that explicitly aimed to promote commercially-oriented agriculture by black people. Under this new programme, higher grants were paid to individuals with the potential to use land productively.

In 2005, the South African government implemented two new redistribution programmes that were meant to provide support to new and emerging farmers. One of the policies was the comprehensive agriculture support programme (CASP) which targeted beneficiaries of the land reform largely through the development of infrastructure on the farms. In addition, the micro-agriculture schemes of South Africa (MAFISA) were established to provide loan facilities to beneficiaries of land reform programmes.

As of 2007, 2,299 000 hectares of land have been transferred through the rural land redistribution programme and 1,897 000 hectares have been transferred through the disposal of state land. This implies that about 4,2 million hectares of land have been transferred to black people benefiting about 1,5 million people in South Africa. Although most empirical studies in South Africa argued that rural land redistribution is ineffective and inefficient in reducing poverty, welfare objectives were achieved to some degree in other areas. Although the impact of rural land redistribution to beneficiaries has been limited, these impacts are not negligible. Thus, it can be stated that rural land redistribution still has the potential to improve the welfare of rural households.

The ineffectiveness of the rural land redistribution policy has been largely attributed to a lack of skill and capital by the beneficiaries and technological differences between large-scale farmers and rural land redistribution beneficiaries. These technological differences will have a direct impact on production in the agriculture sector. As small farmers are less productive, the impact on the total agricultural output will be negative, but the distribution of income will be equal. However, small farmers will gradually become more productive due to technological progress. This implies that rural land redistribution can positively contribute to poverty and income distribution in developing countries.

Overall, the land reforms in South Africa have not been as effective as promised as the land tenure in South Africa remains insecure and land-based inequality is prevalent. Over 80 per cent of land is concentrated in the hands of minority white farmers (Toulmin, 2008) and the situation of most South Africans, with respect to access to and control of land, has not significantly improved (Cross & Hornby, 2002).

2.7.4 The South African Agriculture Sector

South Africa agriculture contributes about 4% of the overall economic gross domestic product (GDP). However, despite the small direct share of the total GDP, the sector employs a significant number of both skilled and unskilled workers. According to the Department of Agriculture (DoA), the sector has been characterised by fluctuations in terms in terms of output growth as evidenced by an annual growth rate of 2,5% between 1950 and 1987 and a decline of an average of 2.1% between 1987 and 1995. Between the year 2006 and 2007, the agriculture sector witnessed a 13% contraction in total

agriculture production. Overall, the agricultural sector witnessed a sharp decline in employment created (from 1.64-0.63 million jobs) between 1970 to 2007 (DoA, 2008).

Apart from a small direct contribution to GDP, the agricultural sector plays a significant role in the economy through backward and forward linkages. The sector is made up of a market for commodities from other economic sectors. For example, chemicals, fertilizers, and labour skills. In addition, the sector also supplies raw materials to the manufacturing sector. The sector is therefore an important engine for overall economic growth.

The agriculture sector in South Africa is highly dualistic with around 50000 commercial farmers and 240 000 small-scale farmers who produce mostly for family livelihood as the produce primarily to meets the needs of their families. Commercial farmers produce mostly for exports, accounting for 9% of the total exports in 2005 (DoA, 2008). According to Siyabulela (2005), about 40% of the population depends primarily on agriculture and other related industries, making it clear that for shared growth and an integrated rural development, the government should target the agriculture sector. Investment in agriculture can stimulate economic growth and help alleviate poverty in rural areas.

2.7.5 The role of agriculture in poverty reduction

Most empirical research point to the fact that agriculture plays an important and significant role in poverty reduction. Apart from the direct impact on farmers' incomes, increasing agricultural productivity creates job opportunities (Bryceson, 1999b). Thirtle *et al.* (2012) pointed to the fact that a 15% increase in agriculture yields reduces the number of people living on less than a dollar a day by 0.83%. Agriculture growth results in cheaper food prices and can also promote growth and development outside agriculture. It is therefore important to increase agriculture productivity to take the initial step in poverty reduction.

Empirical evidence showed that agriculture growth is highly effective in reducing poverty as there is a positive relationship between agriculture growth and economic growth (Kieran and Karl, 2007). In sub–Saharan Africa where productivity is low, there are high

levels of poverty as stagnated agriculture growth poses a serious consequence for poverty reduction (FAO, 2003). Increasing agricultural productivity in many African countries has remained a major challenge due to limited access to productive land, particularly for small holder farmers. This has led to scepticism as to whether agriculture can lead to poverty reduction in today's challenging contexts (DFID, 2005). A major change to land ownership and distribution in most poor countries must be achieved in order to reduce poverty.

The promotion of sustainable economic growth and reduction of poverty continues to be the main concern and focus of most developing countries. As a way of promoting inclusive growth, sub-Saharan countries embarked on the distribution of natural resources to improve ownership of productive resources for the benefit of mostly the rural and poor households. Most empirical findings analysing the relationship between poverty, inequalities and rural land redistribution have applied a wide range of approaches. Different results have led to a huge debate on the nature and size of the relationship. In South Africa, the economy continues to experience a growth due to large infrastructure investment; however, the country continues to experience extreme poverty, especially in rural areas, which shows that the growth in the economy is not inclusive (Ncube *et al.,* 2015).

To promote inclusive growth through the national development plan 2030, the government targeted improving access to productive agricultural land by redistributing 30% of the productive land from large commercial farmers to smaller scale farmers. This is viewed as a way of promoting increased production among small scale farmers, thereby reducing poverty, and increasing access to income. Given the continued commitment by the government towards rural land redistribution and poverty reduction, it is pertinent to analyse the economy-wide impact of rural land redistribution considering growth in output, value added and income distribution between different income groups.

The transmission of agricultural rural land redistribution policy to poverty occurs through several complex and diverse channels, which range from direct and indirect, to short- and long-run, effects. Thus, the issue of methodology to capture such effects is

extremely important. However, until recently, most empirical studies widely adopted a static (CGE) model to account for the impacts of agricultural policies on poverty and income distribution. Most of these models adopted in a representative panel of households for analysing land policies on poverty comprise aggregated CGE models. These apply to all other instances that refer to the adoption of representative households (Chitiga *et al.,* 2007). Although static CGE models are important in policy analysis, they fail to account for both short- and long-run effects of the policy. In addition, empirical works have shown that the use of representative households may hide unexpected effects accompanying certain combinations of household characteristics. It is important to note that the behavioural response of individual households to changes in policy could not be accurately evaluated.

The impacts of rural land redistribution policy have been analysed in the literature using different models which range from the simplest approach of increasing the number of representative household categories to complex static general equilibrium models. Although these models were widely applied, majority of these studies fail to account for dynamics and suffer from the problem of intra-category heterogeneity (Piggott and Whalley, 1985). It must be noted that the majority of CGE models used in poverty analysis are aggregated with representative households to infer changes on income distribution due to the agricultural rural land redistribution policy. Therefore, such CGE models cannot address the policy impact on poverty as the policy tends to affect household differently according to location, education, and household composition. However, not much can be done concerning poverty analysis as the study of poverty relies on micro data (Chitiga, 2007).

Baccaufuso, Decaluwe and Savard (2004) argued that different functional forms for within-category income distribution can be used for poverty analysis by assuming a constant variance across individual households. Subsequently, a CGE model can be used to estimate the change in income by assuming a lognormal distribution within each category (De-Janvry and Sadoulet, 1991). However, the study showed that intra-category income variance amounts to more than half of the total income. Like the static CGE models, the use of log normal distribution cannot lead to true estimates of the impact of policy on poverty. Apart from intra-category variations, most CGE models

used in poverty are static in nature. Hence, they are inadequate for long-term analysis as they do not account for accumulative effects of agriculture rural land redistribution policies. As a result of the adoption of representative households, most empirical studies found relatively small poverty impacts of agricultural redistribution policies. These results are not surprising as a static framework is generally used in which poverty impacts result solely from short-term reallocation of resources (Annabi *et al.,* 2005).

To address the issue of intra-category variation and detailed poverty analysis, micro simulation models, which incorporate a household survey to study the issue of poverty and income distribution, were developed (Bourguignon, Fournier and Gurgand, 2000). Micro-simulation CGE models can be in two forms which can either use a macro-micro model based on household data working in sequence (Cogneau and Robilliard, 2000) or incorporate household data into the CGE models itself (Robilliard, 2000). The household surveys can be subsequently incorporated into the CGE model to allow for comparisons with multiple household categories and fixed intra-category income distribution (Decaluwe, Dumont, and Savard, 1999). Although micro-simulation models can effectively capture welfare effects of household due to policy changes, they have been widely applied to analyse the poverty effects of trade liberalisation (Winters *et al.,* 2002; Reimer, 2002, Rajan and Bird, 2002; Chitiga, 2007). There is still a limited application of micro-simulation models in the analysis of the impact of agricultural rural land redistribution policy on poverty in the African context (Ricardo *et al.*, 2010, Chitiga, 2008).

Empirical work to explore the consequences of rural land redistribution in Africa includes studies by Bautista *et al.* (2000) and Juana and Mabugu (2005). Most of the studies employing a partial static CGE on agriculture land policies and economic growth used representative households to infer the changes due to policy changes. However, these studies do not provide a comprehensive analysis of poverty and cannot explain change in poverty due to rural land redistribution policies as they do not account for distribution effects at a household level (Bourguignon *et al*., 2008). Empirical CGE models, which expand the number of representative households, can lead to bias and incorrect results as macro approaches tend to underestimate the effects of policies on poverty (Robilliard, Bourguigrion and Robinson, 2002). To account for these effects, the

integration of household data in CGE models is viewed as superior to representative household in terms of conducting a comprehensive analysis of the effect of agriculture rural land redistribution policy on poverty (Decaluwe *et al.,* 1999). It is important to disaggregate the household type because poverty analysis relies on micro data (Piggott and Whalley, 1985). The findings of these empirical studies can be further improved by assessing the impacts of poverty and inequalities on land reform with a dynamic CGE model.

In an African context, Chitiga (2007) applied a CGE microsimulation model to assess the impact of rural land redistribution on poverty and income distribution in Zimbabwe. The findings indicate that if properly implemented, rural land redistribution results in substantial improvements in income distribution and poverty reduction. Small-scale rural farmers tend to benefit more from a well-orchestrated rural land redistribution programme. However, the results on poverty due to land reform may vary across different countries because similar policies implemented in different countries may lead to different outcomes. The impact of rural land redistribution depends on country factor endowment, farming skills and the structure of the labour market. Thus, it is also important to do the same evaluation in the South African context.

In South Africa, a lot of attention was given to the evaluation of the impact of rural land redistribution in the last two decades (Lahiff, 2005; Seekings and Nattrass, 2005; Twala, 2007). Although there was a significant focus on the analysis of the impact of rural land redistribution on economic growth over the last decade, this remains a topical issue especially in South Africa (Bernstein, 2008:1). The focus of previous studies has been either to estimate the economy-wide impacts of rural land redistribution using a static CGE model or to give theoretical insights into the impact of rural land redistribution (Thurlow, 2002; Van Rooyen, 2008). Rural land redistribution results in distributional and accumulative effects on households. These effects can lead to reduction in extreme poverty and income inequalities.

Essentially, with static CGE models, the dynamic feedbacks of the policy in the context of economy and distributive poverty effects are not considered. In relation to the analysis of the impacts of rural land redistribution, it is important to understand these

distributional and accumulative effects to obtain a full understanding of the policy impacts as well as political insights into the redistribution. Thus, a dynamic CGE microsimulation specification would extend the range of possible policy simulation and provide a better understanding of the impacts of macro policies on the overall economy.

Unlike other developing countries, rural land redistribution in South Africa was and is being administered in a stable macroeconomic and political environment. Essentially, the redistribution policy is likely to improve income distribution among rural households. Therefore, dynamic CGE simulation models might allow accurate analysis of the effects of rural land redistribution on poverty. The use of micro-simulation models is assumed to be very important for poverty analysis as these models can capture micro effects of macro shocks. Therefore, this study adopted a dynamic CGE microsimulation model to analyse the poverty impact of agriculture rural land redistribution in South Africa.

Numerous economic studies have been carried out to investigate the relationship between rural land redistribution and poverty in many developing countries. The results from these studies have shown that rural land redistribution can be an effective way of reducing rural poverty and promoting economic growth (Birdsall and Londono, 1997; Burgess and Beasly, 1998; Deininger *et al.,* 2000; World Bank, 2004; Cousins, 2004; Lahiff and Cousins, 2005). The results of these empirical studies can be further improved using a dynamic CGE micro-simulation analysis to evaluate the economy-wide and detailed poverty impacts of rural land redistribution initiatives in South Africa. Rural land redistribution impacts that are already on the ground also need to be assessed to explore the possible long-term impacts on the economy.

Although most empirical studies have found that rural land redistribution can be beneficial to the economy and can enhance welfare in several countries, it is useful to have a detailed study to evaluate its effects over time and its influence on poverty and inequality. This can only be done by using a dynamic CGE microsimulation model. The incorporation of a simulation model enables researchers to capture the distributional effects of a policy; hence, the poverty impacts of policies over time can be adequately measured using a dynamic CGE simulation model (Annabi, Cisse, Cockburn, and Decaluwe, 2005). The contribution of this study is to incorporate the growth effects

resulting from rural land redistribution in the long-term and present the poverty and distributional impacts by considering long-term growth impacts of rural land redistribution in South Africa.

Numerous empirical studies have shown that rural land redistribution can be an effective tool in fighting poverty and promoting agricultural growth (Marais, 1998; Deininger, 2003; IFAD, 2001; DFID, 2003; World Bank, 2006). Rural land redistribution in developing countries results in distributional and accumulative effects on households. These effects can lead to reduction in extreme poverty and income inequalities. Thus, even in South Africa, rural land redistribution has been identified as a catalyst for growth, welfare enhancement and rural economic transformation.

2.8 South Africa's poverty profile

Although it is widely agreed that South Africa is an upper-middle-income country by international standards, the country has exceptionally high levels of income inequalities and poverty rates in the world (May, 2002), with 57% of the population living in poverty [Human Sciences Research Council (HSRC), 2004]. This suggests that the country is still faced with the challenge of a significant proportion of the population living in poverty, as this is associated with large income disparities among different groups of the population. This makes reducing income inequalities and eradicating high poverty rates, especially among rural households, primary objectives of the South African government. Hence, long-term strategies that focus mainly on increasing employment and boosting food security in rural areas are required (du Toit, 2005; Bhorat and Kanbur, 2006). Such strategies should promote sustainable employment creation, reduce poverty, foster economic growth and remove structural impediments in the economy. In addition, rural communities should participate fully in economic activities. To this end, the government must increase its spending towards pro-poverty policies, especially those that promote rural agriculture such as rural land redistribution (Deininger, 2003).

The South African agriculture sector is highly dualistic. About 86% of total agricultural land comprises highly developed large-scale commercial farmland and is owned by about 10.9% of the population, with around 89.1% of the population occupying subsistence-oriented rural land (Weiner and Levin, 1993). This means that there are

large disparities in land ownership among different population groups in the country. These disparities mean that only a limited number of rural people may secure a fair living from agriculture, resulting in a large majority of the population being poverty-stricken in rural areas (World Bank, 2006). Although it is evident that the production technology employed by land beneficiaries will differ from that of commercial farmers, rural agricultural land re-distribution in South Africa would still be an important strategy of reducing poverty and improving in-come distribution for the poor (May, 2000; IFAD, 2001; Deininger, 2003). Owing to this, since 1994 the South African government has been progressively engaged in agricultural land policies to address past imbalances as a way of trying to improve the living standards of the rural population (Seekings and Nattrass, 2005). Given that more resources and efforts are deployed for agriculture by the government, it can be expected that agricultural land reform policy will have non-negligible effects on productivity growth and rural poverty reduction. However, as indicated by van den Brink *et al.* (2006), detailed accumulative and welfare analysis of land reform has been hampered by the lack of empirical evidence concerning the impact of the programme on livelihoods of intended beneficiaries.

Increasing population growth, the need to increase economic productivity and reduce rural poverty, and an increasing demand for land resources are raising a growing concern about the efficiency of natural resource use in the country. As the population growth continues to outpace economic growth, the competition for resources between economic agents has increased while their supply has remained inelastic. This has increased the need for rural land redistribution, considering the benefits of efficient agricultural resource policies even in developing countries like South Africa (Deininger and Binswanger, 1999). Lahiff and Cousins (2005) argued that these rural agricultural land redistribution policies are meant to address past land imbalances and improve resource use, thereby promoting sustainable economic growth and reducing poverty. De-spite its importance, rural land redistribution in South Africa has not been fully implemented and articulated.

There is a strong provincial dimension to poverty in South Africa. The highest poverty rate is observed in Limpopo Province (about 64.6%), followed by Eastern Cape (about 57,6%) compared with about 28.8% in Western Cape and 24.9% in Gauteng. The

highest rate of rural population lives below the poverty line (67.7%), which is more than twice that of the urban population (32.7%) (Statistics SA, 2008A). Mostly, the growth points and rural areas of the country experience high poverty rates and highly unequal distribution of income. Most of the households rely on agriculture and survive by supplying cheap labour to surrounding commercial farms.

Rural poverty in South Africa is more prevalent in female-headed households than in male-headed households. According to Statistics SA (2008a), about 45% of female-headed households lived below the poverty datum line compared with 25% male-headed households. Therefore, female-headed households are 1.8 times poorer than male-headed households. This may be mainly since women reside in rural areas where poverty is concentrated, while men migrate to urban areas in search of employment (Woolard and Leibbrand, 1999*)*.

In sub- Saharan Africa, there has been an increased interest in gaining access to and control over land as a way of reducing poverty and addressing past land imbalances. However, in other developing countries, the land question comprises several dimensions including population movements, settlements pattern, income inequalities and poverty reduction. This makes rural land redistribution an important social and economic resource in agrarian-based societies. Like most developing countries, land reform in South Africa seeks to address race-based dispossessions as part of the transition to democracy and rural development. Before independence in 1994, most of the best agricultural land was reserved for the minority white population while the black majorities were confined to native reserves. Thus, approximately 82 million hectares of commercial farmland was in the hands of the white minority, and majority of the poverty-stricken black people remained crowded in homelands. These homelands were characterised by extremely low incomes, high malnutrition and lack of basic facilities.

To date, income distribution in South Africa is highly unequal, which is highly correlated with race and gender (May, 2000). As a way of trying to reduce these income disparities and alleviate rural poverty, the South African government embarked on a multifaceted land reform programme meant specifically to redress land imbalances and promote rural development. This multifaceted land reform is aimed at improving access to land

by historically disadvantaged people, thereby achieving equity concerning land access and improved land use, while contributing to the development of the rural economy. The primary target of land reform policies was to provide the poor with access to land for productive uses to improve their incomes and quality of life.

2.9 Summary

In this chapter, the theory behind the impact of rural land redistribution on poverty and income inequality is examined. It was noted that there is neither consensus nor uniformly acceptable conclusion on the contribution of rural land redistribution on poverty in developing countries. The chapter further discusses the empirical studies on rural land redistribution and poverty mostly in developing countries. Despite the significance of rural land redistribution to poverty, income inequalities and economic growth, the analysis faces several methodological challenges. One of the top challenges facing most researchers relates to difficulties in combining macroeconomic policies with microeconomics data. One important intervention is to adopt a dynamic CGE microsimulation model of analysis. The next chapter reviews the methodology adopted in this study and the sources of data.

CHAPTER 3

MODELLING THE DISTRIBUTIVE EFFECTS OF RURAL LAND REDISTRIBUTION IN SOUTH AFRICA: SAM MULTIPLIER DECOMPOSITION ANALYSIS

3.1 Introduction

In order to address the first objective of the study, this chapter focuses on the SAM multiplier decomposition coupled with structural path analysis to analyse the distributive effects of rural land redistribution in South Africa. More emphasis is directed towards understanding the multiplier decomposition concept. The first section discusses the basic notion of the SAM, and subsequent sections discuss the theory of multiplier decomposition and structural path analysis. The conclusion presents a summary of the chapter.

3.2 The Social Accounting Matrix

Several studies to analyse land inequality and redistribution have been done in developing countries (Thurlow, 2002; DFID, 2003*;* Lahiff, 2005; World Bank, 2006). Most of them indicated that inclusive growth is an effective way of reducing poverty (DFID, 2003; World Bank, 2006*)*. However, most analytical techniques employed in these studies have not attempted to investigate the effect of the proposed rural land redistribution on the welfare of interested stakeholders in the long-run. The empirical techniques applied, generally do not provide a complete picture of the economy-wide effects attributable to agricultural rural land redistribution. For effective policy formulation and implementation, there is a need to investigate the economy-wide effects and welfare consequences of the redistribution by considering both the backwards and forward intersectoral linkages of the South African economy.

By using the SAM multiplier decomposition framework, this study intends to analyse the economy-wide and redistributive effects of rural land redistribution on poor household incomes in South Africa. The SAM multiplier decomposition and structural path analysis model enables the tracking of linkages among demand-driven shocks and economic growth, income generation, and distribution among different economic groups by linking

household income to productive sectors of the economy. The main contribution of this study is to provide a microscopic analysis of the global multiplier by adopting the SAM multiplier decomposition proposed by Pyatt and Round (2006). The multiplier decomposition can help in showing the transmission mechanism of household income from a shock to the agriculture sector. Additionally, dividing multiplier effects into relevant components can assist to show how income moves across sectors, factors of production and households.

3.3 Data

To analyse the intersectional impact of rural land redistribution on South African economy, this study adopted the IFPRI 2009 SAM that was built using official supply-use details, national accounts, state budgets and balance of payments accounts. The SAM provides a detailed representation of the South African economy and records transactions between different economic accounts. Based on this, the SAM is an ideal database for conducting economy-wide impact assessments such as SAM based multiplier analysis and CGE models. The IFPRI 2009 SAM comprises 49 activities, 85 commodities, 14 household types, aggregate accounts for the government, an enterprise, and the rest of the world. The SAM has five factors of production, namely, capital, labourers with primary education, labourers with middle school education, labourers who have completed secondary school education, and labourers with tertiary education.

Given the nature of multiplier decomposition and structural path analysis, activity and commodities accounts are aggregated into single production accounts. For this study and for multiplier decomposition purposes, the government sector and the rest of the world column are excluded. The SAM was aggregated into 41 production activities (in this case production activities are a combination of 49 activities and 85 commodities), 4 factors of production and private institutions which combine 5 household categories and enterprise accounts. The agriculture accounts which comprise of commodities and activities was aggregated into two accounts which are commercial and small-scale agriculture as rural land redistribution is from commercial to small scale agriculture. For further analysis, agriculture capital was sub-divided into equipment and land, which will

be further portioned between large scale commercial and small holder agriculture. Private institutions, activities and factor accounts will then constitute endogenous accounts, while the exogenous account comprises the government account, savings and investment accounts, and accounts of the rest of the world (Pyatt and Round, *2006*)

The SAM framework can be quite effective in capturing linkages between these different production accounts and institutions in the economy. Generally, this framework has been widely employed to explore the impact of different exogenous shocks in the economy (Civardi *et al*., 2006*;* Pansini, 2008).

Several empirical studies such as Nseera (2014)*,* Juana and Mabugu (2005) and Sadoulet and de Janvry (1995) have applied the SAM multiplier framework to analyse growth and distributive impacts of different government policies. The input-output and SAMs have been extensively used in the early literature to analyse growth linkages between various economic sectors, especially to investigate the role of agriculture and industry as engines of economic growth (Hassan and Olbrich, 1999; Bautista *et al.,* 2002; Delgado *et al.,* 1998). However, detailed, and effective analysis of rural land redistribution requires SAM decomposition and a structural path framework that captures intersectoral effects (Sadoulet and de Janvry, 1995). This study adopted this framework to analyse the impact of an exogenous shock in the agricultural sector on the income of poor households in South Africa.

The social accounting multiplier analysis can be applied to analyse the economy-wide impacts of rural land redistribution focusing mainly on the impacts on sectorial output, value added and household income distribution in South Africa. The structure of the SAM is represented in Table 3.1.

Table 3.1 The basic structure of the SAM

	Act1	Act2	Com1	Com2	Factors	h/holds	Total
Act1			S_{11}	S_{12}			X_1
Act2			S_{21}	S_{22}			X_2
Com1	Z_{11}	Z_{12}				C_1	S_1
Com2	Z_{21}	Z_{22}				C_2	S_2
Factors	v_1	v_2					J
h/holds					D		$Y-E$
Total	X_1	X_2	S_1	S_2	J	E	

Notes: Act 1 represents activity 1, Com1 represents commodity 1

In order to analyse the effects of an exogenous shock in the agricultural sector on endogenous variables, a SAM system is transformed into an economic model which can be useful for simulation. Additionally, for the purpose of the multiplier model, the SAMs are designated as endogenous and exogenous accounts as shown in Table 3.2.

Table 3.2 SAM: Endogenous and Exogenous Accounts

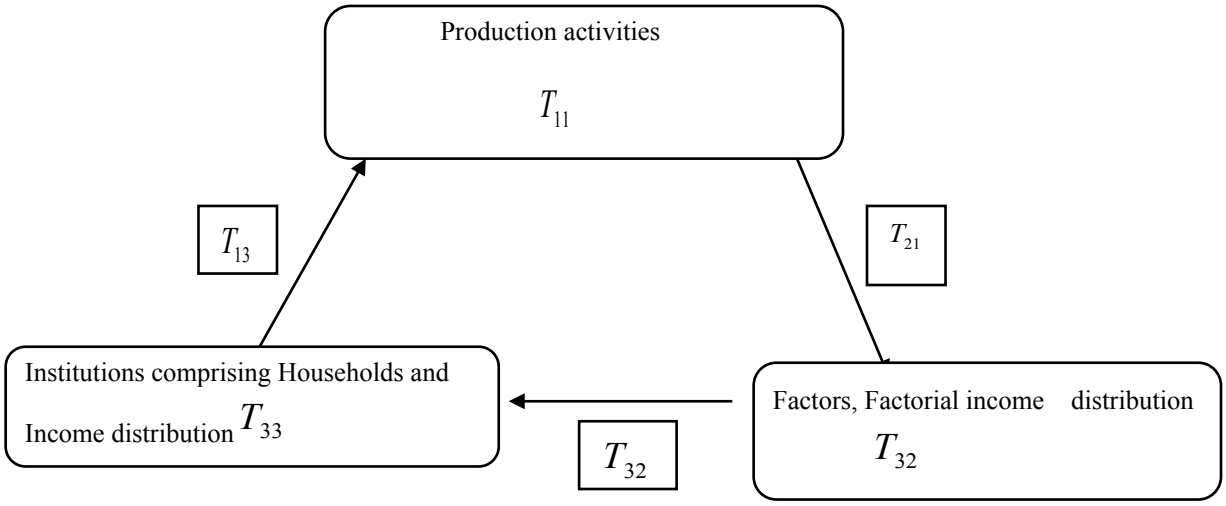
	Endogenous			Exogenous	TOTAL
	Activities	Factors	Households	Exogenous	Total
Activities	T_{11}		T_{13}	X_1	Y_1
Factors	T_{21}			X_2	Y_2
Households		T_{32}	T_{33}	X_3	Y_3
Exogenous	l_1	l_2	l_3		$\sum l$
Total	Y_1	Y_2	Y_3	$\sum X$	

Note: = sum of all activities, ie the value of total production of the n activities,= the final demand of commodities from Private Institutions, = exogenous final demand from consumption, export and investment demand; = exogenous final demand for factors from consumption, export and investment demand; = exogenous injection from government transfers and remittances from abroad toward the Private Institutions.

Source: Civardi and Targetti (2006) and Pansini (2008)

The SAM was calibrated using 2020 as the base year and was divided into endogenous account that includes factors, institutions and production accounts, and exogenous accounts that include a savings and investment enterprise, the government and the rest of the world. These partitions are represented in terms of matrix as shown in Table 3.2. The matrices T_{11}, T_{32}, and T_{33} capture the intermediate input requirements, factorial income distribution and inter-household income distribution, respectively. The interactions among different accounts in the SAM, including production activities, factors and institutions can be represented in terms of a triangle as shown in Figure 3.1.

Figure 3.1: Multiplier process among endogenous accounts



Source: Civardi and Targetti (2006)

Figure 3.1 represents the mechanisms through which the multiplier process operates as a result of different exogenous injections into the economy (Thorbecke, 2000). These mechanisms are represented as relationships among production activities, institutions and factors, which are the endogenous accounts in the model. The production activities generate value added which is allocated as the factor income distributed to households and enterprises. These institutions subsequently spend their income on different commodities generated by the production activities.

The economic model which is represented by the SAM in table 3.1 can be translated into a system of linear equations as shown below:

$$S_{11}S_1 + S_{12}S_2 = Z_1 \quad (3.1)$$

$$S_{21}S_1 + S_{22}S_{22} = Z_2 \quad (3.2)$$

$$a_{11}Z_1 + a_{12}Z_2 + C_1E + JD_1 = S_1 \quad (3.3)$$

$$a_{12}Z_1 + a_{22}Z_2 + C_2E + JD_2 = S_2. \quad (3.4)^*$$

$$v_1Z_1 + v_2Z_2 = J \quad (3.5)$$

$$hJ = Y \quad (3.6)$$

Following the methodology by Pyatt (2001*),* the system of equations (equation 3.1-3.6) can be converted into a matrix. The resultant matrix is as follows;

$$\begin{bmatrix} Z_1 \\ Z_2 \\ S_1 \\ S_2 \\ J \\ Y \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ D_1 \\ D_2 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} Z_1 \\ Z_2 \\ S_1 \\ S_2 \\ J \\ Y \end{bmatrix}$$

The matrix shows that gross output from the economy can be represented by the product of technical coefficient matrix and output of different sectors of the economy. Conversely, the level of activity in the economy in real terms is determined by the vector of intermediate demand and the total final demand for inputs.

The SAM can be used as the basis for modelling by introducing the matrix of average propensities that will be defined within its framework. If a change in exogenous uses (J) can be accommodated and the change in total activity (Z^1), then the total income of the endogenous account matrix represents the basic materials balance equation specified as:

$$Z^1 = AZ^1 + J \quad (3.7)$$

where Z^1 is an $nx1$ column vector of the total sectorial output, A is an *n x n* matrix of direct technical coefficients for the endogenous factors and J is an*nx1* column vector of final demand. The dimension of the 'A' matrix coincides with the number of productive sectors. Solving for Z^1 from material balance equation leads to equation (3.8):

$$Z^1 = (I - A)^{-1} * J \qquad (3.8)$$

where 'I' is the identity matrix and $(I - A)^{-1}$ represents the Leontief inverse.

The input-output model is concerned with solving for the sectorial output levels (Z) that satisfy final demand for the outputs (J) given the inter-industry structure of production (A). The model is used to determine the production plan that is consistent with the desired final demand vector, given the inter-sectorial transactions matrix (A). The equation $(I - A)^{-1} * J = Z^1$ shows the impact of exogenous shocks to the different entries in the SAM. The above equation can be used to derive various types of multipliers, the most common of which are production and income multipliers.

The equation (3.9) can be reduced to:

$Z^1 = N^1 J$, where $N^1 = (I - A)^{-1}$ (3.9)

Equation (3.9) corrects for the equilibrium levels of the endogenous accounts due to an exogenous shock in the elements of the exogenous accounts. The same equation can be used to calculate endogenous incomes associated with changes in the total exogenous accounts, given the multiplier matrix. It can also be used to analyse the effects on output arising from exogenous shocks, such as changes in investment, government expenditure, or the rest of the world, which change the final demand.

The change in output resulting from the redistribution of land can be represented by the equation (3.10):

$$(1 - A_1)^{-1} * J - (1 - A)^{-1} * J = [(1 - A_1) - (1 - A)] = \Delta Z^1 \qquad (3.10)$$

where ΔZ^1 represents the change in sectoral output resulting from redistribution and its impact on the technical coefficient matrix.

The SAM multiplier enables the quantification of the different ways in which the impact of the exogenous shocks is distributed across the economy. This multiplier analysis also indicates the effects of an exogenous shock on the distribution of income and sectoral output (Round, 2003). However, to examine the nature of the linkages in the economic system, it is imperative to decompose the SAM multipliers for a detailed analysis of the inter-sectoral linkages due to rural land redistribution in South Africa.

This multiplier decomposition allows the assessment of linkages between households and different components of the economic system affecting the distribution of income (Civardi *et al.,* 2008). The total multiplier can be decomposed into the following three components: the transfer multiplier, open-loop multiplier and closed loop multiplier. The transfer multiplier captures the effects resulting from direct transfers within the endogenous account; the open-loop multiplier identifies the spill-over effects; and the closed loop captures the full circular flow from the exogenous shock into endogenous accounts. Thus using the multiplicative decomposition proposed by Pyatt and Round (2006), the total multiplier from equation (3.9) can be rewritten as:

$$(I-A)^{-1} = M_3 M_2 M_1 \tag{3.11}$$

where $(I-A)^{-1}$ represents the total multiplier and M_1 denotes the transfer multiplier, M_2 stands for the spill-over effects and M_3 -represents the full circular flow.

To derive the multiplier matrix, we first divide elements in each column of the T matrix by its column total (y) to get average propensities (Round, 2003). The matrix of average propensities that is obtained by dividing each element in the transaction matrix of endogenous account by the corresponding column sum vectors can be represented as:

$$A_n = \begin{vmatrix} A_{11} & 0 & A_{13} \\ A_{21} & 0 & 0 \\ 0 & A_{32} & A_{33} \end{vmatrix}$$

And the diagonal matrices of the average propensities can be represented as:

$$A_0 = \begin{vmatrix} A_{11} & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & A_{33} \end{vmatrix}.$$

The multiplier that will capture the transfer elements M_1 will be given by:

$$M_1 = \begin{vmatrix} {}_1M_{11} & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & {}_1M_{33} \end{vmatrix}$$

and the open-loop multiplier will be given by:

$$M_2 = I + (I - A_0)^{-1}(A_n - A_0) + \left[(I - A_0)^{-1}(A_n - A_0)\right]^2 + \left[(A_n - A_0)(I - A_0)^{-1}\right]^3$$

$$= \begin{vmatrix} I & {}_2M_{12} & {}_2M_{13} \\ {}_2M_{21} & I & {}_2M_{23} \\ {}_2M_{31} & {}_2M_{32} & I \end{vmatrix}$$

.

The closed loop multiplier that captures the full circular flow from exogenous shock to endogenous account will be represented by:

$$M_3 = \begin{vmatrix} {}_3M_{11} & 0 & 0 \\ 0 & {}_2M_{22} & 0 \\ 0 & 0 & {}_3M_{33} \end{vmatrix}.$$

If we let $A^* = (I - A_0)^{-1}(A_n - A_0)$, then the multiplier will be $M = (I - A^{*3})^{-1}(I + A^* + A^{*2} + A^{*3})(I - A_0)^{-1}$.

As in Pansini (2008), the multiplier decomposition focuses on the household income distribution. From Table 3.2, the equation is given by:

$$Y_4 = (M_{33}M_{32}M_{31})x \qquad (3.12)$$

$$Y_4 = M_{31}x_1 M_{32}x_2 M_{33}x_3 \quad (3.13)$$

Where $M_{31} = {}_3\ M_{3_2} M_{31\,1} M_{11}$

$M_{32} = {}_3 M_{33\,2} M_{32}$

$M_{33} = {}_3 M_{33\ \ 1} M_{33}$

To disentangle the three effects: the transfer multiplier, open-loop and closed loop, we consider the single element m_{ij} of the matrix of the global multipliers. The single element m_{ij} can be expressed as:

$$m_{ij} = d_i^{'} M_3 M_2 M_1 d_j = i'(r' As')i \quad (3.14)$$

where $d_i^{'}$ and d_j are vectors in the *ith* element and *jth* element, which are equivalent to one and all others are equal to zero (Pyatt and Round, 2006; Pansini, 2008; Civardi and Targetti, 2008). The matrix A and vectors r' and s' are defined as:

$r' = d_i M_3 \qquad A = M_2 \qquad s' = M_1 d_j$

This implies that each m_{ij} must be equal to the sum of all the elements of the $r' As'$ type transformation of the matrix M_2 when the vector r' is formed from the i^{th} row of M_3 and the vector S is formed from the j^{th} column of M_1 (Pyatt and Round, 2006). This multiplier approach allows the decomposition of direct-direct effect, indirect-direct effect, direct-indirect effect, and indirect-indirect effect (Pansini, 2008). In this study, -i represents the poor rural household in South Africa and j is the agriculture sector. It follows that the element m_{ij} becomes a sub-matrix M_{HA} of M, and the element m_{ij} is given by $m_{ij} = (d'_3 M_{HH})_2 M_{HA} ({}_1 M_{AA} d_j)$

This approach enables the assessment and identification of the microeconomic detail about the nature of the linkages in the economy. In order to capture and assess both

the direct and indirect effects of rural land redistribution on different sectors of the economy which is the main focus of this study, the SAM decomposition and structural path analysis were adopted as in Round (2008).

This decomposition clearly shows the way the consequences of an exogenous enhances clarity in the j^{th} activity on the i^{th} household. Using the block matrices $_2M_{HA}$,and $_2M_{HF}$ which represent the cross effects, the study explains how the original injection into the activities or factor accounts affects the household account (Civardi *et al.,* 2008). An injection or a shock in an activity account of the production sector will be directly translated by the *A* part of the $r'As'$ transformation into income for the endogenous institutions. The main focus of this decomposition is the block matrix M_{HA}, where the column totals of this matrix indicate the effects of each sector of production on the household on account of a shock on the agriculture sector where the row totals indicate the total effect on each household group due to shock on the agricultural activity account. These column and row totals enable the identification of the four different effects in the single multiplier m_{ij}'.

The four different effects can be defined mainly as:

i) Direct-direct effects represent the direct effect of agricultural rural land redistribution on poor households, without considering the other indirect effects on other household categories. It is equal to the- element of the column vector of the block matrix.

ii) Indirect-direct effects measure the effect from other production accounts apart from agriculture on the household group. It is calculated as the difference between row totals of the block matrix and the direct-direct effect.

iii) Direct-indirect effect is the effect emerging from the shock in the agricultural sectors on other household groups. This effect is calculated as the difference between the column totals of the block matrix and the direct-direct effect.

iv) Indirect-indirect effect is the effect emerging from other accounts of the production accounts that are different from the effect of shock in the agricultural sector on other household groups which are also different from the category. The indirect-indirect effect is the difference between the total effects on household and the direct-direct effect.

Although the multiplier decomposition enables the distribution of the global effects into three microscopic effects on the endogenous accounts of the SAM, the analysis alone does not highlight the paths/channels through which this influence is transmitted, and shows that the path is better than the other in transmitting the influences. Based on multiplier decomposition results, the structural path analysis is adopted to identify the transmission mechanism of the interactions among different accounts in the SAM.

If we consider every endogenous account in the SAM as the pole and the link between poles as the arc *(*i*,j)*, then the element a_{ji} in the average expenditure matrix A_n is considered the intensity of the arc *(i,j)* that captures the magnitude of the influence transmitted from pole *i* to pole *j* and the sequence of different arcs.

i) Direct influence: It measures the change in income or production of *j* induced by a unitary change in *i.* All the other poles remaining constant and the direct influence can be measured as:

$$I^{D}_{(i\to j)} = a_{ji,} \qquad (3.15)$$

where a_{ji} is the $(j,i)^{th}$ element of the matrix of average expenditure propensities A_n. The direct influence along more than one elementary path $(i,.....j)$ can be represented as a product of the intensities of the arcs constituting the arc, and hence, $I^{D}_{(i\to j)} = a_{jn}.....a_{mi}$. The number of arc compositions will then be identified as the length of path; additionally, the path that does not pass more than once through the same pole is called an elementary path, while the one whose origin coincides with its pole of destination is the circuit.

ii) Total influence: Given an elementary path $q = (i.,.....j)$ with origin *i* and destination *j,* the total influence will be the influence transmitted from i to j along the elementary path q plus all the indirect effects induced by the circuits adjacent to the same path. Algebraically, the total influence can be represented as:

$$I^{T}_{(i \to D_P)} = I^{D}_{(i \to j)_p} M_P \qquad (3.16)$$

where, M_P is the path multiplier that measures the extent to which the direct influence along path q is amplified through the effects of the adjacent feedback circuits. Thus, the total effects accumulate the direct effects from an elementary path and the indirect effects from an adjacent circuit.

iii) Global influence: It influences and measures the total influence on income or output of pole j consequent to an exogenous shock on income or output in pole i. This global influence captures the reduced form of the SAM model equation $Z^1 = (I - A)^{-1} * J$. The global influence captures the direct influence transmitted by all the elementary paths linking the two poles under consideration; and thus the global influence accumulates all the induced and feedback effects resulting from the existence of circuits (Lantner, 1974; Gabon, 1976). Thus, global influence linking any two poles will be the sum of the total influences of all the elementary paths spanning poles i and j, which can be represented as:

$$I^{G}_{(i \to j)} = m_{a_{ji}} = \sum_{q=1}^{n} I^{T}_{(i \to j)_p} = \sum_{q=n}^{n} I^{D}_{(i \to j)_p} M_P \qquad (3.17)$$

3.5 Estimation approach

The main purpose of this study is to investigate whether redistribution of agricultural land from large commercial farmers to small scale farmers will promote land use social equity. Social equity in this context refers to job creation, income generation and redistribution in favour of low-income households. Since the SAM entries are expressed in millions of Rand and the proposed rural land redistribution is in physical quantities, the land transfers are first converted into land income (revenue shares). This conversion

is essential as the transfer of land from commercial farmers to small scale farmers means transfer of land income. Subsequently, the land revenue shares are used to shock the SAM. Therefore, the SAM multiplier approach enables the tracking of demand –driven shocks, economic growth, income generation and distribution. Furthermore, a multiplier decomposition analysis was applied to show distributional mechanisms across the economy, with focus on the household component of the global multiplier matrix, which are M_{31}, M_{32}, and M_{33}. The behavioural elasticities were estimated using maximum likelihood estimation. The multiplier decomposition shows the capacity of an activity to stimulate household income. The study seeks to analyse and assess the direct and indirect effects of rural land redistribution (which represents a shock in the agriculture sector) on poor household income in South Africa, and, for this study, we assumed a progressive 30 % land transfer from the large-scale to small-scale farmers.

3.6 Summary

This chapter has reviewed the analytical theory behind the SAM and provided detailed knowledge of multiplier decomposition and structural path analysis. The chapter therefore presented the design and techniques that are employed in this study to answer the research questions in order to achieve the research objectives. The next chapter presents the empirical findings of the SAM multiplier decomposition analysis.

CHAPTER 4

DISCUSSION / PRESENTATION / INTERPRETATION OF FINDINGS OF SAM MULTIPLIER DECOMPOSITION ANALYSIS

4.1 Introduction

The previous chapter provided an analytical explanation of the SAM multiplier decomposition. This chapter is aimed at providing a discussion and explanation of the decomposition results. The chapter begins by discussing findings of the decomposition of the global multiplier, and then results from structural path analysis showing various channels of redistribution impact transmission**.** The conclusion presents a summary of the chapter.

4.2 Empirical results

In this study, the global matrix multiplier that reflects the total effects was decomposed to show how income is distributed across various household groups.

Table 4.1: SAM household multiplier

Sector	Total HH multiplier	Rich	Poor
Agriculture	1.107	0.59	0.78
Manufacturing	0.204	0.515	0.15
Mining	0.24	0.450	0.125
Service	0.228	0.670	0.116
Trade	0.353	0.671	0.153
Transport	0.253	0.634	0.162
Enterprise	0.78	0.723	0.464

Source: Authors' computation from South African SAM, 2010

Household multipliers measure the total effect of a unit change in income of a particular household group on the incomes of all households in the economy. Agriculture exhibits

the highest aggregate multiplier, signifying the important role for consumption and livelihoods for rural households. The SAM multiplier established the importance of the agricultural sector, hence increases in agricultural output generates the largest increases in household incomes. The multiplier for the poor household is greater than that of the rich households (0. 78 compared to 0. 59), signifying the dependence of poor household on agriculture for their livelihoods. Thus, the multiplier analysis supports the implementation of agricultural-based policies to alleviate rural poverty.

Table 4.2: Intra and inter-household transfer

	Poor household	Rich household	Total
Poor household	0.13	0.125	0.255
Rich household	0.158	0.146	0.304
Total	0.288	0.271	

Source: Authors' computation from South African SAM, 2010

Table 4.2 shows how a shock in aggregate demand translates into higher income. For both groups of households (rich and poor), an injection into the income of a household group yields less than the initial increase in the income of the same household. However, the overall impact is higher for rich households compared to poor households, which is evidenced by higher row totals. These higher row totals mean that income distribution in South Africa is skewed towards rich household groups.

The focus of the results from the decomposition was on the household section of the total effects which are M_{31}, M_{32}, and M_{33} as shown in Table 4.3 below.

Table 4.3: Summary of M_{31}, M_{32}, and M_{33}

Household type	M_{31}	M_{32}	M_{33}
hhd1	0.889	0.203	1.095
hhd2	1.839	0.414	1.201
hhd3	3.001	0.626	1.335
hhd4	5.551	1.05	1.63
hhd5	22.683	3.802	3.62
Total	33.963	6.095	8.883
Total average	0.828	1.52	1.7766

Notes: hhd1 represents the poorest rural household decile, hhd3 represents the richest rural household decile, hhd4 represents the poorest urban household decile and hhd5 represents the richest urban household.
Source: Authors' computation from the South African SAM, 2010

From Table 4.3, the income effects on household income due to a shock to the production system, as measured by the matrix M_{31}, indicates that household income increases by the size of the average multiplier. The results indicate that a shock of one unit in the agricultural sector has a household income effect of 0,828, and, a total effect of 33,963. However, of this, the rich urban households (22,683 experience a significant multiplier effect. From these results, it is important to note that rural households benefit more from most of the agricultural activities.

Matrix M_{32} measures the impact of an exogenous shock in the agricultural sector on household income, which is directed to the factor account. In addition, on average, an exogenous injection into the factors of production will increase the income, especially of the poor household by a multiplier of 1.52 and by 2.3458 of the total income of the endogenous account. The redistribution of the factor income among different household groups, which is represented by the matrix M_{33}, increased the household income by a multiplier of 1.7766. The redistributive matrix shows that because of the multiplicative effect resulting from the movement of income through the economic system, household income increases by a factor greater than one when there is a unit injection on the income of different groups of households. This is because all the elements of the diagonal matrix are greater than one. This more than proportionate income can be

explained by the diagonal elements of the M_{33} matrix, which are all greater than one.

4.3 Multiplier decomposition and household income

This section seeks to track the contribution of direct and indirect effects of a shock in the agriculture sector on the income of rural households in South Africa. In addition, different directions in which the shocks operate on the agricultural sector will be traced and disentangled (Jami, 2006). The decomposition of the global multiplier matrix will be based on the analysis of elements of m_{ij} based on the $\hat{r}'As'$ type of transformation.

The corresponding element of the global multiplier for a shock in the agriculture sector on poor household income (represented by HHD1 in Table 4.4) is 0.0028874. This element is decomposed into four effects comprising direct-direct effect, direct-indirect effect, indirect-direct effects and indirect- indirect effects as shown in Table 4.4 below. This decomposition enables the identification of the link in that affects households an economic system in South Africa.

Table 4:4 Decomposition of the global multiplier matrix

Column j	Row i	Household group	Direct-direct effect	Indirect-direct effect	Total effect for A1	Direct-indirect effect	Indirect-indirect effect	Total effect	Multiplier
Agric	hhd1	hhd1	0.0087	-0.00587	**0.002827**	0.00089	-0.00083	**0.00006**	0.0028874
Agric	hhd1	hhd2	0.0001	-0.00008	**0.000022**	0.00949	-0.00662	**0.00287**	0.0028874
Agric	hhd1	hhd3	0.0001	-0.0006	**0.000023**	0.00950	-0.00664	**0.00286**	0.0028874
Agric	hhd1	hhd4	-0.000	0.00007	**0.000022**	0.00964	-0.00677	**0.00286**	0.0028874
Agric	hhd1	hhd5	-0.001	0.00110	**-0.000001**	0.0107	-0.00781	**0.00289**	0.0028874

Notes: hhd1 represents the poorest rural household decile, hhd3 represents the richest rural household decile, and hhd4 represents the poorest urban household decile, Agric represents the agriculture sector

Source: Authors' computation from South African SAM, 2010

The results showed different effects which are the direct-direct, indirect-direct, direct-indirect and indirect-indirect as explained in the methodology. The corresponding element of the global multiplier for a unit injection in agriculture on poor rural

households (hhd1) is 0.0028874, and is further decomposed in Table 4.4 above. The results show that poor households benefit more compared to other household groups due to an exogenous shock. This is because the direct effect of an exogenous injection or shock in the agriculture sector on poor household income represents about 98% of the total effect on the household. The direct effect of agriculture on the poor household is higher (0.0087) compared to other different categories of households, indicating a strong link between agriculture and the rural poor (Thorbecke, 2000). Like in other studies (Civardi and Targetti, 2008; Pansini, 2008), direct effects on households have been found to be higher than indirect effects. However, the indirect-direct effect, which captures the effects from other sector on poor household welfare is the minimum for the poor household compared to other groups. This implies that poor households do not benefit much from other sectors.

Concerning rich households, who are mostly urban households, the direct effect of agriculture is almost zero. This implies that these households benefit from agriculture mainly through the indirect channel (which is about 98% of the total effects). In the case of South Africa where, according to Economic Research Division SA (2010), agriculture contributes less than 4% of the total GDP, we expected a minimal direct effect on rich household income from an exogenous shock in the agriculture sector. The shock in the agriculture sector generates intermediate demand for agriculture products, which in turn generates income for rich households.

The decomposition has shown that an injection into the agricultural sector in South Africa will have different results for different household groups. The results show that poor households received higher direct effects of agriculture when compared to richer households. However, the indirect effects are much higher for richer households. This indicates a strong link between poor households and agriculture, but this link is weak for richer households. The results might be attributed to the fact that poor households depend more on agriculture for livelihoods when compared to richer households (Pansini, 2008). These results imply that the stimulus to the agricultural sector will benefit poor households when compared to the richer, which might be a good policy for rural poverty reduction.

4.4 Structural path analysis

The structural path analysis helps us to identify the most important channels and paths that will affect household income within the economic system. This is a technique which is employed to measure and analyse the impact of exogenous shocks on the economy (Civardi *et al.,* 2010, Cardenete & Sacho, 2012). In addition, the analysis enables the identification of sectors and activities that benefit from an exogenous shock in the agriculture sector. In this study, the origin of the shock is the agriculture sector, the shock is the rural land redistribution that will affect the land income of households, and the destination refers to unskilled households that are mostly involved in the agriculture sector and are viewed as intended beneficiaries of the rural land redistribution exercise. Thus the structural path analysis is important as it systematically traces income and expenditure in a national economy (Osorio *et al.,* 2012).

The study chose a few sectors and factors that are mostly and directly linked to the agricultural sector and rural household income. The results of the structural path analysis are shown in Table 4.5 below.

Table 4.5 Structural Path Analysis

Origin	Destination	Global Influence	Path	Direct Influence	Path Multiplier	Total Influence	Proportion
agric	hhd1.	0.02582	agric. flabls. hhd1.	0.00688	1.21498	0.00836	32.39
			agri. fcap. enterprise. hhd1.	0.0007	1.46785	0.00103	3.98
			agri. flabsk. hhd1.	0.00062	1.24171	0.00077	3
			agri. food. flabls. hhd1.	0.00034	1.45392	0.00049	1.9
			agri. food. trade. flabls. hhd1.	0.00017	1.76084	0.00031	1.19
			agri. trade. flabsk. hhd1.	0.00012	1.53034	0.00018	0.7
			agri. transport. flabsk. hhd1.	0.00012	1.40082	0.00016	0.64

agri. transport. trade. flabls. hhd1.	0.0001	1.65305	0.00016	0.62
agri. food. flabsk. hhd1.	0.00008	1.4916	0.00012	0.45
agri. food. service. flabls. hhd1.	0.00004	1.64888	0.00007	0.28
agri. mining. flabls. hhd1.	0.00005	1.26301	0.00007	0.25
agri. fservice. oservice. flabls. hhd1.	0.00003	2.18007	0.00006	0.24
agri. flabhi. hhd1.	0.00004	1.28871	0.00005	0.2
agri. food. trad. flabsk. hhd1.	0.00003	1.80214	0.00005	0.18
agri. food. tran. flabls. hhd1.	0.00003	1.63094	0.00004	0.17
agri. food. fcap. ent. hhd1.	0.00002	1.7505	0.00003	0.12
agri. omining. fcap. enterprise. hhd1.	0.00001	1.51334	0.00001	0.03
agri. oservice. flabsk. hhd1.	0.00001	1.42511	0.00001	0.03
agri. Heavy manufacturing. flabls. hhd1.	0.00001	1.38338	0.00001	0.03

Notes: hhd1 represents the poorest rural household decile, fcap represents capital, flabls represents less skilled labour, flabsk represents skilled labour and flabhi represents highly skilled labour

Source: Authors' computation from the South African SAM, 2010.

Table 4.5 shows the various channels through which the stimulation of the agriculture sector will affect the income of poor households represented by hhd*1*. The results show that the global influence of a decrease in supply in the agricultural sector on household income is 0.02582 (which is column three of Table 4.5). This global influence implies that an injection in the production activity in the case of agriculture yields a 2,58 % increase in the poor household income. However, there are no direct linkages between

the income of poor households and agriculture, and hence the shock is transmitted via intermediate poles such as trade. A significant part of the global influence is transmitted through indirect channels, especially the path of returns to factors of production. It is important to note that food and trade sectors play a significant role in transmitting the influence of the shock in the agriculture sector to poor household income.

The direct influence captures the change in poor household income induced by changes in the agricultural sector when all the other poles are assumed constant. The results proved that the direct influence is minimal with the maximum influence being less than 1%. This implies that the agricultural influence on the income is necessarily transmitted via other poles/paths and not along the direct elementary path. The other paths capture the indirect influence imputed in the elementary path. The amplifying actions of circuits which vary with the length of the path are powerful as indicated by path multipliers, which are all greater than 1.2.

As indicated in the results, rural households received about 46.56% of their income from unskilled labour with a total of 13 paths passing through that arc of the food sector. The skilled labour contributed 5.71% of income to rural households with only 6 paths passing through that arc. This study emphasises the proportion of income that rural households receive from the agriculture sector. The results showed that the proportion of income from unskilled labour from agriculture is 32.39% with only a single arc. This implies that unskilled labour receives their income directly from agriculture and not from other sectors.

The global influence on rural households from a shock in agriculture is 0.2582, with the path of agric-flabsl-hhd1 being the most important path of the rural household income multiplier. This implies that an exogenous shock to the agricultural sector would affect household income mainly by affecting returns to factors of production. Returns to employment for unskilled labour are the main factor affected by the shock in the agriculture sector as a majority of labour is employed in the agricultural sector. Although unskilled households get a significant part of the income from the agricultural sector, the path analysis helps to establish shock in other sectors to income and employment.

Figure 4.1: Structural path to low income households
Source: Survey Data

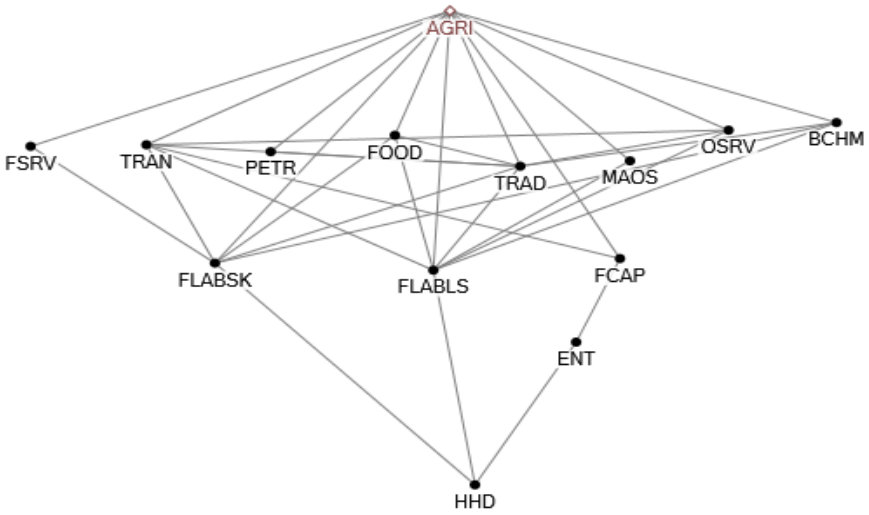


Figure 4.1 shows the various important channels that connect the agriculture sector and low-income households, which in this case are the intended beneficiaries of the rural land redistribution exercise in South Africa. The size and dimension of lines from the graph show the important paths and strength of the connection among sectors. As shown in Figure 4.1, the agriculture sector is connected to almost all the sectors, even though the strength of the connections is almost the same. The existence of both forward and backward linkages among sectors in the economy may be the explanation of these connections. The existence of these connections implies that any exogenous movement in the agricultural sector will affect the whole economy through the different paths that influence this arc.

As shown in Figure 4.1, skilled labour received their income from six sectors that include financial services, transport, trade sector, petroleum products, manufacturing services, and food processing. This might be because majority of skilled personnel is employed in this sector.

The least connected factor of production is capital, which receives its income directly only from the agriculture and transport sectors. Low-income households receive a

significant portion of income from low-skilled workers and less from capital inputs. The low-income households are mostly connected with low- skilled labour.

4.5 Summary

This study adopted a SAM multiplier decomposition and structural path analysis to analyse and track the channels through which an exogenous shock from rural land redistribution in agriculture will affect poor households. This approach enables the different disentangling effects (both direct and indirect effects) of an exogenous shock on the agricultural sector in South Africa (Round, 2006). This study led to the emergence of a different set of results, which has different policy implications for the government.

The results show that although the contribution of the agriculture sector to the overall economy in South Africa is only 4% of the GDP (Juana *et al.,* 2006), the sector influences household income through different paths and sectors. This can be explained by the existence of strong backwards and forwards linkages in the economy. Thus, the proposed rural land redistribution would significantly alter the production structure of the agriculture sector, thereby altering income of the households.

The results showed that the land income transfer increases the income of poor households. The results also identified a different path through which income is distributed from the origin (agriculture sector) to the destination (poor household income). These results can be very important in articulating the impact of the rural land redistribution policy on poverty and income distribution. However, more emphasis can be achieved through the relaxation of the assumption of linearity and fixed prices. This will allow for the analysis of long-run and redistributive effects of rural land redistribution policy in South Africa. Such an analysis would require the application of a dynamic CGE microsimulation model.

CHAPTER 5

ANALYSING THE EFFECTS OF RURAL LAND REDISTRIBUTION ON GROWTH AND HOUSEHOLD WELFARE: A DYNAMIC CGE MICROSIMULATION APPROACH

5.1 Introduction

This chapter is aimed at introducing the background information to the CGE microsimulation modelling technique for the evaluation of the impact of rural land redistribution on the South African economy. It presents the CGE modelling technique which underpins analysis in the literature. In the light of this significance, the chapter presents the macro-micro approach to modelling. This is followed by an analytical framework linking the area of concern to area of interest. The chapter concludes by explaining the nature of data, estimation techniques and a chapter summary.

The SAM multiplier decomposition and structural path analysis was applied in the previous chapter to analyse the intersectional linkages and fixed prices. In addition, since static models fail to deal with structural changes in income distribution and production technology as a result of rural land redistribution, the decomposition analysis may understate the overall impacts of rural land redistribution. In order to address the second objective, this chapter relaxes these assumptions of SAM analysis by applying a dynamic CGE model to investigate the impact of rural land redistribution on the economy, poverty and income distribution in South Africa.

Most of the empirical work on the impact of rural land redistribution concluded that access to productive agricultural land increases household welfare as rural land redistribution improves income, and can increase agricultural output. Household income and agricultural productivity can increase or decrease depending on the size of agricultural investment and government support to beneficiaries of the rural land redistribution. Literature also indicated that small holders are less productive compared to commercial farmers, and hence the impact of rural land redistribution will be negative on the total agricultural output. However, in relation to rural land redistribution in the long-run rural land redistribution, eventually small-holder farmers will become more productive due to technical progress, and hence the output impact will be less negative.

The rural land redistribution policy increases the income of smallholder farmers, and decreases the income of wealthy beneficiaries, thereby facilitating a more equitable distribution of income in the long-run. Therefore, this research uses a dynamic CGE

simulation to examine the impacts of rural land redistribution on economic growth, household poverty and income distribution in South Africa.

5.2 Model specification

The CGE model is one of the most valuable methods to analyse economic changes due to policy changes (Dervis *et al.,* 1982; Sadoulet and De Janvry, 1995; Wobst, 2001, 2002). A recursive dynamic model is used in this study because the model is based on adaptive expectations which are more relevant in developing countries. This model has become a standard tool for empirical policy analysis (Lofgren, Harris and Robinson, 2002). The basic theoretical framework of the model is a competitive market equilibrium that satisfies the Walras law (Decaluwe and Martens, 1988). The CGE model is widely applied and recognised as the best tool of conducting analyses for macroeconomic policy shocks. Thus, researchers in both developed and developing countries mostly use them to conduct simulations of policy impacts because they can effectively capture productivity change due to a government policy.

However, most empirical CGE models are static in nature. In addition, most empirical work which applied this type of modelling failed to capture the transmission mechanisms between changes in policy and consider the long-term (Cockburn *et al.,* 2013). Though they seem to be crucial for policy analysis, these models cannot provide a detailed poverty analysis because they depend on aggregated data. Thus, recursive CGE models combined with microsimulation models are more appropriate for examining the growth and distributive impacts of government policies. They seem to be appropriate and more important for policy impact analysis as they allow for simulation of the evolution of capital over time and provide a dynamic dimension in the transmission mechanisms. Once these mechanisms are appropriately modelled, poverty and inequality implications of policies can be effectively assessed using microsimulation techniques. Therefore, this study adopted this approach to analyse the distributive impacts of land redistributive policies in South Africa.

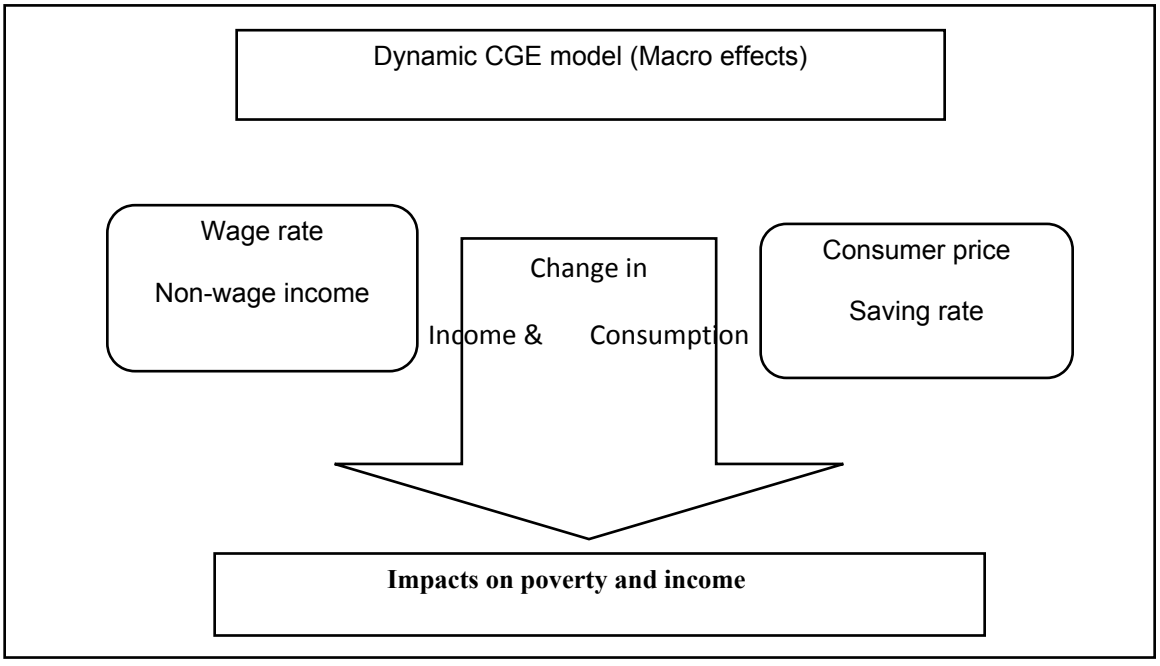
5.2.1 Microsimulation model

Microsimulation models are based on the work of Orcutt (1957, 1961). These models were developed to capture the distributional aspects of policy changes that were largely ignored under most empirical economic models. They try to capture the distributions of earnings and incomes of households by explicitly incorporating individual level data on households and individuals. Combined with economy-wide models, micro simulation models are used to simulate the impact of changes in policy on macro-aggregate variables, consumption patterns and micro level incomes.

5.2.2 The macro-micro model

The dynamic CGE modelling provides an economy-wide assessment of policy, while a microsimulation model enables a detailed poverty analysis. Thus, this study uses a top-down approach to effectively analyse the impact of the rural land redistribution on poverty. The combination of the CGE and microsimulation aims to provide a tool for analysing the macro economic impact of the rural land redistribution. The models are integrated with micro-data to provide a detailed distributional analysis.

Figure 5.1 The macro-micro simulation model

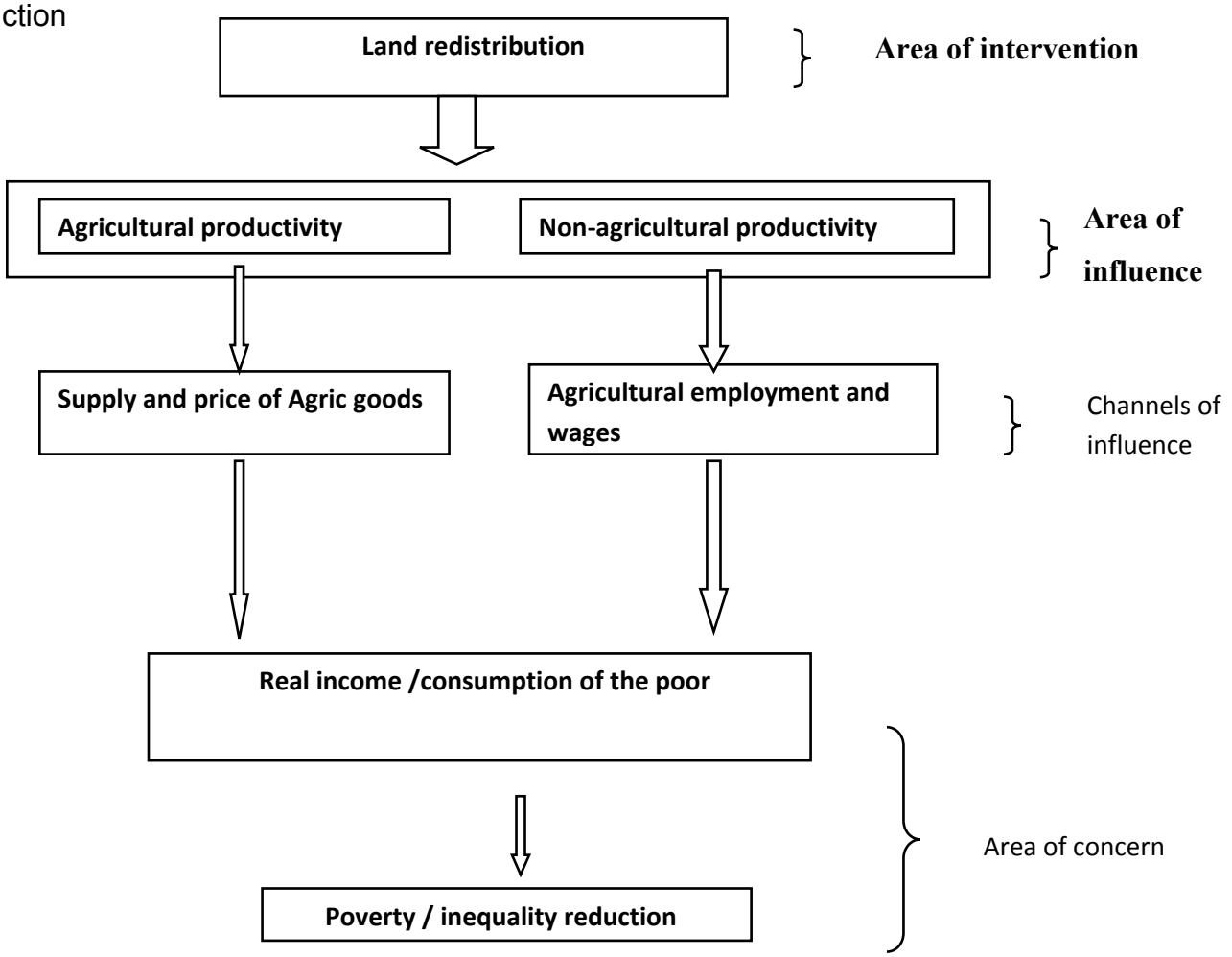


Source: Adopted from Zhang, Wang, and Chen (2011)

The CGE microsimulation model operates in two stages. The first stage involves running the CGE model to generate changes in prices, production and income due to

policy changes. These changes are incorporated into the household model through the use of linking variables. In the second stage, a disaggregated microsimulation model is used to simulate changes to incomes of individual households. The results of the simulations from the macro CGE model are then combined with the simulation derived from the micro model to provide both the accumulative and distributional impacts of the rural land redistribution policy. The dynamic CGE model will capture the macro effects of rural land redistribution which include changes in wages, non-wage revenues, commodity prices, GDP and savings rate. The simulation models will trace the effects of macroeconomic changes on household welfare.

Figure 5.2 Analytical framework depicting links between land reform and poverty reduction



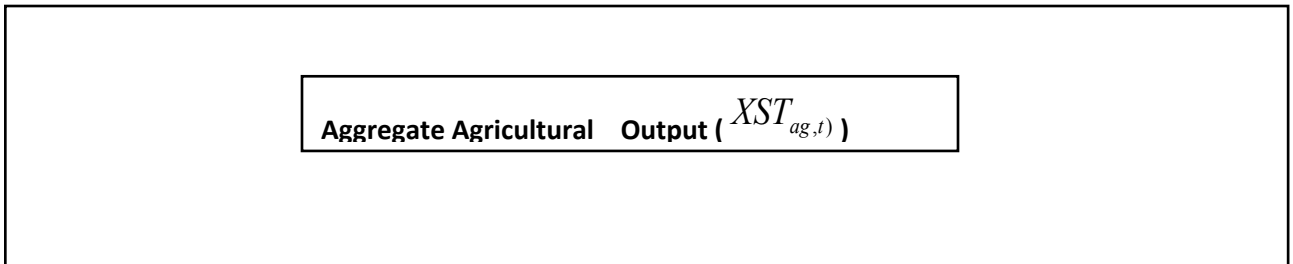
Source: Adopted from Ali and Pernia (2003)

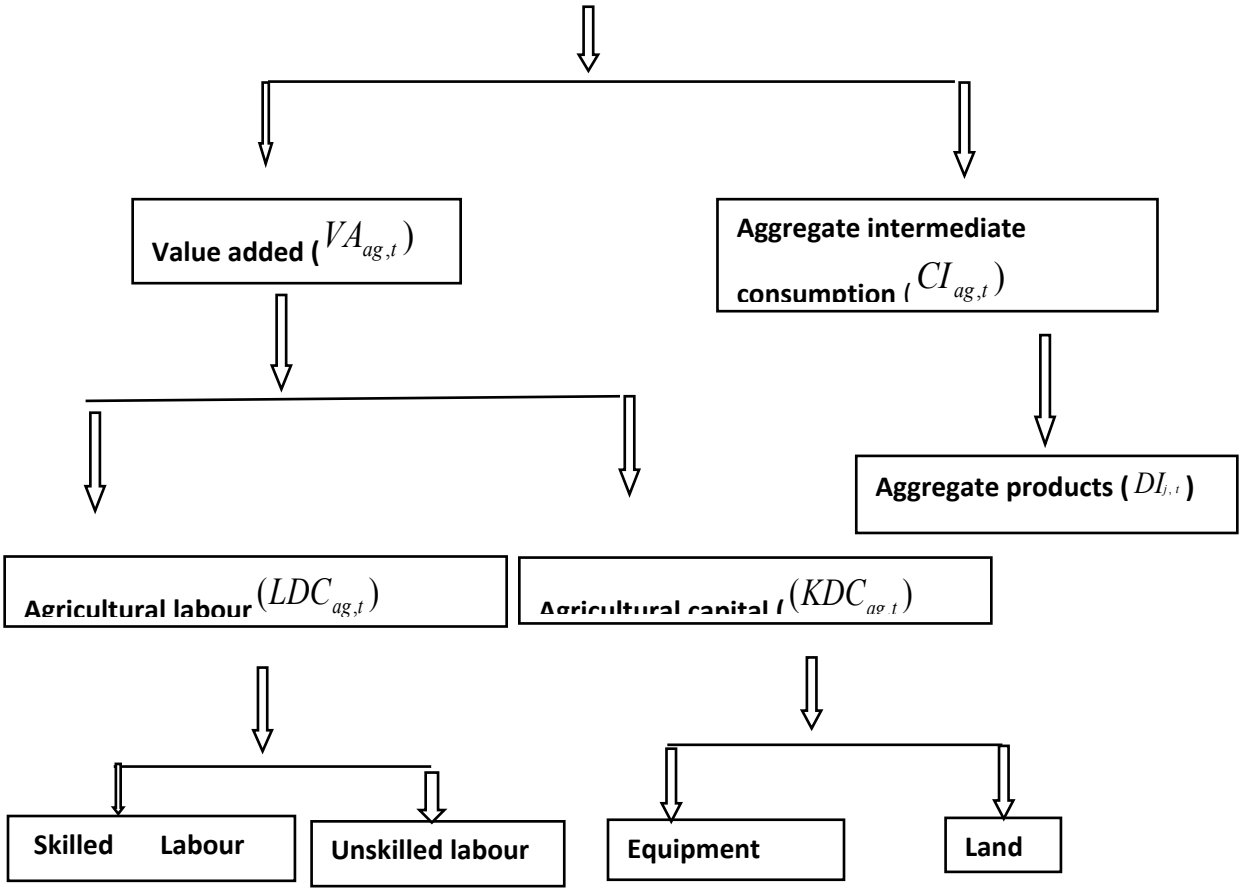
Rural land redistribution presents a powerful tool for poverty reduction and raising living standards. Rural land redistribution contributes to poverty through the effect on income

distribution (direct channel) and the effect on income growth (the indirect channel). The direct effect brings about improved employment and earnings prospects for the poor as a result of non-agricultural sector growth and increasing productivity in both the agricultural and non-agricultural sectors. Rural land redistribution has the potential to reduce poverty through an increase in agricultural productivity and food security in rural areas of many developing countries. In rural areas, agricultural productivity can bring about improvement in employment and wage prospects for poor people (Ali and Pernia, 2003). An increase in employment will translate into an increase in real income for the poor, and increased agricultural productivity will have an effect on the supply and prices of basic goods.

The production model adopted in this study is a multi-stage nested structure of production function where production and demand side interact simultaneously. Sectorial output is modelled using a Leontief production function, and value addition is modelled by a constant elasticity of substitution in the non-agricultural sector, constant elasticity of substitution function of land and a composite factor of production. The constant elasticity of substitution will be used for primary factors, which are agriculture, capital and labour. The short-run use of capital is fixed and sector-specific, but the labour categories are assumed to be freely mobile across sectors.

Figure 5.3 Structure of the production





Adopted from Cockburn, Dissoou, Duclos and Tiberti (2013)

The sectorial agricultural output of each productive activity *j* is a combination of the value added and the total intermediate consumption. The output produced by different sectors is sold to other production sectors as intermediate inputs, and some of the output is consumed domestically or exported to other countries. To model the substitutability between domestically-consumed goods and exported goods and to model the imperfect substitution between domestically-produced goods and imports, the models use the constant elasticity of substitution function. This modelling technique allows the investigation of the impact of external forces on domestic prices.

From the sectoral agricultural output $XST_{ag,t}$, the value added by industry j is given by:

$$VA_{ag,t} = v_{ag} XST_{ag,t} \qquad (4.1)$$

Additionally, the total intermediate consumption from agriculture by industry j will be given by:

$$CI_{j,t} = io_j XST_{ag,t} \tag{4.2}$$

where: $CI_{j,t}$: is the total intermediate consumption of industry j

$XST_{ag,t}$; Total aggregate output of the agriculture sector

io_j: and v_j: are coefficients (Leontief-intermediate consumption and Leontief –value added)

The industry's value added is made up of composite labour and capital which follows a constant elasticity of substitution specification given as:

$$VA_{ag,t} = B_{ag}^{VA}\left[\beta_{ag}^{VA} LDC_{ag,t}^{-\rho_j^{VA}} + (1-\beta_{ag}^{VA}) KDC_{ag,t}^{-\rho_j^{VA}}\right]^{-\frac{1}{\rho_J^{VA}}} \tag{4.3}$$

where; $KDC_{ag,t}$: is the demand for composite capital

$LDC_{ag,t}$: is the demand for composite labour

B_{ag}^{VA}: is the scale parameter (CES-value added)

β_{ag}^{VA}: is the share parameter

ρ_{ag}^{VA}: is the elasticity parameter

Household income is derived from three main sources which are labour income, capital income and transfers from other agents. Each household receives a fixed share of earnings from each type of labour. Total capital income is distributed between agents and transfer income is the summation of all transfers received by a household. Thus, the total income for type *h* households will be represented by:

$$YH_{h,t} = \sum_{l} \lambda_{h,l}^{WL} \left(W_{l,t} \sum_{j} LD_{l,ag,t} \right) + \sum_{k} \lambda_{h,k}^{RK} \left(\sum_{j} R_{k,ag,t} KD_{k,ag,t} \right) + \quad (4.4)$$

where; $R_{k,ag,t}$:is the rental rate of *k* capital in the agricultural sector

$TR_{ag,agi,t}$; is the transfer from agents

$W_{l,ag}$: is the wage rate of type *l* labour

$\lambda_{ag,k}^{RK}$: is the share of type *k* capital income received by agent *ag*; and

$\lambda_{h,l}^{WL}$: is the share of type *l* labour income received by type *h* households

The disposable consumption of households is calculated after deducting transfers, taxes and savings, and the objective of these households concerning consumption expenditure is to maximise the utility, subject to prevailing market prices.

The representative firm's income comprises the share of capital income and transfers received from other agents resulting in:

$$YF_{f,t} = YFK_{f,t} + YFTR_{f,t} \quad (4.5)$$

where: YFf,t : is the total income of type *f* business

$YFK_{f,t}$:is the capital income of type *f* business, and

$YFTR_{f,t}$; is the transfer income of type *f* business

The firm pays tax to the government such that the residual remains after subtracting transfers from disposable income. The saving equation will be given by:

$$SF_{f,t} = YDF_{f,t} - \sum_{ag} TR_{ag,f,t} \quad (4.6)$$

where: SFf,t : is the savings of type f business

$TDF_{f,t}$; comprises the income taxes of type f business;

$YDF_{f,t}$: is the disposable income of type f business

The government draws its revenue from income taxes paid by both households and businesses, taxes on products and imports, and other taxes on production. The government sector also receives part of the remunerations of capital and transfers from others agents. Thus, the government revenue function will be given by:

$$YG_t = YGK_t + TDHT_t + TDFT_t + TPRODN_t + TPRCTS_t + YGTR_t \tag{4.7}$$

where, YG_t: is the total government revenue, YGK_t: is government capital income, $YGTR_t$:is government's transfer income, $TDFT_t$:is government's revenue from business taxes, $TDHT_t$:is government's revenue from household taxes and $TPRODN_t$; is government's revenue from taxes on production.

Producers allocate output to maximise sales revenue at given product prices subject to total aggregate production. Total aggregate output describes the ease with which the production mix can be adjusted in response to price changes. The output equation is represented as:

$$XST_{agit} = B_{ag}^{XT}\left[\sum_i \beta_{ag,i}^{\rho_J^{XT}}\right]^{\frac{1}{\rho_J^{xt}}} \tag{4.8}$$

where, $XS_{ag,i,t}$; is production of commodity i by agricultural sector, B_{ag}^{XT} :are scale parameters, $\beta_{ag,t}^{XT}$; is a share parameter, and ρ_{ag}^{XT}; is the elasticity parameter. The total industry output will be divided between the domestic and international market such that;

$$XS_{ag,i,t} = B_{ag,i}^{x}\left[\beta_{ag,i,t}^{X} EX_{ag,i,t}^{\rho_{J,X}^{X}} + (1-\beta_{ag,i}^{X}) DS_{ag,i,t}^{\rho_{j,x}^{X}}\right]^{\frac{1}{\rho_{j,i}^{X}}} \tag{4.9}$$

where; $DS_{ag,i,t}$:refers to agricultural supply to the domestic market and $EX_{ag,i,t}$; refers to the quantity exported.

The factor market for land is considered a closed market by assuming that the quantity of agricultural land is fixed and that the total sectoral land use is equal to the total supply of productive land. The capital market is considered a closed market by assuming that the demand for capital is equal to its supply, thereby implying full employment of capital. However, owing to the high unemployment rates in South Africa, the labour market is not closed.

The CGE model is solved over time and links one period to the next and thus the variables are assumed to grow over time. Over time, the total labour supply is assumed to increase at the same rate as exogenous population growth;

$$LS_{l\cdot t+1} = (1+n_t).LS_{l,t} \tag{4.10}$$

Other variables that are assumed to grow at the rate of population growth are the current account balance, minimum consumption by households, government expenditures and public investment by category.

The household minimal consumption is also assumed to grow according to the population growth rate. This can be represented as:

$$C^{\min}_{i,,h,t+1} = (1+n_t).C^{\min}_{i,h,t+1} \tag{4.11}$$

The capital stock in the agricultural sector is updated by an accumulation function that gives:

$$KD_{k,ag,t+1} = (1-\delta_{k,ag})KD_{k.ag,t} + IND_{k,ag,t} \tag{4.12}$$

Where; $IND_{k,ag,t}$: volume of new capital investment and $\delta_{k,ag}$: depreciation rate of capital

The household income and expenditure vectors will be recalculated using household survey data. First, we establish the link between domestic agricultural final consumer goods and consumption categories. We then link them to household income sources (returns from factors of production, dividends, net transfers from government and rest of the world) and sources of income identified in the survey data.

The aggregate values for household categories will be calculated by multiplying individual household values by sampling weights and sum over all households in each region. The household consumption will then be modelled as:

$$CH_{hh,i} = MINI_{hh,i} + \beta_{hh,i}(CTH_{hh} - \sum PC_j MINI_{hh,i}) / PC_i \quad (4.13)$$

Where $CH_{hh,i}$ -consumption of good i , $MINI_{hh,i}$ -minimum subsistence required for commodity i, $\beta_{hh,i}$ - marginal share of good i in its consumption, PC_j -composite price of good j.

The household income will be then the addition of earnings and other observed income such that:

$$Y_h = (\sum_{i \in h} PGE_{i,FS} \times FW_i + PGE_{i,IS} \times IW_i + y_h - taxes_h) / CPI_h \quad (4.14)$$

The results summarising the impacts of agricultural land reform from the dynamic CGE model are fed into a micro simulation household model to obtain the predicted household effects (Chitiga *et al*., 2007). The per capita consumption in real terms for the base year and the simulation periods will then be the bases for estimating poverty and inequality changes across the different scenarios. The per capita variable is affected by the change in goods prices and corresponding wage employment changes. The household income generation model is given by a set of equations capturing earnings and net income function of the households.

The earnings of household member will be given as function of personal characteristics which include age, education, geographical region and unobserved earning determinants. The earning function is given:

$$LogW_{mi} = \alpha_{g(mi)}) + x_{mi}\beta_{g(mi)} + \nu_{mi} \quad (4.15)$$

The earnings function is separated according to labour market segments $g(mi)$. The net income function which includes the opportunity cost of household labour and profit depends also on household characteristics and is given as:

$$LogY_m = \gamma_{f(m)} + Zm\delta_{f(m)} + \lambda_{f(m)}N_m + \eta_w \quad (4.16)$$

Where Z_m represents household's characteristics and N_m denotes activities.

Total household real income is defined as the sum of wage income of its members, profit from self- employment and non-labour income given as:

$$Y_m = \frac{1}{p_m}\left(\sum_{i=1}^{k_m} w_{mi} IW_{mi} + y_m IND(N_m \quad 0) + y_{0m}\right) \quad (4.17)$$

The occupational choice made by households is given by:

$$P_m = \sum_{k=1}^{K} s_{mk}\rho_k \text{ and } IW_{mi} = Ind\left[a^w_{b(mi)} + z_{mi}b^w_{h(mi)} + u^w_{mi} \quad \sup(0, a^w_{b(mi)} + z_{mi}b^s_{h(mi)} + u^s_{mi}\right] \quad (4.18)$$

5.2.2.1 Poverty Analysis

For the sake of poverty analysis, the study adopted the top-down approach where changes in the CGE model are imported in the household data. It uses the 2010 Family income and expenditure survey (FIES). The survey has detailed information on household expenditure, consumption patterns, income and household characteristics.

The effects of changes in consumption prices on household expenditure and commodity prices are captured from the CGE model. These changes are then fed into the FIES to evaluate changes in income and expenditure.

Poverty effects are measured using the Foster-Greer-Thorbecke (FGT) index which is defined as:

$$P_\alpha(z) = \frac{1}{N}\sum_{h=1}^{H} \rho_{h,d}((x - e_{h,d,t}(P_{k,x,o}, P_{k,d,t,}, y_{h,d,t})/x, o)^\alpha_t, \quad (4.19)$$

where x is the poverty line, y is income and α is the degree of aversion to poverty. However, this index will provide a single dimension of poverty, yet rural households are deprived in multi dimension ways. To capture these multidimensional aspects of

poverty, a Bourguignon and Chakravarty index is also adopted in this study. The index is defined as:

$$\Pi(x_i, z) = \left[\beta_1 g_i^{\varepsilon}{}_{,1} + (1-\beta_1) g_i^{\varepsilon}{}_{,2}\right]^{\frac{\alpha}{\varepsilon}} \quad (4.20)$$

Where z: poverty line, β is poverty attribute weights and α is the aversion to poverty gap. Although different poverty lines are adopted by different analysts for South Africa such as Hoogeveen and Ozler (2004) and Deaton (1997), this study used a poverty line of R3864.00 South African Rand per year as suggested by Hoogeveen and Ozler (2004) and Chitiga and Mabugu (2007a).

5.2.2.2 Income inequality analysis

Income inequality on the other hand is calculated using the Gini coefficient which computes the average between cumulative population shares and cumulative income shares (Duclos and Araar, 2006). The coefficient is calculated as;

$$Gini \equiv l(2) = \int_0^1 (p - l(p))k(p;2)dp \quad (4.21)$$

where $l(p)$ is the cumulative percentage of total income held by the cumulative proportion p of the population and k represents the percentile-dependent weights.

5.3 Validity and reliability

The purpose of establishing reliability and validity in research is to ensure that the data are sound and replicable and thus the findings from the study are accurate. It is thus important to consider reliability and validity especially in quantitative research.

5.3.1 Validity

Validity refers to the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of the interpretations and actions based on the test scores (Messick, 1989, p 6). In other words, validity can be seen as an important form of assessment that is trustworthy and accurate (Bond, 2003, p 179). In this study, validity was based on concurrent and construction validity. Concurrent

validity refers to the degree to which the dynamic CGE model compares with other models when they are concurrently administered. Construct validity was established by means of a flexible cross entropy approach to estimate a consistent SAM (Robinson, Cattteneo and El-Said, 2010). In addition, the dynamic CGE model was judged to present a logical linkage between research questions and the intended objectives. The study adopted an appropriate likelihood function for data aggregation and a stochastic simulation to measure the randomness of the data. Based on these SAM balancing techniques, the estimation method and model can be regarded as valid.

5.3.2 Reliability

Reliability reflects the consistency, stability and repeatability of results over time (Twycross and Shields, 2004, p36). This implies that a test should produce consistent results when applied by different researchers under stable conditions. According to Fraenkel and Wallen (2003) and Neuman (2003), reliability is seen as the degree to which a test is free from measurement errors. This implies that the researcher must obtain the same result in a repeated experiment as the set of variables are consistent in what it is intended to measure (Hair *et al.,* 2014). The Cronbach's alpha is used to measure the reliability of the test tool, especially the internal consistency of each dimension. Internal consistency is the extent to which all the items within a single instrument yield similar results (Leedy & Ormrod, 2010). However, because of the nature and composition of the SAM, this measure is not applicable for this particular study. For the purpose of this study, reliability lies on accurate estimation of parameters, hence the study adopted a stochastic estimation and meta-regression analysis to estimate accurate parameters and coefficients. Based on these rigorous data calibration, validation experiments and techniques, the CGE model can be regarded as reliable.

5.4 Data

In terms of empirical analysis, the study adopted a recursive dynamic CGE microsimulation and the underpinning database is the IFPRI 2009 SAM for South Africa (Statistics SA, 2009) similar to that applied by Mabugu (2001) and Decaluwe *et al.*

(2000). This SAM distinguishes between 49 activities and 85 commodities. There are also 14 different household types and the rest of the world account. For the purposes of this study, a few adjustments were made to the original IFPRI 2009 SAM in order to make the data compatible with the Partnership for Economic Policy (PEP) 1-t CGE model. The adjustment included splitting the agricultural accounts into large-scale commercial and small-holder agriculture accounts. The capital accounts for the agricultural sector were divided using extrapolation into agricultural land and equipment. Lastly, the external demand account was created from the domestic demand account.

This study uses the standard CGE framework, coupled with a microsimulation model for detailed poverty analysis. The basic theoretical framework of South Africa CGE models is a comprehensive market equilibrium that satisfies Walras law (Decaluwe & Martens, 1988). The basic framework of the CGE is shown in Figure 1. The model consists of a production module, an international module, and an income and expenditure module of the final demand. Producers are assumed to maximise profit using a concave production technology, and consumers are assumed to maximise utility. Factors are enumerated at the margin with factor payments equal to their marginal value. This CGE specification follows the neoclassical-structuralist modelling as presented in Dervis *et al.* (1982) and incorporates imperfect Armington Constant Elasticity of Substitution (CES) on the demand side, and Constant Elasticity of Trans-formation (CET) on the supply side, allowing for substitution possibilities between domestically-produced and externally-traded goods (Lofgren and Diaz-Bonilla, 2005). The CGE model consists of a production module, an income module and final demand accounts.

5.4.1 Model closure rules

All the prices in the CGE model were expressed relative to the consumer price index, which is the numeraire price. Factor market closure in this study assumed that production factors are mobile across various activities in the economy and all savings and investment-related transactions are conducted by assuming that the share of investment expenditure in total final domestic demand remains constant. The foreign

exchange market is assumed to clear via a flexible exchange rate and the external balance remains fixed.

5.4.2 Model calibration

The CGE model was calibrated using computer codes written in General Algebraic Modelling System (GAMS) language. Inputs to the model included the SAM and other behavioural parameters on the production technology, commodity rate and consumer preferences.

The GAMS model for the Nonlinear Complimentary Problem (NCP) is solved as a Mixed Complementary Programming (MCP) problem with the Path Solver Algorithm. The SAM database, variable description, elasticities and population were captured in a Microsoft Excel file which is used as an include file into GAMS code of the CGE model via a GAMS Data Exchange (GDX) file. The solution file of the calibrated CGE model is read into the simulation GAMS file.

The model is a SAM based CGE model wherein the SAM serves to identify agents in the economy and a database for model calibration. The modelling technique was applied to present a scenario in which the government progressively redistributes 30% of the productive land from large-scale commercial farmers to small-scale farmers covering a 10-year simulation period (2015–2025) in line with the National Development Plan 2030. This modelling technique combines a microsimulation model and a standard multi-sectoral recursive CGE model to simulate the full distributional impact of a rural land redistribution policy and to generate counterfactual scenarios. The microsimulation adopted in this study helps to understand key determinants and mechanisms of inequality and poverty, and the recursive dynamic microsimulation model can provide disaggregated results that are consistent with the macroeconomic framework at the microeconomic level.

The study assumes that there are two different types of farmers, that is, large-commercial and small-scale farmers. These farmers have different production technologies. However, in the 2009 SAM for South Africa, the agriculture sector was aggregated. The following adjustments were made to the model: the agricultural

account in the social accounting matrix was spilt according to the type of farming (small-scale or large-scale farming) using the proportion and ratios from Statistics South Africa. The splitting was essential for the calculation of revenue shares for the different categories of farmers. In addition, the capital account in the agriculture sector needed to be disaggregated into land and equipment as these are the main forms of capital used in the agricultural sector.

5.5 Estimation technique

The simulation assumed that the total quantity of productive agricultural land remains constant, and the land is either utilised by large commercial farmers or by small-holder beneficiaries. In the experimental scenario, the total agricultural arable land is maintained at the same level as the base year simulates a land transfer of 30% from commercial to small-scale farmers over a 10-year period. For proper analysis of the underlying land allocation and macroeconomic issues, wastage is assumed away (Chitiga, 2007).

The rural land redistribution simulated in this particular study is based on the current-market based “willing-buyer willing-seller” approach where the government provides grants for financing the programme. The land is redistributed to farmers who are assumed to be constrained in technology and production options. This is based on the assumption that production tends to be low in the agriculture sector, and cropping patterns tend to become less tradable-oriented. The small-holder production patterns will shift domestic prices and increase agriculture’s terms of trade. In the simulation, the study assumes that the total agricultural land (82 million hectares) is a fixed percentage of land that is redistributed, and its success is directly correlated with a decline in production.

For detailed poverty analysis, a top-down CGE microsimulation model is employed by using the results of the CGE simulations as inputs into a microsimulation module. This is important in order to assess the distributive impacts of rural land redistribution by using the 2010 Family Income and Expenditure Survey of South Africa (Statistics SA, 2009). Per capita consumption in real terms for the base year and the simulation periods are variables of interest of estimating poverty and inequality changes across the

different scenarios (Zhang and Wan, 2004). Changes in the CGE factor prices were transferred to the microsimulation model, leading to household-specific income changes (Cockburn *et al.,* 2011). These income changes are combined with a change in consumer prices from the CGE model to compute welfare changes.

This simulation tries to give some preliminary answers to the current debate on the impact of the proposed rural land redistribution in South Africa. The study is envisaged to yield knowledge about the impact of rural land redistribution on growth, poverty reduction and income inequalities in South Africa. The results are expected to contribute to policy formulation aimed at reducing poverty and income inequalities among the rural households who face long-term poverty and widening income gaps.

5.6 Summary

Chapter five discussed the use of the dynamic CGE microsimulation in analysing the cumulative effects of rural land redistribution in South Africa. The PEP 1-t model was adopted using the IFPRI 2009 SAM for South Africa as data base. The chapter also highlighted the linkage between the macroeconomic CGE model and the microeconomic simulation model. Finally, the Foster-Geen-Thorbecke model and the Gini coefficient were explained. The results of the model are presented and explained in the next chapter.

CHAPTER 6

DISCUSSION / PRESENTATION / INTERPRETATION OF FINDINGS

6.1 Introduction

The previous chapter introduced the background information to the CGE microsimulation modelling technique for the evaluation of the impact of rural land redistribution on the South African economy. This chapter presents and explains the results from the estimation model. The first section discusses the macroeconomic impact of rural land redistribution and the impact on poverty and income inequalities. The counterfactual results were analysed in both the short-run (first year period) and the long-run relative to the base scenario. The last section presents the summary of chapter.

6.2 Empirical test results

The macroeconomic impacts are reported in Table 6.1.

Table 6.1 Macroeconomic effects (% change from base year value; base year = 2015)

Variables	Short- run	Long- run
Domestic agricultural demand	-0.1425	0.15
World agricultural export demand	-0.3217	-0.3179
Agriculture supply Commercial Small scale	 0.41 -21.01	 0.58 -15.76
Agricultural exports Commercial Small-scale	 0.23 -12.17	 0.41 -15.91
Intermediate agricultural consumption	0.377	0.55
Capital agricultural investment 	 1.72 -21.01	 +1.83 -26.32
Commercial	0.01	1.01089
User cost of capital	-0.01	0.03
Real gross domestic product	-0.0247	0.0278
Agricultural imports	0.349	0.3319

Notes: Short-run (SR) refers to the year 2015 (start of simulation) and long-run (LR) refers to 2025 (end of simulation)

Source: Author's calculations, based on simulation results

The results in Table 6.1 show that for most macro-economic variables, the impacts tend to be negative in the short-run but gradually increase in the long-run. Agricultural imports, prices, agricultural consumption, and commercial agricultural supply record positive growth in both short- and long-run. However, the magnitude of growth is very marginal with most of these variables recording a 0.05% growth. The impacts on both real GDP and domestic agriculture demand decline in the short-run (–0.0247 and –0.1425 respectively) and marginally increase in the long-run compared to the business-as-usual (BaU) simulation.

Land redistribution is likely to lead to a negative real gross domestic product in the short-run and to a positive improvement in the long-run. An increase in consumer price index reflects an increase in prices of agricultural products, and an increase in the aggregate price level leads to a reduction in aggregate household consumption, which is an indicator of welfare deterioration. A decrease in agricultural sectoral output and decrease in real household consumption could lead to reduced demand for imports in the long-run.

The short-run negative impact of most of the macroeconomic variables can be explained by the contraction of the agriculture sector due to rural land redistribution as most beneficiaries do not have the means and capacity to fully and productively utilise the land. The contraction of the agriculture sector is transmitted into other sectors of the economy through backward and forward linkages. Significant positive growth is observed in the price levels both in the short-run and long-run. The significant decline in agriculture supply, especially among small-scale producers, may bid up the domestic prices, especially of agricultural products. The user cost of capital also declines in both short- and long-run.

Table 6.2 Price effects (% change from base year (2015) value)

Variables	Short-run	Long-run
Basic price of agricultural production	0.200	0.204
Purchase price	0.1798	0.1824
Intermediate consumption price	0.031	0.04
Price of local products	0.191	0.194
Agricultural export price	0.139	0.142
FOB price of exported commodity	0.126	0.13
Price (CPI)	0.008	0.008

Notes: Short-run (SR) refers to the year 2015 (start of simulation) and long-run (LR) refers to 2025 (end of simulation)

Source: Author's calculations, based on simulation results

According to Table 6.2, general prices were positive in both short- and long-run, depicting an increase in prices as a result of the redistribution of land. Significant increases in prices were noted on the prices of exported and purchase prices of agricultural commodities. The marginal increase in Free On Board (FOB) prices is essentially due to the increase in the cost of trade and transportation margins. These marginal changes in domestic and export prices imply that the country is not gaining much ground with respect to its agricultural trade competitors. Real household consumption decreases across all household groups in both short- and long-run. This is mainly due to the increase in food prices as a result of increased food production and reduced returns of factor income. The contraction of the agricultural sector leads to an increase in demand for unskilled labour as a result of reduced primary factor productivity. This showed that agricultural rural land redistribution will affect the agricultural trade rating of South Africa with respect to its major trading competitors.

Table 6.3 Effects on factors of production (% change from base year value)

Variables	Short-run	Long-run
Demand for capital		
Equipment's	0.00	0.156
Land	5.00	1.93
Supply of capital		
Equipment's	0.685	0.400
Land	0.00	0.0004
Demand for labour		
Commercial agriculture	0.969	1.115
Small scale agriculture	-13.808	-17.056

Notes: Short-run (SR) refers to the year 2015 (start of simulation) and long-run (LR) refers to 2025 (end of simulation)

Source: Author's calculations, based on simulation results

An increase in land for smallholder agriculture tends to reduce the demand for labour, especially in small-scale agriculture, in both short- and long-run (–13.808 and –17.056 percent respectively). The demand for natural capital in the form of land increased significantly in the short-run as everyone needs his/her own piece of land, but decreased sharply in the long-run (5.00–1.93 percent) as most of the small-scale farmers tend to abandon the land. The supply of capital equipment dropped by 41.6 percent, as there is a limited investment in the agriculture sector by large commercial farmers. The reduction in output in many agricultural subsectors leads to reduced demand for both capital and labour.

Table 6.4 Sectorial effect (Percentage Changes in Volumes from BaU Path)

	Domestic demand for local goods		Total intermediate demand		Domestic demand for local goods		Total intermediate demand		Total intermediate consumption	
	SR	LR	SR	LR	SR	LR	SR	LR	SR	LR
Agriculture	0.4055	0.579	-0.12	0.11	-0.14	0.15	0.09	0.1	0.377	0.55
Food	0.372	0.362	-0.02	0.01	-0.046	0.5	-0.1	0.03	-0.04	0.03
Trade	-0.01	0.004	-0.022	-0.203	-0.20	0.13				
Manufacturing	-0.166	-0.18	0.02	0.018			0.01	0.03	0.037	0.082
Dairy					0.04	0.3	0.03	0.2	-0.0343	0.02
Transport	0.005	0.012	-0.03	-0.02						
Education			-0.02	-0.01	0.0	0.019			-0.02	0.03
Service	-0.18	-0.179					0.21	0.31		
Fish	-0.087	-0.09	-0.006	0.009						
Meat	-12.5	-16.21	-0.03	0,04	0.166	.25	0.02	0.01		
Forestry			-0.01	-0.02					-0.0	0.1

Notes: short-run (SR) refers to the year 2015 (start of simulation) and long-run (LR) refers to 2025 (end of simulation)

Source: Author's calculations, based on simulation results

Table 6.4 shows the impacts on the different sectors of the economy, especially agriculture-related sectors. The results showed that domestic agriculture production decreased significantly in most subsectors, including food, meat and manufacturing sectors. The decrease in production of the most subsectors will affect many sectors of the economy through intersectoral linkages. Most of the sectors will have a reduced aggregate output and export; hence, most of these firms are unable to adjust their nominal wage of labour. This may have led to the reduction in labour demand, especially in agriculture subsectors. The decrease in labour demand aggregate supply expands mostly in the crop sectors and will translate into decreased household income as their income is based on labour income. The decrease in household income both in the short-run and in long run will negatively affect household consumption. The results showed that there would be decreased production activity in most sectors. This

decrease will translate into decreased demand for intermediate consumption, which indirectly and negatively affects other economic sectors.

Table 6.5 Percentage Changes in Volumes from Business as Usual (BaU) Path

	Domestic supply		exports		Imports		World demand for exports		Total intermediate consumption	
	SR	LR	SR	LR	SR	LR	SR	LR	SR	LR
agriculture	0.3167	0.470	-0.176	-0.330	0.271	0.28	0.25	0.26	0.2944	0.448
Food	0.29	0.300	-0.047	0.047	0.017	0.016	-0.10	-0.03	-0.033	-0.028
trade	-0.1395	-0.140	-0.13	-0.133	-0.017	-0.01	0.003	0.005		
manufacturing	-0.1288	-0.144	-0.328	-0.156	0.01	0.02	0.007	0.025	0.0292	0.0677
dairy			-0.057	-0.057	0.037	0.036	-0.07	-0.05	-0.0326	-0.028
fertiliser	-0.012	0.03	-0.1334	-0.02	0.231	0.343	0.007	0.022		
Oils			-0.053	-0.053	0.009	0.01	-0.1	-0.051	--0.0243	0.033
vegetables	-0.063	-0.066	-0.074	-0.075	0.023	0.07	-0.05	-0.04		
Fish	-0.068	-0.073	-0.076	-0.078	-0.044	-0.025	0.003	-0.005	0.2944	0.448
meat	-0.059	-0.06	-0.073	-0.075	0.029	0.025	-0.06	-0.04	-0.033	-0.028

Notes: short-run (SR) refers to the year 2015 (start of simulation) and long-run (LR) refers to 2025 (end of simulation)

Source: Author's calculations, based on simulation results

Crops grown by rural land redistribution increased significantly. Domestic agriculture supply increases both in the short-run and long-run by 0.3167 and 0.470, respectively. Basically, communal farmers demand non-export-oriented agricultural products; hence notable increase in food crop production in both periods. Other horticultural crops experienced a decline in production as small scale farmers tend to pull factors away from export crops traditionally grown by commercial farmers. The decrease in export-oriented crops can be observed by a sharp decline in agriculture exports volume mostly from agriculture subsectors both in the short-run and long-run. This decrease in exports was mainly due to decrease in output volume from the meat, food, oils and vegetables sectors. Limited output in the agriculture subsectors means that farmers focus more on domestic supply.

Table 6.6 Poverty and Inequality effects (% Changes in Volumes from BaU Path)

	Short-run	Long-run

Poverty headcount Simulation	0.067	0.125
Components of changes in poverty headcount • Growth • Redistribution	 -0.146 -0.01	 0.17 0.015
Change in poverty headcount due to changes in Wages Own-consumption Consumer prices	0.013 0.00477 -0.092	0.12 0.152 0.1
Poverty headcount (by household type) • rural • urban	 0.585 0.005	 0.93 0.0038
Gini coefficient Simulation	-0.004	0.039

Source: Author's calculations, based on simulation results

The results in Table 6.6 reflect the poverty and distributional effects of rural land redistribution in South Africa. The poverty headcount increases in both short-run and long-run (0.067 and 0.125, respectively). The increase in poverty headcount was mainly due to the negative demand-side effects of rural land redistribution which accrued over time. These negative demand-side effects lead to lower wages and returns on capital, and these lower factor returns in both short- and long-run retard the poverty-reducing effect of income. In addition, the poverty-increasing effects of increased consumer prices lead to an increase in poverty in both short- and long-run. There is a slight decrease in inequality in the short-run (–0.004), but eventually inequality increases in the long-run (0.0039). The reason for the short-run decrease may be mainly because the simulation reduced the wealth of rich commercial farmers and transferred this to poorer rural households; but in the long-run, as the income of the rural farmers continues to decrease, the inequality increases.

6.3 Summary

The study investigated the impact of 30% rural land redistribution on macroeconomic variables in South Africa both in the short- and long-run. The results indicate that rural land redistribution generally leads to a reduction of economic activity, especially in the

short-run. This reduction will lead to a deterioration in the welfare of poor households. Although rural land redistribution can lead to agricultural output growth, the gains from the output growth accrued mostly among the rich commercial farmers. Therefore, rural land redistribution is not equitable.

CHAPTER 7

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

7.1 Introduction

The previous chapter provided an analysis and interpretation of results based on both the CGE and microsimulation approach. This chapter presents summary of findings, conclusions, and recommendations from the study.

It is generally accepted that rural land redistribution plays an important role in rural community development particularly in developing countries. Rural communities are usually faced with a few challenges as many people do not have access to means of production. One of the most notable challenges pertains to increasing poverty levels and widening income inequalities. As a way of trying to alleviate rural poverty, many governments have devoted particular attention to rural empowerment through increasing access to productive land. This study, therefore, aimed to establish whether rural land redistribution can help alleviate rural poverty and improve income distribution.

7.2 Summary and interpretation of findings

This section of the chapter provides key findings of the study and interpretations of results based on the following research objectives.

- To identify the total effect on changes in agriculture supply on income

  The global effect of changes in the agriculture supply due rural land redistribution on household income was 0.002582. This implied that an increase in agriculture activity will lead to a 2.58% increase in household income. The study also revealed that the poor benefitted more directly from rural land redistribution with a total direct effect of 0.0087. This implied that there exists a strong link between rural households and agriculture compared to other sectors.

- To identify the macroeconomic impact of rural land redistribution

  The results indicated that most macroeconomic variables were negatively affected particularly in the short-run. Notably output from the economic sectors recorded negative growth. Agriculture imports and prices recorded marginal growth and thus generally, rural land redistribution led to a contraction in agriculture supply, which in turn, is transmitted to various sectors of the economy through the intersectoral linkages among sectors.

- To analyse the effects of rural land redistribution on poverty and income inequality

  Poverty headcount increases both in the short and long-run due to the negative demand side-effects of rural land redistribution. These negative demand side-effects lead to reduced farm wages and rental rate of capital; hence retarding the poverty reducing effect of income. Income inequalities decrease slightly in the short-run but eventually increase in the long-run.

Inequalities in resource ownership are more common in developing and emerging economies. Evidence seems to suggest that this is the major cause of rural poverty and income inequalities. The reason is that poor households do not own the means of production; hence they are more prone to poverty. In line with these arguments, empirical literature points to the fact that land redistribution can be effective in equity groups.

However, there is no strong evidence in many countries that land redistribution will decrease poverty and improve income inequalities or guarantee that poor people will always benefit. This inconclusiveness seems to suggest that such evidence from a particular country must be obtained empirically.

The analytical results show that the transfer of land from commercial to small-scale farmers leads to a decrease in output, which has negative consequences for other economic sectors through intersectoral linkages. The decrease in output leads to a decrease in factor remuneration, which will translate into job losses and poor household income. The CGE simulation results also show that land redistribution leads to an improvement in poor household income in the long-run. The simulation results indicate that land redistribution has economy-wide impacts on demand, intermediate consumption, and consumer prices through intersectoral linkages. It also has consequences on factor remuneration, especially wages, and leads to job losses and a decline in poor household income. The study recommends minimal transfer of land coupled with government investment in agriculture. To minimise this negative impact, there is a need to design and implement agriculture policies to maintain agricultural

productivity. One such policy is to increase government investment and improve irrigation facilities for small-scale farmers.

7.3 Suggestions for further study

This study analysed the potential impact of rural land redistribution on poverty and economic growth in South Africa. The findings of the study suggested that the redistribution process has a positive direct effect on rural poverty and long-term effect on the overall economy. Although this study is important in providing an understanding of the contribution of rural land redistribution on poverty and income inequalities, much remains for future research. Notably, the study could focus on provinces that rely more on agriculture for rural livelihoods. Provincial analysis can provide detailed and greater insights into the issue to be analysed. It will of great interest to repeat the empirical part of the research with provincially representative dataset.

While this study has succeeded in addressing several issues pertaining to poverty and rural land redistribution in South Africa, there remain certain issues that require to be incorporated for further studies. Notably, the incorporation of land size, irrigation, education and training and agriculture investment in the agriculture sector may yield additional results.

7.4 Limitations of the study

The study was aimed at analysing the potential impact of rural land redistribution on poverty and economic growth in South Africa. The main limitation of the study was the non-availability of small holder specific data of both IFPRI 2009 SAM and Statistics South Africa. Data on the overall production level of land beneficiaries was missing, and where available, it was aggregated. To overcome this challenge, the study disaggregated the data and used extrapolation methods to calculate the contribution of smallholder land beneficiaries to overall agriculture output.

Secondly, the IFPRI 2009 SAM that is available and adopted in this study does not truly represent the current structure of the economy of South Africa as major changes have occurred especially due to the global financial crisis. Lastly, it was also recognised that

external consumption and the household survey data were aggregated. However, for the purposes of this study, the SAM was adopted and updated using different software.

7.5 Conclusions

The study has highlighted the impact of rural land redistribution on various macroeconomic variables, poverty and income distribution. Empirical results showed that there is a strong connection between the agriculture sector and household income as rural households mostly derive income from agricultural activities. This implies that policies that target the agriculture sector will impact rural household income.

Contrary to the general view that rural land redistribution in developing countries is disinclined to poverty and income inequalities, the study established that properly implemented rural land redistribution coupled with government support is an important strategic policy in poverty reduction with long-term economic benefits. The study also identified various channels through which rural land redistribution impacts rural household income. It can be noted that poor households are net direct beneficiaries of rural land redistribution, particularly through factor returns. It can be foreseen that improving household access to productive land could be key to sustainable and inclusive economic growth in South Africa.

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APPENDICES

APPENDIX 1: Equations

1. $VA_{j.t} = v_j XST_{j,t}$

2. $CI_{j,t} = io_j XST_{j,t}$

3. $VA_{j,t} = B_j^{VA}\left[\beta_j^{VA} LDC_{j,t}^{-\rho_j^{VA}} + (1-\beta_j^{VA}) KDC_{j,t}^{-\rho_J^{va}}\right]^{-\frac{1}{\rho_J^{va}}}$

4. $LDC_{j,t} = \left[\frac{\beta_j^{VA}}{1-\beta_j^{VA}} \frac{RC_{j,t}}{WC_{j,t}}\right]^{\delta_j^{VA}} KDC_{j,t}$

5. $LDC_{j,t} = B_j^{LD}\left[\sum_l \beta_{l,j}^{LD} LD_{l,j,t}^{-\rho_J^{LD}}\right]^{-\frac{1}{\rho_J^{ld}}}$

6. $LD_{l,j,t} = \left[\frac{\beta_{l.j}^{LD} WC_{j,t}}{WTI_{l,j,t}}\right]^{\delta_J^{LD}} (B_j^{LD})^{\delta_J^{LD}-1} LDC_{j,t}$

7. $DI_{i,j,t} = aij_{i,j} CI_{j,t}$

8. $YH_{h,t} = YHL_{h,t} + YHK_{h,t} + YHTR_{h,t}$

9. $YF_{f,t} = YFK_{f,t} + YFTR_{f,t}$

10. $YG_t = YGK_t + TDHT_t + TDFT_t + TPRODN_t + TPRCTS_t + YGTR_t$

11. $YROW_t = e_t \sum_i PWM_{i,t} IM_{i,t} + \sum_k \lambda_{row,k}^{RK} (\sum_j R_{k,j,t} KD_{k,j,t}) + \sum_{agd} TR_{row,agd,t}$

12. $TR_{agng,h,t} = \lambda_{agng,h}^{TR} YDH_{h,t}$

13. $PC_i, tC_{i,h,t} = PC_{i,t} C_{i,h,t}^{\min} + \gamma_{i,h}^{LES}(CTH_{h,t} - \sum_{i,j} PC_{ij,t} C_{ij,h,t}^{\min}$

14. $PC_{i,t}INVi,t = \gamma_i^{INV} IT_t^{PRI}$

15. $PC_{i,t}INV_{i,t}^{PUB} IT_i^{PUB}$

16. $INVi,t = INV_{i,t}^{PVT} + INV_{i,t}^{PUB}$

17. $XSTj,t = B_i^{XT}\left[\sum \beta_{j,i}^{XT} XS_{j,i,t}^{\rho_j^{XT}}\right]^{\frac{1}{\rho_J^{xt}}}$

18. $Q_{i,t} = B_i^M\left[\beta_i^M IM_{i,t}^{-\rho_i^M} + (1-\beta_i^M)DD_{i,t}^{-\rho_i^m}\right]^{\frac{-1}{\rho_i^m}}$

19. $Q_{tr} = DIT_{tr} + \sum_h C_{tr,h} + INV_{tr}$

20. $XS_{ntr} * P_{ntr} = G$

21. $LS = \sum_j LD_j$

22. $IT = \sum_h SH_h + SF + SG + CAB$

Appendix 2: Variables

$C_{i,h}$: Consumption of commodity i by households h

CI_j : Total intermediate consumption of industry j

DD_i : Demand for domestic commodity

CG_j : Public consumption of commodity i

$C_{i,h}^{MIN}$: Minimum consumption of commodity i by household j

$DI_{i,j}$: Intermediate consumption of commodity i by industry j

DIT_i : Total intermediate demand for commodity i

$DS_{j,i}$: Supply of commodity i by sector j to the domestic market

$EX_{j,i}$: Quantity of product I exported by sector j

G^{REAL} : Real government expenditures

IM_i : Quantity of product I imported

INV_i : Final demand of commodity I for investment purposes

$KD_{k,j}$: Demand for type k capital by industry j

KDC_j : Industry j demand for composite capital

KS_k : Supply of type k capital

LDC_j : Industry j demand for composite labour

LS_l : Supply of type I labour

Q_i : Quantity demanded of composite commodity i

VA_j ; Value added of industry j

$VSTK_i$: Inventory change of commodity i

$XS_{j,i}$: Industry j production of commodity i

XST_j : Total aggregate output of industry j

Appendix 3: Parameters

$aij_{i,j}$; Input- output coefficient

B_j^{KD} : Scale parameters (CES-composite capital)

B_j^{LD} : Scale parameters (CES-composite labour)

B_i^{M} : Scale parameter (CES-composite commodity)

B_j^{VA} : Scale parameters (CES-value added)

$B_{j,i}^{X}$: Scale parameter (CET-exports and local sales)

B_j^{XT} : Scale parameter (CET-total output)

$\beta_{k,j}^{KD}$: Scale parameter (CES-composite capital)

$\beta_{l,j}^{LD}$: Scale parameter (CES-composite labour)

β_i^{M} : Scale parameters (CES-composite commodity)

β_j^{VA} : Scale parameter (CES-value added)

$\beta_{j,i}^{X}$: Scale parameter (CES-exports and local sales

$\beta_{j,i}^{XT}$: Scale parameter (CET-total output)

APPENDIX 4: MULTIPLIER DECOMPOSITION

APPENDIX 4.1 Decomposition of the global multiplier matrix

Decomposition of multiplier mH1A1 of matrix M on the income of account i									
Column J	Row I(Eff	Househo	Direct-Di	indirect-d	Total effe	Direct-In	Indirect-I	Total effe	Total Multiplier
Agric	Hhd1	Hhd1	0.008697	-0.00587	**0.00283**	0.000893	-0.00083	**6.1E-05**	**0.00289**
Agric	Hhd1	Hhd2	0.000104	-8.1E-05	**2.2E-05**	0.009487	-0.00662	**0.00287**	**0.00289**
Agric	Hhd1	Hhd3	8.8E-05	-6.5E-05	**2.3E-05**	0.009502	-0.00664	**0.00286**	**0.00289**
Agric	Hhd1	Hhd4	-4.6E-05	6.88E-05	**2.2E-05**	0.009636	-0.00677	**0.00286**	**0.00289**
Agric	Hhd1	Hhd5	-0.00111	0.001103	**-7E-06**	0.0107	-0.00781	**0.00289**	**0.00289**

APPENDIX 4.2 Matrix M_{32}

Factor Income						
	FCAP	FLABHI	FLABLS	FLABSK	TOTAL	AVERAGE
HHD1	0.011	0.019	0.133	0.04	**0.203**	**0.05075**
HHD2	0.026	0.042	0.25	0.096	**0.414**	**0.1035**
HHD3	0.055	0.081	0.303	0.187	**0.626**	**0.1565**
HHD4	0.131	0.201	0.38	0.338	**1.05**	**0.2625**
HHD5	0.638	1.383	0.702	1.079	**3.802**	**0.9505**
TOTAL I	**0.861**	**1.726**	**1.768**	**1.74**	**6.095**	**1.52375**
ENT	1.287	0.668	0.666	0.667	**3.288**	**0.822**
TOTAL	**2.148**	**2.394**	**2.434**	**2.407**	**9.383**	**2.34575**

APPENDIX 4.3 Matrix M_{33}

Redistribution of factor income										
	HHD1	HHD2	HHD3	HHD4	HHD5	TOTAL I	ENT	TOTAL	AVERAG	total average
HHD1	1.022	0.021	0.02	0.018	0.016	1.097	0.012	**1.109**	**0.18483**	**0.2194**
HHD2	0.046	1.043	0.041	0.037	0.034	1.201	0.027	**1.228**	**0.20467**	**0.2402**
HHD3	0.074	0.071	1.068	0.063	0.059	1.335	0.058	**1.393**	**0.23217**	**0.267**
HHD4	0.136	0.132	0.127	1.12	0.115	1.63	0.137	**1.767**	**0.2945**	**0.326**
HHD5	0.552	0.537	0.524	0.506	1.501	3.62	0.667	**4.287**	**0.7145**	**0.724**
TOTAL I	**1.83**	**1.804**	**1.78**	**1.744**	**1.725**	**8.883**	**0.901**	**9.784**	**1.63067**	**1.7766**
ENT	0.677	0.67	0.666	0.66	0.671	3.344	1.348	**4.692**	**0.782**	
TOTAL	**2.507**	**2.474**	**2.446**	**2.404**	**2.396**	**12.227**	**2.249**	**14.476**	**2.41267**	

APPENDIX 5: Structural Path Analysis

Origin	Destination	Global Influence	Path	Direct Influence	Path Multiplier	Total Influence	Proportion
AGRI.	HHD1.	0,02582	AGRI. FLABLS. HHD1.	0,00688	1,21498	0,00836	32,39
			AGRI. FCAP. ENT. HHD1.	0,0007	1,46785	0,00103	3,98
			AGRI. FLABSK. HHD1.	0,00062	1,24171	0,00077	3
			AGRI. FOOD. FLABLS. HHD1	0,00034	1,45392	0,00049	1,9
			AGRI. FOOD. TRAD. FLABLS.	0,00017	1,76084	0,00031	1,19
			AGRI. TRAD. FLABSK. HHD1.	0,00012	1,53034	0,00018	0,7
			AGRI. TRAN. FLABSK. HHD1.	0,00012	1,40082	0,00016	0,64
			AGRI. TRAN. TRAD. FLABLS.	0,0001	1,65305	0,00016	0,62
			AGRI. FOOD. FLABSK. HHD1	0,00008	1,4916	0,00012	0,45
			AGRI. FOOD. OSRV. FLABLS.	0,00004	1,64888	0,00007	0,28
			AGRI. OMIN. FLABLS. HHD1	0,00005	1,26301	0,00007	0,25
			AGRI. FSRV. OSRV. FLABLS. I	0,00003	2,18007	0,00006	0,24
			AGRI. FLABHI. HHD1.	0,00004	1,28871	0,00005	0,2
			AGRI. FOOD. TRAD. FLABSK	0,00003	1,80214	0,00005	0,18
			AGRI. FOOD. TRAN. FLABLS.	0,00003	1,63094	0,00004	0,17
			AGRI. FOOD. FCAP. ENT. HH	0,00002	1,7505	0,00003	0,12
			AGRI. OMIN. FCAP. ENT. HH	0,00001	1,51334	0,00001	0,03
			AGRI. OSRV. FLABSK. HHD1.	0,00001	1,42511	0,00001	0,03
			AGRI. VEHE. FLABLS. HHD1.	0,00001	1,38338	0,00001	0,03

APPENDIX 6: CGE RESULTS

APPENDIX 6.1: Impact on domestic demand for agricultural products

period	1	2	3	4	5	6	7	8	9	10
base	111044	112487	113950	115265	116932	118452	11992.3	121551.16	123132.33	124733
simulation	110886.1	112326.8	113786	115265	116763	118250	119818.2	121375.6	122953.5	124551.8
Variation (%)	-0.1425	-0.143	-0.1438	-0.144	-0.1446	-0.1449	-0.145	-0.145	-0.1453	-0.1453

APPENDIX 6.2: Impact on supply of agricultural products to domestic market

period	1	2	3	4	5	6	7	8	9	10
base	4878.06	4941.48	5005.71	5070.79	5136.71	5203.49	5271.13	5339.66	5409.07	5479.39
simulation	4292.03	4325.51	4325.51	4394.38	4429.75	4465.74	4502.34	4539.55	4577.35	4615.77
Variatio	-	-12.47	-12.91	-	-13.76	-	-14.58	-14.984	-15.38	-15.76

n (%)	12.013			12.91		14.17				

APPENDIX 6.3: Impact on real domestic product

Period	1	2	3	4	5	6	7	8	9	10
Base	2176597	2204893	2233557	2262593	2292007	2321803	235186	2382562	2413535	2444911
Simulation	2176060	2204339	2232987	2262008	2291405	2321186	2351353	2381913	2412870	2444231
Variation (%)	-0.0247	-0.02509	-0.255	-0.0259	-0.263	-0.0266	-0.0269	-0.027	-0.0275	-0.0278

APPENDIX 6.4: Impact on domestic demand for agricultural labour

Period	1	2	3	4	5	6	7	8	9	10
Base	720.3	729.638	739.113	748.72	758	768.314	778.30	788.42	798.67	809.052
Simulation	603.23	607.937	612.73	617.606	622.57	627.62	632.98	637.98	643.28	648.665
Variation (%)	-16.248	-16.68	-17.10	-17.512	-17.916	-18.311	-18.70	-19.08	-19.456	-19.82

APPENDIX 6.5: Impact on domestic for capital investment in the agricultural sector

Period	1	2	3	4	5	6	7	8	9	10
Base	21658.41	21939.97	22225.2	22514.2	22806.8	23103.3	23403.6	23707.85	24016.08	24328.29
Simulation	21558.41	21744.15	21837.3	21937.6	22044.8	22159.5	22279	22404.8	22536.8	22679.54
Variation (%)	0.00	-0.893	-1.745	-2.56	-3.34	-4.089	-4.807	-5.497	-6.159	-6.798

APPENDIX 6.6: Impact on price for agricultural products sold on the domestic market

Period	1	2	3	4	5	6	7	8	9	10
Base	1.1269	1.1269	1.1269	1.1269	1.1269	1.1269	1.1269	1.1269	1.1269	1.1269
Simulation	1.12967	1.12966	1.12965	1.12965	1.1296	1.12963	1.1296	1.1296	1.1296	1.1295
Variation (%)	0.245	0.245	0.2446	0.24398	0.2432	0.2424	0.2414	0.2404	0.239	0.238

APPENDIX 6.7: Impact on real consumption budget of the poor households

Period	1	2	3	4	5	6	7	8	9	10
Base	25050.7	25376,3	25706.23	26040.41	26378.93	26721.86	27069.244	27421.14	27777.62	28138.73
Simulation	25048.6	25374.2	25704.09	26038.24	26376.74	26719.64	27067.00	27418.89	27775.34	28136.44
Variation (%)	-0.00834	-0.0828	-0.00821	-0.0083	-0.0083	-0.008295	-0.008295	-0.00823	-0.00819	-0.00814

APPENDIX 7: Household Matrix M3:1

Matrix M31

	AGRI	BCHM	BTOB	BUSI	COAL	COMM	CONS	ELEC	EMCH	FOOD	FOOT	FSRV	FURN	GLAS	GMCH	GOVN	HOTL	IRON	MAOS	MEQU	METP	NFER	NMET	OCHM	OMAN	OMIN	OSRV
HHD1	0.026	0.019	0.019	0.02	0.025	0.021	0.026	0.023	0.014	0.026	0.027	0.021	0.026	0.025	0.013	0.03	0.018	0.024	0.021	0.02	0.022	0.024	0.026	0.018	0.019	0.023	0.025
HHD2	0.053	0.041	0.038	0.043	0.053	0.045	0.053	0.048	0.029	0.053	0.054	0.046	0.053	0.051	0.027	0.064	0.038	0.049	0.044	0.042	0.046	0.049	0.052	0.037	0.039	0.047	0.052
HHD3	0.084	0.067	0.063	0.075	0.087	0.076	0.086	0.082	0.046	0.084	0.08	0.084	0.082	0.083	0.043	0.108	0.065	0.078	0.077	0.068	0.075	0.077	0.084	0.06	0.065	0.076	0.085
HHD4	0.151	0.125	0.116	0.15	0.163	0.146	0.158	0.163	0.083	0.152	0.135	0.174	0.143	0.151	0.078	0.206	0.127	0.141	0.154	0.123	0.136	0.135	0.15	0.111	0.121	0.14	0.161
HHD5	0.591	0.515	0.458	0.67	0.673	0.632	0.631	0.721	0.328	0.595	0.485	0.825	0.537	0.599	0.308	0.925	0.547	0.554	0.707	0.497	0.535	0.514	0.586	0.452	0.488	0.56	0.681
TOTAL H/HOLDS	0.905	0.767	0.694	0.958	1.001	0.92	0.954	1.037	0.5	0.91	0.781	1.15	0.841	0.909	0.469	1.333	0.795	0.846	1.003	0.75	0.814	0.799	0.898	0.678	0.732	0.846	1.004
ENT	0.781	0.585	0.559	0.853	0.92	0.78	0.785	0.937	0.362	0.707	0.551	0.88	0.591	0.775	0.335	0.725	0.743	0.68	0.842	0.55	0.584	0.562	0.701	0.52	0.681	0.724	0.862
TOTAL	1.686	1.352	1.253	1.811	1.921	1.7	1.739	1.974	0.862	1.617	1.332	2.03	1.432	1.684	0.804	2.058	1.538	1.526	1.845	1.3	1.398	1.361	1.599	1.198	1.413	1.57	1.866

APPENDIX 8: Household Matrix M3:2

OTRN	PAPR	PETR	PLAS	PRNT	RTEL	RUBB	TEXT	TRAD	TRAN	VEHE	WATR	WEAR	WOOD	TOTAL	AVERAGE
0.014	0.026	0.019	0.022	0.023	0.009	0.021	0.021	0.032	0.022	0.017	0.02	0.016	0.026	0.889	0.021683
0.03	0.053	0.038	0.046	0.047	0.02	0.043	0.044	0.065	0.046	0.034	0.042	0.032	0.053	1.839	0.044854
0.048	0.085	0.063	0.074	0.077	0.032	0.071	0.069	0.102	0.076	0.055	0.074	0.051	0.084	3.001	0.073195
0.086	0.152	0.117	0.132	0.145	0.058	0.132	0.123	0.179	0.144	0.098	0.15	0.092	0.15	5.551	0.13539
0.347	0.598	0.48	0.518	0.593	0.23	0.542	0.472	0.682	0.6	0.386	0.673	0.36	0.588	22.683	0.553244
0.525	0.914	0.717	0.792	0.885	0.349	0.809	0.729	1.06	0.888	0.59	0.959	0.551	0.901	33.963	0.828366
0.352	0.64	0.593	0.572	0.779	0.258	0.556	0.538	0.813	0.765	0.437	0.93	0.427	0.669	26.904	0.656195
0.877	1.554	1.31	1.364	1.664	0.607	1.365	1.267	1.873	1.653	1.027	1.889	0.978	1.57	60.867	1.484561

RESEARCH OUTPUT FORM THESIS

Journal articles

- **Mukarati J**., Mongale I.P., Makombe G. (2020): Land redistribution and the South African economy. Agric. Econ. – Czech, 66: 46–54.
- **Mukarati.J. (2017).** Modelling the distributive effects of an agricultural shock on household income in South African: a Sam multiplier decomposition and structural path analysis (Journal of Economics Bibliography, 4(1).

Book chapters

- **Mukarati, J.,** Mongale, I.P., & Makombe, G. (2019). Impact of rural land distribution on the South African economy. in T. Ncanywa & B. Yamb (Eds.), Studies of African Economies Vol.3. (pp.72-95), KSP Books: Istanbul
- **Mukarati, J.,** Mongale, I.P., & Makombe, G. (2019). Modeling the distributive effects of an agricultural shock on household income in South Africa: A SAM multiplier decomposition and structural path analysis. In E. Ngongang & Y. Oukhallou (Eds.), Studies of African Economies Vol.4, (pp.30-52), KSP Books: Istanbul.

Conference papers

Mukarati, J. Mongale. I.P, and Makombe. G (2019**):** Land redistribution and poverty alleviation in South Africa: The 4th Annual International conference on Public Administration and Development Alternatives, 03-05 July 2019, Southern Sun Hotel, South Africa.

- **Mukarati. J,** and Makombe.G. (2015). Modelling the distributive effects of an agricultural shock on household income in South African: a Sam multiplier decomposition and structural path analysis. International Conference on Economic Modelling, Boston USA.