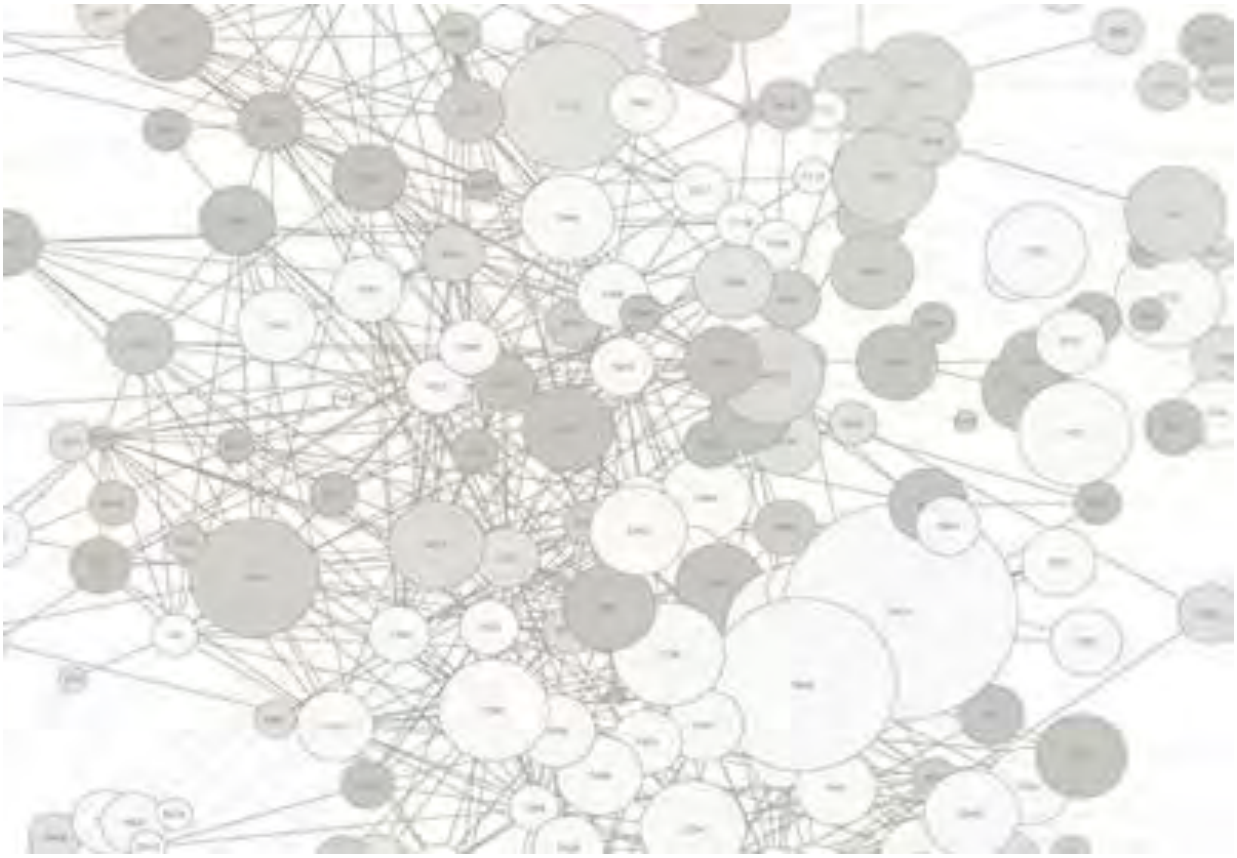
CHAPTER 1

INTRODUCTION

Background, motivation, objectives and outline



1.1 BACKGROUND

1.1.1 Introduction

The global agricultural sector has developed greatly in the last four decades. Industrialisation and globalisation, driven by advancements in technology, have shaped the production of food, feed and fibre for the 21st century. Many developed countries have transformed and diversified their agricultural and food production, yet South Africa is lagging somewhat behind. This undermines the unlocking of the full economic development and growth potential from agriculture. This study will, therefore, develop a theoretically-founded and practical framework to provide guidance for the future development of the broader agricultural sector (i.e. agro-complex) of South Africa and underpin its role in the country's growth path.

The departure point of this study is the potential of agriculture and international trade in economic growth. The section continues with a discussion of a new theoretical concept in explaining economic growth, based on a country's production. Subsequently, the product space concept which entails the practical application of this theory is discussed.

1.1.2 Agricultural development and trade

The positive link between agricultural development and economic growth has been a topic of many studies. Johnston and Mellor (1961) argued that, in the early stages of economic development, the agricultural sector supplies food, generates export earnings, provides labour and capital, and spurs domestic demand to support growth in other sectors of an economy. Furthermore, agricultural development is a key determinant of food stability, nutrition and poverty reduction (Lewis, 1954). The link between agricultural development and growth can be illustrated historically by noting the fact that during the Industrial Revolution the stronger agricultural performers developed more rapidly (Adelman and Morris, 1967). An example of more recent origin is the Green Revolution in South-East Asia, which increased agricultural productivity and formed the basis for broad-based economic growth in the region (Toenniessen, Adesina and De Vries, 2008). Although the extent of the

potential role of agricultural development in South Africa's growth path is debatable, it has an unmistakable and important role to play.

The pathway of agricultural development should also be guided by the significant increases in the global demand for food over the last fifty years caused by the huge growth in population, especially in the developing world. The world economy has been dominated by globalisation, which is linking producers and markets with each other from all over the world. South African farmers not only produce food staples for local markets and traditional commodities for exports, they also supply high-value agricultural products, such as fruits, vegetables, flowers and some processed foods, to regional and international markets. Thus, the development of the agricultural sector in South Africa is not only important to food production for local markets but also as an earner of valuable foreign currency.

Thirlwall (2000) argues that the challenge for many developing countries, including South Africa, in terms of reaping the benefits from trade is that the type of agricultural products they are trading (mainly primary products) cause both a deterioration in the terms of trade, as well as an underutilisation of resources. Thirlwall (2000) has two explanations for this. Firstly, primary agricultural products have both a low price and income elasticity of demand, which implies that if supply increases, prices may drop significantly. Secondly, primary commodities are land-based activities and subject to diminishing returns, and there is limited employment in diminishing return activities.

Diversifying agricultural production and breaking away from the dependency on the export of a small basket of traditional export commodities, as well as on food imports, is of utmost importance for addressing the vulnerability of the country's agricultural sector. This also calls for a focus on the level of sophistication of products, being high-value and value-added products. Recent work by Hausmann, Hwang and Rodrik (2005) finds that it is not only how much, but also what you export, that matters for growth (see also Section 1.1.3).

Most long-term trade opportunities for South Africa's agricultural sector are likely to come from regional markets. This is underpinned by the significant population growth on the continent. It is estimated that by 2030 the Sub-Saharan population will have increased by an

enormous 64 per cent, and that the growth for regional southern African countries is estimated at a mere 14 per cent (UN, 2012). On the other hand, the effects on consumption patterns of urbanisation, income growth, technology, changing diets, and increased off-farm consumption, which are emerging in especially the more developed nations in Africa, should not be marginalised. These effects will lead to an increased demand for non-traditional food products and the creation of new regional supply chains.

The next section will discuss a new growth theory that can provide an innovative direction for the development of South Africa's agricultural production and trade.

1.1.3 A new theory of growth

Many theories, from the work of Adam Smith to the model of endogenous growth, have tried to develop a concept around the attributes of economic growth processes. Most of these growth models focus on a country's fundamentals (e.g. factor endowments, technology, and environment), which determine a country's productive structure and subsequently its generated wealth. However, these models fail to explain why similar countries have different specialisation patterns and levels of product sophistication.

New theories of economic growth processes need to be applied to better understand the development of the agricultural sector in South Africa. One such theory was recently developed by Hausmann, Hwang and Rodrik which states that the wealth of a nation is determined by its productive structure. This productive structure is defined by the set of products and services that a nation can supply. The most important observation of the research underpinning their theory is that what a country produces matters more for growth than how much value it extracts from this. Furthermore, as not all products have an equal level of sophistication, the income of countries is determined by its product variety and sophistication in the long run, and not by the traded value of their exports (Hausmann *et al*., 2005).

Hidalgo and Hausmann (2009) expanded this theory by arguing that the productive structure of a country is defined by the local availability of unique inputs or capabilities.

They argue that these capabilities can be perceived as being specific building blocks of production. Capabilities may consist of tangible inputs, such as infrastructure and land, as well as intangible inputs, such as institutions, norms, skills and knowledge (Hidalgo and Hausmann, 2009). For instance, the production of oranges requires a certain type of soil, climatic conditions, labour skills, farming equipment, food safety standards, distribution network, port facilities. The exact set of capabilities is unique to each product but the exchange of capabilities between products is possible.

Hidalgo and Hausmann (2009) argue that each country has a unique set of capabilities and each product requires a specific combination of these capabilities. They argue that the sophistication of a product is related to the number of capabilities needed for its production and supply. Furthermore, the level of complexity of an economy is strongly related to the set of embedded capabilities it has available. A country can only produce the products for which it has all the required capabilities, and if these are difficult to accumulate, then the current set of capabilities will not only determine the range of products a country is able to produce currently but also the products that it will be able to produce in the future. Countries will bias their future production towards products that use many of the capabilities that are already available (Hidalgo and Hausmann, 2009).

Countries that can produce products that require a relatively large number of capabilities should have economies that are more adaptable than countries producing less complex products. The countries with large capability endowments will have more productive potential, which will ultimately make development easier (Hidalgo, 2009). This explains why what you exports matters, as equal revenues from products of different levels of complexity do not translate into equal future possibilities (Hausmann *et al*., 2005).

Referring back to the example of oranges, producing grapefruits, for instance, may require similar capabilities, to a certain extent. Therefore, the capabilities used to produce one product are an imperfect substitute for those required to produce another product. A country's ability to apply its capability endowments to the production of more sophisticated goods will determine its economic development. Hence, the process of structural transformation depends on the distance between products and the cost of jumping to

producing new goods (Hausmann and Klinger, 2006a). This theory is called the product space theory and it can provide valuable concepts for agricultural growth and development in South Africa.

1.1.4 The product space

This specific theory of economic growth and productive structure has been empirically tested by using a combination of statistical network physics and development economics (Hidalgo, Klinger, Barabási and Hausmann, 2007). This innovative approach resulted in a network structure that connects products, based on the probability that countries export them in tandem. This "product space" assumes that similarities in capability requirements of products are expressed through co-exports (Hidalgo, 2009).

The product space can be seen as an industrial map of where economic development occurs. In line with the described theory, an important aspect of the economic development process is the process by which countries upgrade their productive structures. The network shows explicitly which products require similar capabilities to the ones that a country already produces (Hidalgo, 2009). The fact that countries tend to diversify towards products that are close by in the product space was demonstrated empirically by Hidalgo *et al*. (2007).

The outcome-based approach used in the product space theory as developed by Hidalgo *et al*. (2007) stipulates that if two goods are related because they require a largely similar set of capabilities, they will tend to be produced in tandem, whereas unrelated goods are less likely to be produced together. This similarity is measured by *Proximity*. The *Proximity* measure is based on the premise that the ability of a country to produce a certain product depends on its ability to produce other products (Hidalgo *et al*., 2007). This degree of relatedness is evident when the production of oranges and lemons is compared with the production of oranges and canned fish, where the latter are less related. The proximity captures this notion and is specified as the pair-wise conditional probability of having a Revealed Comparative Advantage (RCA) in exporting one product, given that it exports another.

Resulting from the respective position in the products space, the network may present many valuable insights into the pathways of agricultural development for South Africa. This is done by linking the sector's current production structure with opportunities for diversification and growth.

1.2 PROBLEM STATEMENT AND MOTIVATION

Apart from a hike between 2004 and 2007, South Africa's economy has been plagued by sluggish growth rates of below three per cent over the last fifteen years (IHS Global Insight, 2014). In comparison, the average growth rate for all emerging and developing economies was 7.5 per cent in the last fifteen years (IMF, 2014). The objectives of the National Development Plan (NDP) state that South Africa's annual economic growth rate should be at least 5.4 per cent in order to make a real difference in socio-economic development.

Given the current economic structure and policy environment, it is envisaged that South Africa's growth rate has reached its ceiling. With regard to the latter, rigid labour policies are often viewed as one of the constraints on further growth. This is underpinned by a dismal score in many aspects of labour market efficiency, as measured by the Global Competitiveness Index (WEF, 2013). However, the most predominant factor is the limited structural change in South Africa's economy over the last decades. The country's economy is heavily reliant on the production and export of primary mineral commodities, with automobile manufacturing as the main exception. This pattern can be transposed to the agro-complex as its production is dominated by primary commodities (e.g. fruits and maize) with the production and export of wine as a main exception. Hence, South Africa will not break through its three per cent growth rate without significant transformation of its economy, which is a lengthy process. It is argued that the agro-complex has a potential impact to make in this transformation and growth process by diversifying itself.

One category of socio-economic consequences arising from these sluggish growth rates are high levels of unemployment and poverty. Employment is one of the single most important channels through which poverty can be alleviated. South Africa's unemployment rate

currently is 25 per cent, according to the strict definition[1]. This rate ranks the country as having the fourth-highest level of unemployment, globally. Furthermore, urban areas in South Africa generally have a lower level of unemployment than the rural areas (Harmse, Blaauw and Schenck, 2008). As mentioned, the level of poverty is directly related to unemployment. The proportion of the South Africa population living below the poverty line was almost 36 per cent in 2012 (IHS Global Insight, 2014), which has significant negative welfare implications (e.g. food security).

However, economic growth is not a sufficient condition for poverty reduction as the distributional effects also play an important role. South Africa has one of the most unequal societies in the world, as is evident from its relative high Gini-index of 0.6 (World Bank, 2014a). Apart from unemployment, this inequality is also attributed to the fact that most of the employed are unskilled, resulting in large wage inequalities. Finally, the integration into global markets has indirectly led to increased competition in the local labour market owing to fewer barriers to imports.

South Africa's agricultural sector has traditionally been a relatively large absorber of labour. This has decreased significantly over time, from 25 per cent of total employment in 1970 to six per cent in 2011 (Quantec, 2012), although agricultural sector employment levels are still higher than those of the mining sector, especially in primary agriculture which is relatively labour intensive. Even though the recent pressures arising from labour legislation will result in some degree of mechanisation, it will remain an important employer as long as output is able to grow. Considering the down- and up-stream activities of primary agriculture, and the potential for further developing those activities, the prospects for employment are far from bleak. It is argued that growth in the agro-complex has potentially a significant contribution to make in reducing South Africa's high levels of unemployment.

From a developmental perspective, the growth of the agro-complex also has further socio-economic implications. Firstly, the structure of South Africa's agricultural sector is undergoing some significant changes in terms of transformation and land-reform. The

[1] Proportion of the economically active population that is not currently employed and is actively looking for employment (StatsSA, 1996)

sector has been historically dualistic in nature. It consists of a well-developed commercial sector and a developing sector, which predominantly consists of traditional subsistence farmers, as well as newly-established farmers who are beneficiaries of land reform policies. The latter face some challenges, which include lack of inputs, lack of support structures, lack of training, inadequate land tenure system, improper selection of beneficiaries, low land potential, and a lack of access to competitive markets (see Fraser, Monde and Van Averbeke, 2003; Ortmann and Machethe, 2003; Jacobs, 2003). Getting these farmers on board with the future growth path of the agro-complex is critical for improving its overall output.

Secondly, although South Africa is food secure at a national level, the urgency for further agricultural growth and development was recently highlighted by the global food crises. In 2008, food prices soared to the highest levels in 30 years (OECD-FAO, 2009). One of the main underlying causes for this crisis was the slower growth in production compared to a more rapid growth in demand (Trostle, 2008). The latter is spurred by population growth, which is especially rapid on the African continent. Thus, there exists a significant global and regional incentive to increase agricultural productivity and further develop the agro-complex.

Against this background, the problem statement of this study derives to the following:
Limited structural transformation in South Africa's economy has led to stagnating growth levels resulting in consistently high levels of unemployment and poverty. The potential role that the agro-complex can play in the country's desired growth path is acknowledged but has never been determined.

1.3 RESEARCH OBJECTIVES

The primary objective of this study is: to establish the role of the agro-complex in South Africa's future economic development by identifying diversification pathways for structural growth and employment within the agricultural product space.

In order to answer this central research question, ten secondary objectives have to be attained. These include:

i. Provide a theoretical background on the links between economic growth and international trade, agriculture and diversification
ii. Provide a background on South Africa's agro-complex from an international and national perspective
iii. Provide a background of South Africa's performance of international trade from its agro-complex
iv. Develop a methodological framework for identifying diversification pathways in the agricultural product space
v. Construct and visualise the agricultural product space
vi. Analyse the structure of the agricultural product space and the linkages between the different clusters of the agro-complex
vii. Determine and analyse South Africa's position in the agricultural product space
viii. Determine South Africa's diversification pathways for structural transformation in the agricultural product space
ix. Determine South Africa's market-driven diversification pathways in the agricultural product space
x. Determine South Africa's diversification pathways for employment creation in the agricultural product space.

1.4 METHODOLOGY AND DATA

1.4.1 Methodologies

In order to reach the objectives as stipulated in the previous section, a variety of, mostly, quantitative methodologies are applied. These are briefly summed up here:

- Review of literature; investigating existing growth theories and the theoretical foundation of the qualitative methodologies;

- Module 1 of the *Trade Competitiveness Diagnostic Toolkit* (Reis and Farole, 2012); an analytical framework using a variety of quantitative indicators to analyse a country's trade performance;
- The Decision Support Model (DSM), which uses a set of quantitative filters to identify realistic export opportunities;
- The product space; a quantitative network of relatedness between products providing an industrial map of productive structures and diversification opportunities;
- Other quantitative analyses, comprising simple trade data analysis or the construction of indices to measure the level of complexity, the level of labour intensity, or to identify the most viable diversification pathways in the product space.

1.4.2 Data requirements

International trade data is used for the trade performance analysis, the construction of the product space, and the analyses of product complexity. This is done for the product classification at the six-digit level of the 2002 version of the Harmonised System (HS). This data is extracted from the UN Comtrade database using the World Integrated Trade Solutions (WITS) online interface. For some of the more historical analyses of trade performance before 2002, trade data at the four-digit level of the fourth revision of the Standardised International Trade Classification (SITC) is used, which is also sourced from the UN Comtrade database. The latest data used in this study is for 2011.

Apart from trade data, the DSM uses a variety of data sources for constructing indices on risk, economic dynamics and market accessibility. These are sourced from, among others: the World Bank, the International Monetary Fund, Office National du Ducrioire (ONDD), and the United Nation's Conference on Trade and Development (UNCTAD).

Data for analysing South Africa's agricultural production and resources in an international context was sourced from FAOSTAT. Furthermore, the data used for analysing South Africa's sector in the national context is sourced from a variety of sources, including, Statistics South Africa (StatsSA), Quantec and the Department of Agriculture forestry and Fisheries (DAFF).

Finally, one of the indices constructed for measuring labour intensity uses the latest detailed Quarterly Labour Survey of 2007 of StatsSA.

1.5 OUTLINE OF THE STUDY

In Chapter 2 a review of literature is conducted to provide a theoretical background on the theories of growth, with special reference to agriculture, international trade, and diversification. Chapter 3 analyses South Africa's agricultural sector broadly, both in an international and national context, as well as for its trade performance. Chapter 4 sets out the methodological framework for the product space analysis, as well as the identification process of diversification pathways. Chapter 5 specifically analyses the structure of the agricultural product space and the position of South Africa in the network. Chapter 6 identifies product-level diversification opportunities based on upgrading (i.e. structural transformation), local and international market demand, and labour absorption and quality. Chapter 7 provides a summary of the study, an overview of the main findings and their implications, a discussion of the contributions of the study and, finally, some recommendations.