ASSESSING THE IMPACTS OF SADC FREE TRADE AGREEMENTS (SADC FTA) ON SOUTH AFRICAN AGRICULTURAL TRADE

By

OLUWATOBA AKINSUYI FADEYI

Submitted in partial fulfillment of the requirements for the degree of MSc (Agric.)

in the
Department of Agricultural Economics
Faculty of Natural and Agricultural Sciences
University of the Free State
Bloemfontein
South Africa

January, 2013

DECLARATION

I declare that the thesis hereby submitted by me for the MSc degree in Agricultural Economics at the University of the Free State is my own independent work and has not previously been submitted by me at another university.

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O.A Fadeyi

January, 2013

ACKNOWLEDGEMENTS

First and foremost, praise goes to my God, for His infinite mercy, grace and wisdom to complete this study.

I would like to extend my deepest gratitude and respect to my supervisor, Dr. Yonas Bahta whose patience, tolerance, guidance, and support motivated me throughout the study period. More specifically, his excellent supervision and encouragement has been instrumental in the completion of this study. I would also like to thank my co-supervisor, Mr. Abiodun Ogundeji, for his guidance and supports. I feel fortunate to have collaborated with such talented and accomplished scholars.

I am grateful to the staff members of the Department of Agricultural Economics at the University of the Free State, especially Prof. Johan Williemse, Head of the Department of Agricultural Economics, for all his supports and contributions, as well as Mrs. Annely Minnaar, Mrs. Louise Hoffman and Mrs. Marie Engelbrecht for contributing to the conducive nature of the research environment.

Furthermore, I would like to specially thank my wife, Iseoluwa Hannah and my son, Oluwafumbi Akindayomi whose patient love, kindness and prayers enabled me to complete this thesis. I would also like to thank my mother, Mrs. Abiola Fadeyi, who made it possible for me to continue my education, and my brothers and sisters for all their supports.

Finally, I am greatly thankful to Pastor and Mrs. Chizindu Alikor, Mrs. Ogundeji, Mr. and Mrs. Omoshoro-Jones, Abigail Jirgi and Mrs. Israel-Akinbo for their supports and encouragements. I thank God for bringing you into my life. To all members of The Redeemed Christian Church of God, Bloemfontein, I say thank you. I am blessed to be part of this wonderful family of God.

Oluwatoba Akinsuyi Fadeyi

Bloemfontein, South Africa: January, 2013.

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Degree:	**MSc (Agric.)**
Department:	**Agricultural Economics**
Supervisor:	**Dr Yonas Bahta**
Co-supervisor:	**Mr. A.A Ogundeji**

ABSTRACT

In today's economically integrated world, trade matters more than ever before. Nations are signing various bilateral trade agreements and are engaged in various form of economic integration. Developing countries are also involved in economic integration for vital developments. Free trade areas (FTA), which is a form of economic integration, is formed by removing tariffs on trade among member nations leaving the autonomy in setting their tariffs on trade with non-members. The Southern Africa Development Community (SADC) became a Free Trade Area in 2008 for the economic integration of members.

Literature reviews revealed that econometric models (gravity model in particular) have not been extensively used to estimate the impact of free trade agreements on South African agricultural trade at commodity level using disaggregated data. This study, therefore, evaluates the impact of Southern Africa Development Community Free Trade Agreements (SADCFTA) on South African agricultural trade using gravity model.

The study focuses on South African data for agricultural exports and imports with SADC member countries and EU-15 countries for meat of bovine, maize and wheat commodities from 2000 to 2011. These products were selected based on their sensitivity, relative importance in terms of their contributions to the gross value of

agricultural production, consumption and their tradability. The study used the gravity modeling technique to analyse the impact of SADC free trade agreement. The applied regression method used is the Poisson Pseudo Maximum Likelihood (PPML) estimator to determine the significance of variables within the model. The PPML was preferred to the ordinary least square (OLS) method of estimation. In the presence of heteroskedasticity the standard OLS methods can severely bias the estimated coefficients, casting doubt on the empirical findings. The PPML is robust to different patterns of heteroskedasticity and provides a natural way to deal with zero values in data.

The result shows that there has been a significant increase in trade for meat of bovine and maize among SADC members. There has been a net trade creation and an increasing intra-SADC bloc bias for meat of bovine. The intra-regional trade in maize has also been stimulated by the implementation of the free trade agreements. The study cannot identify any strong bloc effect in wheat trade. Therefore a trade diversion effect was established.

The empirical findings of this study can be considered as an intermediate step to address the relative trade creation and trade diversion effects. The study also signifies the importance of analyzing the effects of SADCFTA for major agricultural commodities.

In order to assess the progress of the SADCFTA scheduled of full liberalization up till the end of 2012, it is imperative that the study recommends carrying out further studies to assess the full liberalization of trade in the agricultural sector.

Key words: Free trade agreements, SADC, Agricultural trade, Trade creation, Trade diversion, Gravity model, Poisson Pseudo Maximum Likelihood (PPML) estimator.

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OLUWATOBA AKINSUYI FADEYI

Graad: **MSc (Agric)**
Departement: **LandbouEkonomie**
Studieleier: **Dr. Yonas Bahta**
Mede-studieleier: **Mnr A.A. Ogundeji**

UITTREKSEL

In vandag se ekonomies geïntegreerde wêreld is handel belangriker as ooit tevore. Nasies onderteken verskeie bilaterale handelsooreenkomste en is betrokke in verskeie vorme van ekonomiese integrasie. Ontwikkelende lande is ook betrokke in ekonomiese integrasie ter wille van belangrike ontwikkelings. Vrye Handel Areas (VHA) wat 'n vorm van ekonomiese integrasie is, word gevorm deur die verwydering van die tariewe op handel tussen lid lande en behou die outonomie in die opstel van tariewe op handel met nielede. Suider-Afrikaanse Ontwikkelingsgemeenskap het 'n Vry Handel Area in 2008 geword vir die ekonomiese integrasie van die lid lande.

Literatuurverwysings toon dat ekonometriese modelle wat spesifieke/aparte/losstaande data gebruik (swaartekrag model in die besonder) nie op groot skaal benut word om die impak van vrye handel ooreenkomste op die Suid-Afrikaanse landbou op kommoditeitsvlak gebruik nie. Hierdie studie evalueer dus die impak van die Suider-Afrikaanse Ontwikkelingsgemeenskap Vry Handel Ooreenkomste (SAOGVHO) op die Suid-Afrikaanse landbou handel.

Die studie fokus op Suid-Afrikaanse data vir landbou uitvoere en -invoere met SAOG-lid lande en die EU-15 lande vir die vleis van beeste, mielies en koring vanaf 2000 tot 2011. Hierdie produkte is gekies op grond van hul sensitiwiteit, relatiewe belangrikheid

in terme van hul bydraes tot die bruto waarde van landbouproduksie, verbruik en hul verhandelbaarheid. Die studie het die swaartekrag modelleringstegniek gebruik om die impak van die SAOG vrye handelsooreenkoms te ontleed. Die toegepaste regressie-metode wat gebruik is, is die Poisson Pseudo Maksimum Waarskynlikheid (PPML) beramer om die betekenis van veranderlikes binne die model te bepaal. Die PPML is gekies in plaas van die gewone minste vierkant (OLS) metode van beraming. In die teenwoordigheid van "Heteroskedasticity" kan die standaard OLS metodes die geraamde koëffisiënte bevoordeel wat twyfel oor die empiriese bevindinge te weeg bring. Die PPML verwerk die verskillende patrone van "Heteroskedasticity" en bied 'n natuurlike manier om te handel met die nul waardes in die data.

Die resultaat toon dat daar 'n beduidende toename in die handel was vir die vleis van beeste en mielies onder die SAOG lid lande. Daar is 'n netto handel skepping en 'n toenemende intra-SAOG-blok vooroordeel vir vleis van beeste. Die intra-plaaslike handel in mielies is ook gestimuleer deur die implementering van die vrye handelsooreenkomste. Die studie kan nie 'n sterk blok effek in koringhandel identifiseer nie. Daar is dus 'n afwyking in die handel van koring.

Die empiriese bevindinge van hierdie studie kan beskou word as 'n intermediêre stap om die effekte van die relatiewe handel skepping en die verlegging van die handelsverkeer aan te spreek. Die studie dui ook die belangrikheid aan van die ontleding van die gevolge van SAOGVHO vir groot landboukommoditeite.

Ten einde die vordering van die SAOGVHO skedule van die volledige liberalisering tot aan die einde van 2012 te bepaal, is dit noodsaaklik dat verdere studies gedoen word om die volledige liberalisering van die handel in die landbou sektor te bepaal.

Sleutelwoorde: Vryehandelsooreenkomste, SADC, lanbou handel, handel skepping, handels afwyking, Poisson Pseudo Maksimum Waarskynlikheid (PPML).

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LIST OF ABBREVIATIONS

AFTA	ASEAN Free Trade Area
CEEC	Central and Eastern European countries
CGE	Computable General Equilibrium
CUSFTA	Canada-US Free Trade Agreements
DTI	Department of Trade and Industry
EU	European Union
FTA	Free Trade Agreement
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GEIS	General Export Incentive Scheme
GLS	Generalised Least Square
GSP	Generalized System of Preferences
NAFTA	North American Free Trade Agreement
DOA	National Department of Agriculture
OLS	Ordinary Least Square
RTA	Regional Trade Agreement
SA	South Africa
SSA	Sub-Saharan Africa
SACU EFTA	Southern Africa Custom Union-European Free Trade Agreement
SADC	Southern African Development Community
SADCFTA	Southern African Development Community Free Trade Agreement
USA	United States of America
WTO	World Trade Organisation

CHAPTER 1

INTRODUCTION

1.1 Introduction and background

The importance of trade cannot be overemphasized in today's economically integrated world. The rapid spread of regional integration is one of the most vital recent developments in the world trading system. Almost all the members of the World Trade Organization (WTO) belong to at least one or more Regional Trade Agreements (RTA) that is notified to the world trade organization (WTO). About two third of the world trade takes place within such agreements, and all of them have a common objective to reduce trade barriers among members. Trade liberalization arrangements varies from one regional trade agreements (RTA) to another, some covers a limited range of products while some make provisions such as services and intellectual property rights that are beyond traditional tariff reduction (Chia, 2007).

There is an increasing recognition that effective regional integration requires more than just reducing tariff and quotas. Many other barriers impede the free flow of goods, services, investments and labour that are also to be removed during regional integration. The so-called 'deep integration' was first pursued by the European Union (EU) and it is becoming attractive in other regional initiatives. The number of RTAs has increased since the early 1990's. As of 15 January 2012, 511 Regional Trade Agreements (RTAs) have been notified to the World Trade Organization (WTO) and 319 RTAs were in operation. Free Trade Agreements (FTAs) is the single most important form of integration and this account for 70 percent of all RTAs (WTO, 2012). These developments have occurred concurrently with the advancement of the multilateral trading system under the WTO.

Developing countries have also made attempts to form regional trade among themselves. For example, in 1992, The Southern African Development Community (SADC) was created by the Treaty of Windhoek (Namibia), replacing the Southern African Development Co-ordination Conference (SADCC). The current 14 Members States of SADC are Angola, Botswana, the Democratic Republic of Congo (DRC), Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. Madagascar is not included due to suspension (SADC Secretariat, 2012). One of the main objectives of SADCFTA is to achieve development and economic growth, alleviate poverty, and enhance the standard and quality of life of the people of Southern Africa through regional integration.

SADC only became a Free Trade Area (FTA) as of January, 2008. The formal free trade agreement was launched at a regional Heads of State Summit held in Johannesburg, South Africa, on the 16th and 17th August, 2008. The creation of an FTA in 2008, in principle, saw up to 85 percent of intra-SADC trade flows duty free, with the remaining 15 percent consisting of sensitive products (i.e., products that enjoyed significantly higher tariff rates and higher values of trade) to be liberalized by 2012 (SADC Secretariat, 2003). The roadmap of the SADC Regional Indicative Strategic Development Plan (SADC Secretariat, 2003) is to see SADCFTA being transformed into a Customs Union (CU) in 2010, a Common Market (CM) in 2015 and a Monetary Union (MU) in 2016 and finally, it will become an Economic Union in 2018.

1.2 Problem statement

An increasing theoretical and empirical literature has revived the argument over the welfare effects of FTAs and their likely impact on multilateral trading system. Srinivasan (1995), Bhagwati *et al*., (1998); and Panagariya (1999 and 2000) believed that RTAs are welfare reducing by acting primarily to divert trade from the rest of the world to the countries receiving preferential treatments, consequently, they argued that FTAs serves as 'stumbling blocks' to multilateral trade liberalization. However, Ethier (1998) and Ornelas (2005) argued that FTAs are stepping stones towards multilateral trade liberalization, therefore, likely to raise economic welfare. Their conclusion was based upon the findings that FTAs induce their member governments to lower their

external tariffs, and to do so deeply enough to enhance trade even between FTA members and non-members. Existing literature is ambiguous on the welfare effects, noting that there can be both trade creation and trade diversion effects.

The study by Nin-Pratt *et al*., (2008) using partial equilibrium model analyze the impact of regional and country level impact of FTA on agriculture in the SADC region. They concluded that the welfare impact of a FTA in the agricultural sector is positive, but small. Their estimation shows that the total value of trade creation was $157 million or 0.92 percent of total agricultural trade for SADC countries, and the net effect between trade creation and trade diversion was $129 million or 0.75 percent of total agricultural trade.

Researchers have employed a range of techniques to examine the effects of FTAs. There are large empirical literature using multi-sectoral computable general equilibrium (CGE) models, partial equilibrium model and static applied CGE model to analyze the welfare impacts of FTAs. Although, the CGE models have been influential in analyzing the welfare effects of trade agreements, some serious questions have been raised about the empirical validity of these models. The parameter selection criteria have been criticized to be unsound and the use of first-order constant elasticity of substitution (CES) functional forms imposes severe restrictions on the model's structure (McKitrick, 1998). The CGE studies have been prospective rather than retrospective, that is, looking back at what happened (Krueger, 1999).

Other techniques like the descriptive approach have also been used to analyse the impacts of RTAs (dell'Aquila *et al*., 1999). This approach implicitly assumed that the share of trade occurring with partner countries would not have changed in the absence of the agreement. Consequently, changes in terms of trade due to changes in the relative importance of members and nonmembers, as well as declines in the volume of trade for a single commodity included in the broader class cannot be detected (dell'Aquila *et al*., 1999). The method also lacks the ability to analyse trade creation and trade diversion effects, and hence, the welfare implications of FTAs.

Econometric techniques had rarely been used to analyze the effects of FTAs on trade in agricultural products. Empirical researchers have paid little attention to incorporate the effects of FTAs into the specification of econometric model and to estimate the model by using pre- and post- FTA agricultural product data (Jayasinghe & Sarker, 2007). Maringwa (2009) use the traditional gravity modeling technique, trade intensity and product complementarity indices to analyse bilateral trade flows on sensitive products such as textiles and apparels, cereals and vehicles between SADC countries. He found out that trade creation on wheat and sugar products dominate trade diversion even though the percentage increase in trade in these products is small.

The effects of trade creation and trade diversion in the free trade agreement are important to study for several reasons. Free trade agreements are very important for developing countries. With free trade agreement in force, trade flows will be smooth for both trading partners and eventually improve the welfare and consumption level of the population at large, depending on the total effect. For this reason trade creation and trade diversion effects play an important role in identifying trade patterns.

Despite the number of theoretical and empirical contributions in recent years, the effects of FTAs on trade in agricultural products for South Africa are not evident in existing literature. Maringwa (2009) deals with sensitive products such as textiles, apparels, cereals and vehicles, while other studies are mainly on merchandize trade. Although the trading pattern for agricultural products differs from the general merchandize trade, it remains an open empirical question to what extent did agricultural products trade among SADCFTA partners increases and how much of the increase can be attributed to trade creation and trade diversion.

Therefore, this research attempt to analyze the impact of SADCFTA on South African agricultural trade using the Standard International Trade Classification (SITC) for meat of bovine (SITC 0111), maize (SITC 044) and wheat (SITC 041), applying econometric modeling (gravity model) in order to overcome the shortcomings of other modeling techniques as mentioned above to estimate the trade creation and trade diversion effects of SADCFTA.

1.3 Objectives of the study

Free trade agreements have a substantial impact on the participant countries in terms of welfare, consumption, production and trade flows. The main objective of this study is estimate the trade creation and trade diversion effects of the SADCFTA on South African agricultural trade, using the meat of bovine (SITC 0111), maize (SITC 044) and wheat (SITC 041) subsectors. The sub-objectives of the study are to:

1. Predicts South Africa's bilateral trade potentials, opportunities and performance in meat of bovine, maize and wheat export
2. Determine South Africa's degree of agricultural trade integration with its major trade partners in SADC region
3. Formulate suitable policy recommendations.

1.4 Methodology and data used

In an effort to analyze the impact of SADCFTA on South African agricultural trade, the gravity model will be employed. The gravity model states that the volume of trade between two countries is proportional to their gross domestic income and inversely related to trade barriers between them. Quite a number of alternative specifications had been generated by empirical research for the gravity model of international trade (Jayesinghe, 2007). The gravity model is suitable because of its consistent results and relatively compact specification, which makes it appealing for analyzing regional and international agreements designed to promote trade. A panel regression using Poisson Maximum Likelihood will be used for the study.

The study concentrate on yearly data (Panel) for bilateral trade flows (exports and imports), gross domestic products (GDP), population and distance between exporting and importing countries from 2000 – 2011. A panel regression will be estimated. The agricultural products included in this study are; meat of bovine (SITC 0111), maize (SITC 044) and wheat (SITC 041). These products were selected based on their sensitivity, relative importance in terms of their contributions to the gross value of agricultural production, consumption and their tradability. The study sought to single

out these sensitive products because this would show the extent to which free trade agreements would have gone in giving preferences. As tariffs on some of these sensitive products got reduced, bilateral trade values would have been expected to increase showing the existence of real market access benefits stifled by highly protective duties on such products.

1.5 Outline of the study

This study is primarily concerned with assessing the impact of SADCFTA on South African agricultural trade. In order to sufficiently address this, **Chapter 2** is devoted to the literature review that provides a general overview of free trade agreements and the modern perception of trade. Selected studies relevant to the methodology involved in bilateral trade volume using gravity model was also reviewed. **Chapter 3** provides overview of South African trade in meat of bovine, maize and wheat sub sectors that were used. In **chapter 4** the empirical method and the data used for this study was discussed, while **chapter 5** presents the results and discussion. In **chapters 6** a summary of findings and some conclusions were drawn based on the results. At the end of the study some recommendations on future research is presented.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of relevant literature and the modern perception of free trade agreements and South African agricultural trade. It offers a systematic account of discussions on regional trade agreements under GATT/WTO, welfare analysis of free trade agreements, what free trade agreements means for agricultural trade, the impact of free trade agreements and further presents the complexity and interpretation of trade liberalization in Southern African economies. The chapter also reviews selected studies relevant to the methodology involved in bilateral trade volume using gravity model.

2.2 Regional trade agreements under GATT/WTO

The World Trade Organization (WTO) was established in 1995 as a governing body of the international trade. As of June 2012, the WTO has 155 members, accounting for more than 90 percent of the world trade. More than 70 percent of the members are developing countries. The centerpiece of the WTO is the Most Favored Nation (MFN) principle enunciated in its Article I. The MFN clause prohibits member nations from pursuing discriminatory trade policies against one another. The MFN principle says that when a country extends trade concessions to one partner, it must extend them to all members. Therefore, RTAs are in conflict with Article I of the WTO and had to be accommodated through additional provisions (Tomz *et al*., 2007).

The WTO has three provisions to accommodate the RTAs. First, developed countries can give developing countries one-way trade preferences. This provision is termed the *Generalized System of Preferences* (GSP). It is designed to promote exports from developing countries to developed countries. Second, under the *Enabling Clause*, developing countries can exchange any trade preferences to which they agree. The provision is intended to promote trade among developing countries. With this provision,

there is no need to have a complete free trade area; instead, partial preferences are permitted. Many RTAs among developing countries were formed under this provision (Krueger, 1999).

Finally, Article XXIV states that countries can form Free Trade Areas or Custom Unions. Article XXIV offers the only avenue to RTAs in which developed countries are recipients of trade preferences. This article only allows for forming a free trade area or a customs union, which eliminates duties and other restrictive regulations of commerce with respect to 'substantially all trade' in products originating from union members. The SADC Protocol on Trade was notified to the WTO under Article XXIV of GATT 1994.

However, the world trade organization has not actively enforced the provisions of the Article XXIV and the definitions of 'substantially all trade' have not been clarified satisfactorily. As a consequence, many RTAs around the world violated the basic provisions of Article XXIV and the WTO has not censured any RTA as being incompatible with its standards (Panagariya, 2000).

2.3 Free trade agreements and regional trade agreements

Difficulty in achieving global agreement through the WTO has been one of the reasons responsible for the creation and expansion of numerous regional trade associations and agreements (Lambert and McKoy, 2008). In the early 2000's, about 97 percent of all global trade involved countries that belong to at least one RTA (Clarete *et al*., 2003).

Baldwin and Venables (1995) defined a free trade area (FTA) as an area formed by removing tariffs on trade among member nations and leaving members with the autonomy in setting their tariffs on trade with non-members. FTAs requires the enforcement of rules of origin; in order to prevent imports from the country with the lowest external tariff, free internal trade is permitted only for goods which can be

proved to originate within the FTA, and not for re-exports. A free trade agreement (FTAs) is a form of regional trade agreements (RTA)[1].

The studies on the effects of regional integration were initiated during the 1950's when there was the first global wave of regional trade agreements. During this period, multilateral trade was at its early stage. The proliferations of FTAs have created scholar's interest on the desirability of these arrangements and how they affect multilateral trade. Various questions were raised that include the following: does the success with multilateralism necessarily lead to the spread of RTAs? Will the resurgence of RTAs undermine the process of multilateralism? These questions and many more that were raised are dynamic in nature (Lahiri, 1998).

2.4 Welfare analysis of Free Trade Agreements (FTAs)

There are static and dynamic effects of free trade agreements. The static effects concentrate on the immediate effects of a given FTA. Viner (1950) examined the welfare of custom unions. He introduces the concept of trade creation and trade diversion of RTA. He assumed constant cost of production and zero demand elasticities and focused on shifts in a given volume of production among alternative locations within and outside the RTA. Due to the formation of an RTA, a higher cost member country's production may shift to a lower cost member and additional trade is created. Trade creation should stimulate an increase in intra-SADC trade and should, in theory, lead to an improvement in the efficient allocation of scarce resources and gains in consumer and producer welfare (Maringwa, 2009).

In Figure 2.1, before the economic integration, the price of the good in country A is PA (PB plus the tariff). With integration between A and B, the tariff is removed, and A now imports (Q4 – Q1) rather than (Q3 – Q2) from B. Q2 - Q1 of the increased imports displace previous home production and Q4 – Q3 reflect the greater consumption at the new price PB facing country A's consumers. The trade effect is the sum of areas b and d. In general trade creation means that a free trade area creates trade that would not have

[1] Free trade agreements (FTAs) and Regional trade agreements (RTAs) are used interchangeably in this study.

existed otherwise. As a result, supply occurs from a more efficient producer of the product.

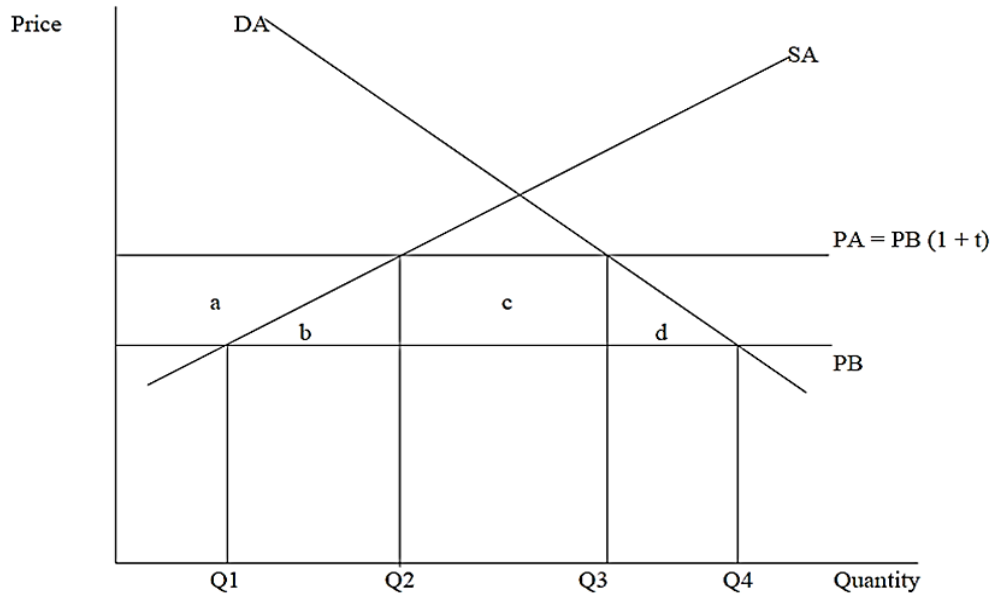


Figure 2.1: Trade Creation Effects

Note: DA= demand, SA= Supply, PA= Price of country A, PB= Price of country B and PC= Price of country C

Source: Du Plessis *et al.*, 1998.

If a RTA shifts production from a lower cost of nonmember country to a higher cost member country, trade is diverted. From Figure 2.2 before the union with country B, country A has a tariff on imports of the good. Thus country C's tariff – inclusive of price in A's market is PA = PC (1 + t). Before the union, country A imports (Q3 – Q2) from country C. When the union is formed with country B, country A imports (Q4 – Q1), all coming from partner B, which no longer faces a tariff. In general trade diversion means that a free trade area diverts trade that existed otherwise. The net trade effects for country A is the difference between areas b + d (a positive effect due to the lower price in A) and area e (a negative effect due to lost tariff revenue by A that is not captured by country A's consumers). Producers in the importing country suffer losses as a result of the free trade area.

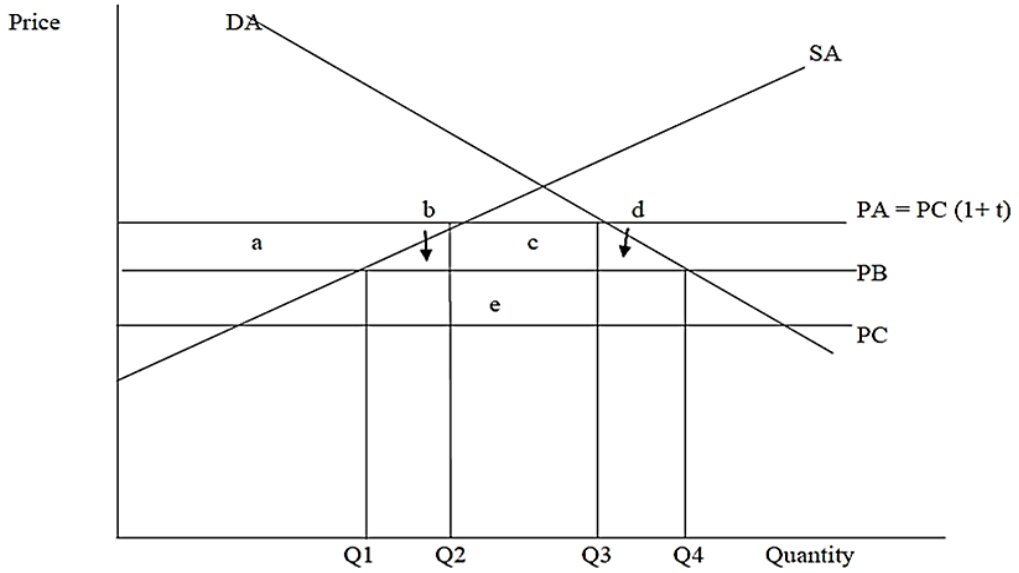


Figure 2.2: Trade diversion effects

Source: Du Plessis *et al.*, 1998.

Viner (1950) argued that since a RTA is trade creating in some products and diverting in others, one cannot be sure if it increases or decreases welfare. He concluded that it all depends on the relative magnitude of trade creation and trade diversion. Meade (1955) and Lipsey (1957) developed a formal analysis of the welfare effects as related to RTAs. Meade (1955) developed a general equilibrium analysis of welfare effects of RTA with vertical supply and downward demand functions. Meade indicated that the relative magnitude of trade creation and trade diversion are insufficient to determine the welfare effects of RTAs. He also argued that benefits of a RTA depend not only on the extent of trade creation, but also the magnitude of the cost that are reduced on each unit of the created trade. In the same manner, losses are determined by the amount of trade diversion and also the magnitude of the increase in costs due to trade diversion.

Krugman (1991b) finds that world welfare declines as the number of trade blocs' increase, that is, countries are combined into larger RTAs. The world welfare increases as the number of blocs is reduced to two, and it increases further when they move to a single bloc, therefore arriving at a non-discriminatory free trade for all countries. As a

result, Krugman concluded that bilateral trade is generally undesirable, since the formation of bilateral trade would reduce world welfare.

Deardorff and Stern (1994) criticizes Krugman's conclusion saying that they are not robust to changes in key assumptions. Krugman's assumptions that the firms in each country produce goods that are distinct from those produced by other firms were relaxed by Deardorff and Stern (1994). Their analysis shows that world welfare increases monotonically with size of the blocs.

The study by Baldwin (1993) focuses on the incentives of members to join RTA. He argued that the incentive of joining RTA will be positive and this will in turn encourage outsider's interest to become member of the RTA. According to Baldwin and Venables (1995), the effects of a FTA on participating countries could be analyzed by knowing how the formation of a FTA changes the static allocation of resources in participating economies, the accumulation effects and Location effects.

By the creation of free trade area (FTA), the allocation of resources is affected and this implies changes in welfare for the countries involved in free trade. The impact depends on the relative size of the economies involved and the market structures. The second impact of FTA is that the rates of return and the accumulation of capital, both human and physical, plays a positive role on the potential for the long run growth within a FTA, as long as diminishing returns to capital can be offset. Lastly, firm location as well as geographical distribution of wealth is affected by the formation of FTA. This arises as a result of changing balance between production cost and trade costs. This impact depends on the extent of competition and the magnitude of endowment dissimilarities among the participating countries (Baldwin & Venables, 1995).

Bhagwati (1998) and Panagariya (2000) viewed a regional trade agreement (RTA) as reducing global welfare and creating 'stumbling blocks' to multilateral free trade. The other school of thought argues that RTAs are likely to raise global welfare and can act as 'building blocks' to multilateral free trade (Summers, 1991 and Ethier, 1998).

Bhagwati (2000), concluded that FTAs are by definition discriminatory and they are trade diverting. He argued that tariffs remain high on many goods imported into developing countries and even on some labor-intensive goods, like wearing apparel and agricultural products, imported into developed countries. Thus, he emphasizes, trade diversion will likely occur when a FTA is formed. Bhagwati also claimed that the rule of origin in one FTA more than likely do not coincide with the rules of origin in many of the other FTAs. Furthermore, he argued, the schedule of implementation of the tariff reductions and other conditions for one FTA will not match the schedule of other FTAs. The inappropriateness of these regulations across FTAs has created what Bhagwati sees as a customs administration nightmare and calls the 'spaghetti-bowl' phenomenon.

A range of economists and other trade experts embrace the second view that FTAs can enhance trade and should be encouraged. Lawrence and Weinstein (1999) argued that FTAs involve much more in economic integration than the elimination of tariffs. He pointed out that North America Free Trade Area (NAFTA) had led to the reduction in barriers on services trade, foreign investment and other economic activities not covered by the WTO.

Hudgins (1995) maintained that while it may be preferable to liberalize trade multilaterally, countries should take any available approach, including bilateral or regional FTAs, even if they lead to some trade diversion. He further asserts that, FTAs can be more efficient vehicles for addressing difficult trade barriers than the WTO, where the large membership requires compromise to the least common denominator to achieve consensus. FTAs have also provided momentum for WTO members to move ahead with new trade rounds (Hudgins, 1995). Bergsten (1997) holds a similar view to the one expressed by Hudgins, that instead of multilateral trade negotiations, FTAs are the next best thing and promote global trade liberalization. He advocated structuring FTAs in a manner that could serve as 'building blocks' of a global free trade system.

Krishna (1998) and Levy (1997) both supported the suggestion that RTAs will undermine the efforts to liberalized multilateral trade by reducing the incentives of member countries to seek multilateral framework. Krishna (1998) concluded that, trade

diverting RTAs are more likely to be supported politically and also such RTAs could change domestic incentives, so that politically feasible multilateral liberalization can be made infeasible by RTAs. Levy (1997) shows that RTAs can weaken political supports for further multilateral trade liberalization. If a RTA offers disproportionately large gains to key agent in a country, their utility is raised above the multilateral free trade level and a multilateral agreement would be blocked. Free trade agreements between countries with similar factor endowments are most likely to have these effects.

2.5 What does FTAs mean for agricultural trade?

Agricultural sectors are more complex in a FTA because, until recently, agriculture was excluded from General Agreement on Tariff and Trade (GATT) negotiations. Many countries have domestic support programs for agriculture and these programs usually conflict with trade liberalization. To the extent that a RTA can induce countries to reform domestic support programs, and it encourages deeper integration among its members (Robinson & Thierfelder, 2002).

Burfisher and Jones (1998) survey empirical studies which focus on the implication of a variety of RTAs for U.S. agriculture. They found the following: firstly, U.S. agriculture can gain from participating in various RTAs. The international terms of trade facing the U.S. in agriculture are expected to improve, with an increase in farm export prices relative to import prices; secondly, U.S. agriculture can lose if not a member of RTAs because they divert trade from U.S. agriculture; thirdly, agriculture is the source of most U.S. gains from RTAs. Because agriculture still faces relatively high trade barriers in world markets, its inclusion in trade agreements accounts for much of the U.S. gains from RTAs and lastly, RTAs limit the ability of member countries to maintain independent farm programs.

Consistent with economy-wide models such as CGE model, which focus on agriculture, they find that aggregate trade creation dominates trade diversion. Moreover, RTAs are generally net trade creating in agriculture; and, in some cases, there is no aggregate trade diversion (Robinson & Thierfeilder, 2002). Hertel *et al.,* (1999), also describe

economy wide models of trade liberalization with a focus on agriculture and domestic policy distortions. They found that domestic distortions can offset trade diversion effects. For example, as the EU expands to incorporate seven of the Central and Eastern European countries (CEEC), the rest of the EU benefits from replacing subsidized domestic farm output with imports from new members.

Liapis and Tsigas (1998) also examine the effect of EU expansion to include Central and Eastern European Countries (CEEC). In their Global Trade Analysis Project (GTAP) simulation, the CEEC participate in the EU budget and receive common agricultural policy (CAP) payments. They found that trade diversion in agricultural products as EU imports from third countries are replaced by CEEC countries who now receive output subsidies in agriculture. However, it is a net trade creating in the aggregate, as they reported that the trade balance increases in all regions, except the CEEC.

Morley and Piñeiro (2004) in their work on the effects of WTO and Free trade areas of the Americas (FTAA) on agriculture and the rural sector in Latin America, concluded that these two alternatives, that is, WTO and FTAA is expansionary for both output and employment in general and for agriculture in particular in most Latin American countries. They argued that the WTO in particularly favors the rural sector because the elimination of producer subsidies in developed countries causes a big increase in prices of all food commodities, but especially grains, dairy products and milk. They also found that trade liberalization reduced skill differentials within the urban sector.

Some analysts believe free trade agreements provide benefits, while others believe they cause disadvantages. Such gains and losses are measured by the welfare resulting from trade liberalization. A growing literature addresses the debate based on the welfare effects of regional trade agreements (RTAs) and their likely impacts on the multilateral trading system (Panagariya, 2000; and Krueger, 1999). Moreover, a number of studies in the past on the impact of free trade agreements in Southern Africa using a partial equilibrium model show that trade creation dominates trade diversion and that there are economic benefits to be realized from a FTA. Others have repeatedly indicated

limitations in Southern Africa's economies that reduce the potential gains from a FTA (Nin-Pratt *et al.,* 2008).

2.6 South African trade liberalization

Trade liberalization can be explained as the relaxation or elimination of tariffs and removal of duties and/or quotas on exports; alteration in non-tariff barriers such as import quotas and quantitative restrictions, changes in licensing and direct allocation of foreign exchange and in specific regulations for products and removal or relaxation of export subsidies (Bienen, 1990).

It is plausible to submit that trade liberalisation in South Africa had the effect of an improved export performance in some economic sectors. Additionally, it is also difficult to argue that the impact of trade liberalisation was negative on a substantial part of the economy. The net implication is that trade liberalization appears to have been associated with an improving export orientation of the South African economy (Fedderke & Vaze, 2001).

In the agricultural sector, for the goods subject to import control measures, importers must apply for import permits prior to the goods importation (this is in accordance to the import and export control Act of 1963, which empower the Minister of Trade and Industry to limit the import of certain goods into South Africa). The list of restricted goods requiring import permits has been substantially reduced as the department of trade and industry (DTI) has tried to phase out import permits in favor of tariffs (Cassim *et al.,* 2002).

According to Agriculture South Africa (Agri SA) (2000), commitments related to market access, such as replacing quantitative restrictions (QRs) with tariffs and the general reduction of tariffs went smoothly and is completed. Most applied rates of duties (average 11 percent) are well below the commitment levels of the bound rates (average 41 percent). In some cases specific duties (e.g. poultry and garlic) were

implemented. This may complicate the monitoring of WTO-commitments; it is still in accordance with WTO rules which allow for both *ad valorem* and specific duties.

The degree of protection on agricultural products derived from a tariff of output needed to be qualified by the degree of taxation due to tariffs on its inputs, in order to get a sense of the net protection, as opposed to the gross protection. In other words, it can also be expressed as effective rate of protection of output. Agriculture is ranked 53rd out of a total of 95 categories in terms of its nominal rate of protection (note: the lower the rank, the lower its nominal rate of protection). Agriculture's rank improves to 58 for the effective rate of protection (Cassim *et al.,* 2002). This involves that the tariff regime is actually taxing the agricultural sector and this is also in agreement with the findings of Jooste and Van Zyl's (1991).

On export subsidies, the South African Government in 1995 initiated a three-year program to eliminate the General Export Incentive Scheme (GEIS) as envisaged under the commitments to the world trade organization (WTO). By June 1995, the GEIS benefits became taxable and the number of export categories eligible for the subsidy was reduced, while the level of subsidy was also cut. In April the GEIS subsidy for processed products was reduced from 14 percent of the export value to 12 per cent, and was scheduled to decline further to 6 percent in July, while the GEIS subsidy for raw materials was reduced from 3 per cent of the export value to 2 per cent in April. The GEIS on raw materials was later phased out in July 1997, effectively limiting the GEIS to fully manufactured products (Kusi, 2002).

Given significant changes in domestic policy e.g. scaling down of the budget of the National Department of Agriculture, Forestry and Fisheries (DAFF) and changes in the marketing dispensation (i.e. price fixing no longer occurs), South Africa now complies fully with the Green Box criteria as well as domestic support reduction commitments (Amber Box). Various Government Departments and parastatals set and police standards affecting the trade of agricultural products, most notably the Department of Agriculture Forestry and Fisheries (DAFF), the Department of Health, Department of Trade and Industry (DTI), the South African Bureau of Standards (SABS) and the

Council for Scientific and Industrial Research (CSIR). Most standards conform, or are in close conformity with international standards (Jooste *et al*., 2003).

Southern Africa countries depend heavily on trade, especially in agricultural products for their exports as well as machinery, fuels and chemicals, among other inputs into production, in their imports. Over the years, trade with the outside world has outweighed intra-SADC trade primarily because the economic structure of the SADC states has changed only marginally (SADC Trade Performance Review, 2007). While motives for negotiating and signing bilateral trade agreements are diverse and varied, bilateral trade agreements are fairly easy to negotiate and give the partners favored trading status with each other (Maringwa, 2009).

The South African Development Community (SADC) member countries have engaged in series of trade liberalization activities which include negotiating and signing bilateral trade agreements and also negotiating at the multilateral level under the World Trade Organization (WTO). Maringwa (2009) submit that pursuing these trade negotiations and agreements, both at the regional level and multilateral levels, shows that SADC member states agreed that trade plays a vital role in the overall economic development of the member states.

The SADC region has been trading as a Preferential Trade Area (PTA) since its inception in 1980. But by January 2008, SADC became a Free Trade Area (FTA). Preferential trading agreements (PTAs) as opposed to free trade agreements have greater scope to deal with the whole range of trade obstacles. Unfortunately many of South Africa's trade agreements are free trade-related ones and which mainly focus on the reduction of tariffs. There are, opportunities in some of the new trade agreements, to embark on a more holistic trading relationship which addresses some of the prohibitive non-tariff barriers facing exporters.

The SACU-MERCOSUR (Southern Common Market) is an economic and political agreement among Argentina, Brazil, Paraguay, Uruguay and Venezuela founded in (1991) preferential agreement is one such relatively new agreement which lays the

foundation for future mutually beneficial trading relations between the respective countries. This agreement is further cemented by South Africa recently joining the BRIC group (BRIC group includes Brazil, Russia, India and China) of emerging countries. While there is little in terms of concrete trading agreements within this group at present, it provides the opportunity for increased trade between these nations (DTI, 2011).

The SADC schedule of implementation of tariff reduction is as follows: a FTA in 2008, in principle, saw up to 85 percent of intra-SADC trade flows duty free, with the remaining 15 percent consisting of sensitive products to be liberalized by 2012 (SADC, 2008). The rigorous pursuit of bilateral trade arrangements by SADC member states is with a view to promoting enhanced regional trade and promoting further regional integration, thereby promoting economic growth and development within the region (Maringwa, 2009).

Roberts (2000) found that liberalization of trade in South Africa did not yield the expected gains from incentives to export during 1992 - 1997 period. Instead, while manufacturing exports and imports increased, output growth faltered in most sub-sectors and there were major reductions in employment. Fedderke and Vaze (2001) investigated the impact of the new trade regime on the capacity of South Africa firms to penetrate world markets. The study found that, while there is evidence to suggest that trade liberalization emerged for some economic sectors, effective protection remained constant or increased in others. Thus, trade liberalization as measured by effective rate of protection, could be describes as partial or incomplete during the 1994 - 1998 period.

However, Jonsson and Subramanian (2001) tested the proposition that trade liberalization is beneficial to the dynamic efficiency of South Africa and used both the time-series and cross-sectional approach, covering different manufacturing sectors including the food industry. The results obtained indicate that trade liberalization has contributed significantly to augmenting South Africa's long-run growth potential because of its impact on Total Factor Productivity (TFP) growth. However, the results

show that the number of employees has declined in most industries. The firms purposefully reduced the workforce to remain competitive.

2.7 Trade liberalization and economic growth

Theoretically, the impact of trade liberalization on economic growth is ambiguous such as the issue of trade creation and trade diversion. In a conventional neoclassical growth model, trade does not affect the equilibrium or steady state rate of output growth because by assumption, growth is determined by an exogenously given technological progress. In two-sector model of this kind, trade policy affects the allocation of resources between sectors and, thus, the steady state level of savings and capital accumulation. This can have a one-off effect on the steady state level of output but not on the rate of growth (Jonsson & Subramanian, 2000).

Dollar and Kraay (2004) studied the impact of trade liberalization by classifying countries into globalized and non-globalized economies according to the performance of gross domestic product (GDP). Their study revealed that trade liberalization accelerates economic growth, with the former group having experienced higher growth rates as a result of trade liberalization.

Santos-Paulino and Thirlwall (2004) were more critical of the effect of trade liberalization on a country's economic growth. They conducted a study on 22 developing countries, and their results shows that the adoption of trade liberalization policies stimulate both export and import growth. Thus, trade liberalization is likely to have exerted a net positive effect on the economic growth.

However, in endogenous growth model the impact of trade liberalization on output growth can be positive or negative, depending on model-specific assumptions. Increased trade can have a number of generalized impacts. Trade for example enables a country to; firstly, employ a larger variety of intermediate goods and capital equipment which could enhance productivity of other resources; second, acquire technology developed worldwide; third, to increases the variety of products produced and consumed and lastly,

to improve efficiency with which resources are used. As emphasized by Rodriguez and Rodrik (2001), the impact of trade policy changes cannot be ambiguously signed. If the resource allocation effect of trade policy promotes sectors or activities that generate more long run growth, the impact is positive or negative.

Diao and Robinson (2003) show that the elimination of agricultural tariffs among SADC countries would benefit real agricultural GDP in the region, national income and agricultural output. Studies by Lewis (2001) and Lewis *et al.,* (2003) using computable general equilibrium (CGE) modeling examined the impact of a FTA on SADC economies. They found out that the gains that can be achieved through trade expansion are limited given SADC's small size relative to the global economy and the trade imbalances among its members.

It can be argued that nations engaged in trade liberalization to achieve a number of national objectives. However, the international trade of goods and services free from restrictions and barriers provides nations with a broad group of economic benefits. These benefits are categorized as one-time, or static benefits, which include gains for consumers and gains for producers, and dynamic benefits that accrue over time and can positively affect the long-term rate of growth of a country. While it is not always possible to measure these effects accurately, most economists believe that the net effect of international trade on the national economy as a whole is positive, that is, the total gains exceed the total costs (Cordell, 2006).

2.8 Empirical assessment of FTAs using different models

Researchers have employed a range of techniques to examine the effects of FTAs. There are large empirical literatures on estimation techniques using multi-sectoral computable general equilibrium (CGE) models to analyze the welfare impacts of FTAs. The CGE models are based on general equilibrium theory and are estimated using computer intensive numerical methods. The model has many important features that make them powerful tools for policy analysis. First, they are multi-sectoral and the behavior of economic agents is modeled through utility and profit maximizing assumptions. Second,

economy-wide constraints are generally enforced to deduce the impacts of one sector in the economy on other sectors given limited resources (Jayasinghe, 2003)

Although the CGE models have been influential in analyzing the welfare effects, some serious questions have been raised about the empirical validity of these models. The parameter selection criteria have been criticized to be unsound and the use of first-order Constant Elasticity of Substitution(CES) class functional forms imposes severe restrictions on the model's structure (McKitrick, 1998). Also, the CGE studies have been seen to be prospective rather than retrospective, that is, looking back at what happened. It is widely believed that *a priori* judgments regarding the net effects of RTA and can often be misleading (Krueger ,1999).

Descriptive approach has also been used to analyse the impacts of RTAs (Yeast, 1996; dell'Aquila *et al*., 2000). This approach implicitly assumes that the share of trade occurring with partner countries would not have changed in the absence of the agreement. The method depends on a static frame work and the results depend on the level of aggregation. Consequently, changes in terms of trade due to changes in the relative importance of members and outsiders, as well as declines in the volume of trade for a single commodity included in the broader class cannot be detected using descriptive approach (dell'Aquila *et al*., 2000). The method also lacks the ability to analyse trade creation and trade diversion effects of free trade agreements.

As an alternative, recent econometric studies have integrated the effects of FTA into the model specification and estimate models using pre-FTA and post-FTA data. The impact of FTAs on trade flows is captured through the use of dummy variables. This model is widely known as the gravity model approach, which explains bilateral trade flows between trading partners over time. In the next section, we will discuss the gravity model applicable for this study.

2.9 Gravity model and its applications

The gravity model has a fairly long history and is well known for its empirical success. The gravity model is used to empirically measure the extent to which trade policies are influencing bilateral trade patterns. Gravity model, which relate bilateral trade to the aggregate supply of the exporting country, the aggregate demand of the importing country, transport and transaction costs, and specific trade factors (for example, free trade agreements), are an extremely popular tool for applied trade analysis (Fidrmuc, 2009).

Based on the old and new theories of gravity model of international trade explained as follows, Tinbergen (1962) pioneered the use of gravity model in empirical specifications of bilateral trade flows in which the volume of trade between two countries is proportional to the product of an index of their economic size and the factor of proportionality depends on measures of 'trade resistance' between them. The gravity model has dominated empirical research in international trade; it has been used to estimate the impact on trade flows of international borders, preferential trading blocs, currency unions' membership in the WTO, as well as the size of home-market effects (McCallum, 1995; Wei, 1996; Anderson & van Wincoop, 2003 and Rose, 2004).

Anderson (1979) was the first article stating a micro foundation of the gravity model and it was based on the Armington assumption of specialization of each nation in the production of only one good. This hypothesis was initially supported by Bergstrand (1985), completing the theoretical foundation with a more detailed explanation of the supply side of economies and the addition of prices into the equation. Helpman (1987) also derived a foundation relying on the assumption of increasing returns to scale where products were differentiated by firms, not only by country, and firms were monopolistically competitive. However, some years later, Deardorff (1998) asserted that the gravity model could be derived from standard trade theories, conciliating both the old and the new theories.

The gravity model appears to be highly effective as proven by the works of Linnemann (1966) and Leamer and Stern (1970). However, several controversies have arisen regarding the model. The theoretical framework was put into doubt and afterwards justified by Bergstrand (1989) for the factorial model, Deardorff (1998) for the Hecksher–Ohlin model, Anderson (1979) for goods differentiated according to their origin and Helpman *et al.,* (2008) in the context of firm heterogeneity. New estimation problems concerning the validity of the log linearization process of the gravity model in the presence of heteroskedasticity and the loss of information due to the existence of zero trade flows have been recently explored. Silva and Tenreyro (2006) pointed out that, in the presence of heteroskedasticity, ordinary least square (OLS) estimation may not be consistent and nonlinear estimators should be used.

To overcome the problem of zero trade flows, Eichengreen and Irwin (1998), Sandberg and Martin (2001) and Sandberg *et al*., (2006) suggested adding a value of one to the dependent variable before taking the natural logarithm. Thus, the dependent variable becomes $X_{ijt}^* = X_{ijt} + 1$. In the cases where there is no observed bilateral trade, i.e., where $X_{ijt} = 0$, $X_{ijt}^* = 1$, and $\ln X_{ijt}^* = \ln(1) = 0$. Subsequently, in the cases where $X_{ijt}>0$ the dependent variable becomes $\ln X_{ijt}^* = \ln(X_{ijt}+1)$, which should not be significantly different from $\ln(X_{ijt})$.

A theoretical foundation was given for the presence of zero trade flows in import and export data; this was as a result of the insistence of the new trade theory on the heterogeneity of firms regarding their exporting behavior (Melitz, 2003). In line with this, Helpman *et al.,* (2008) developed a two-stage estimation procedure that takes into account extensive and intensive margins of trade. They showed that the incorrect treatment of zero flows may lead to biased estimates and developed a complete framework to provide a rationale for the existence of these flows.

A number of papers have tackled the question of 'zeros' in the trade matrix, for instance, Helpman *et al.,*(2008) uses a sophisticated two step procedure, and Westerlund and Wilhelmsson (2006) suggests using a Poisson fixed effects estimator. They both show that estimates can be severely biased by incorrect treatment of zero trade flows. The

recent empirical trade literature demonstrated that the results of gravity models may be relatively sensitive to the proper specification of gravity models (Mátyás, 1998; Egger & Pfaffermayr, 2003; Cheng & Wall, 2005; Baldwin & Taglioni, 2006).

According to Pöyhönen (1963a and 1963b) and Pulliainen (1963), the basic idea behind the gravity model of international trade is that bilateral trade volumes from one country to another can be explained by:

(a) Factors that capture the potential of a country to export goods and services;
(b) Factors that capture the propensity of a country to import goods and services; and
(c) Other forces that either attract or inhibit bilateral trade

Economic size or GDP of an exporting country is used as a proxy for its productive capacity and it's an indicator of the range of product varieties available for export since richer economies tend to have a more sophisticated productive base. An importer's GDP serves as an indicator of the absorptive capacity of imported goods. Naturally, both countries' incomes would have positive effects on bilateral trade levels (Tinbergen, 1962; Pöyhönen, 1963a and 1963b; Pulliainen, 1964; Linnemann, 1966 and Hewett, 1976).

It is postulated that countries with larger populations tend to have diversified economies and tend be more self-sufficient (Linnemann, 1966; Hewett, 1976 and Brada & Mendez, 1983). However, countries with large populations also tend to have a larger industrial base and are able to capture more economies of scale in production than would smaller economies. Hence, the sign of the impact of physical size or population on bilateral trade levels should be ambiguous. In a broader sense, as crude as the generalization might be, one can view the exporter's income and population as indicators of supply factors, or potential export supply, and the importer's income and population as indicators of demand factors, or potential import demand (Aitken, 1973).

Distance is included as a proxy for transaction costs and it is expected to have a negative impact on the volume of trade. It was further argued by Linnemann (1966) that

the geographic distance is also an indicator of 'psychic distance' between countries according to Beckerman's (1956) assertion. It is common to augment the gravity model with variables that either increase or reduce trade.

Studies by Beckerman (1956), Isard and Peck (1954) and Isard (1956), among others, documented a strong negative impact of distance on the volume of both domestic trade and international trade. They recognized that distance alone does not explain the volume of trade, nor does it fully account for transaction costs, and needs to be considered in a broader context with the consideration of such factors as culture and language barriers, which naturally also influence transaction costs.

Logically, it can be argued that participation in economic integration agreements alters trade patterns and sharing a boarder or a common language would reduce transaction costs, and countries sharing a common language often have cultural similarities. This translates into stronger trade ties since countries tend to interact more intensively with countries with which they have similarities, *ceteris paribus*. Conversely, countries with historical colonial ties usually have strong trade relationships established between the former colonies and would thus trade more than they would with other countries. By explicitly controlling for these qualitative factors, the direct impact on trade patterns can be assessed (George & Kirkpatrick, 2004).

An appealing aspect of using binary variables to capture the effects of regional trading agreements, linguistic ties, adjacency, and colonial history on bilateral trade is that it enables researchers to assess how trade flows under the presence of such influences differ from presumably 'normal', or 'baseline', trade patterns (Linnemann, 1966; Hewett, 1976 & Carrere, 2006).

However, agriculture sector is more difficult, as trading environment for agriculture is different from other sectors due to their sensitivity, complexity of tariff and other related issues. Aggregate trade creation and trade diversion are insufficient to infer the welfare effects of FTAs on agricultural trade. The implication of RTAs on trade in highly protected agriculture sector has not been rigorously explored in recent quantitative

studies. While econometric evaluations have an advantage over other tools as they can be appraised with standard statistical criteria, econometric studies will complement other analytical tools such as CGE model. However, in this study, gravity model will be applied to assess the impact of SADCFTA on South Africa beef (meat of bovine: SITC 0111), maize (044) and wheat trade (041).

2.10 Application of gravity model to South African trade

A couple of researchers have used gravity model to estimate bilateral trade potentials between South Africa and her trading partners.Sichei et al., (2005) applied an augmented gravity equation to South Africa's exports of motor vehicles, parts and accessories to 76 countries over the period 1994 to 2003. Their study employs a dynamic panel data model to estimate long-run and short-run coefficients. They argued that a number of variables, namely; importer income, population, exchange rate, distance, free trade agreements are important determinants of bilateral trade flows for motor vehicles, parts andaccessories. They solved the gravity model stochastically to determine South Africa's optimistic, pessimistic and average potential exports to the 76 countries. The estimates of the degree of variability of average potential exports are provided, which show that South Africa's trade with Germany, the United Kingdom and the United States have low variability.

Jordaan and Eita (2010) investigated the determinants of South Africa's exports of wood and articles of wood using a gravity model approach. It further examines whether there is unexploited trade potential between South Africa and its trading partners within this sector. Their results were in line with the theoretical predictions of the gravity model which indicated that there is unexploited trade potential among some South Africa's trading partners.

Maringwa (2009) use the traditional gravity modeling technique, trade intensity and product complementarity indices to analyse bilateral trade flows on sensitive products; textiles, apparels, cereals and vehicles between SADC countries that have signed bilateral trade agreements between themselves and also implemented the SADC TP

which led to the adoption of a SADC Free Trade Area in 2008. He argued that trade creation on wheat and sugar products dominate trade diversion even though the percentage increase in trade in these products is small. More so, there is no conclusive evidence that bilateral trade agreements have increased bilateral trade flows beyond the market access opportunities provided by the SADC TP except only for textile products from Malawi into South Africa.

2.11 Summary and conclusion

This chapter provided an overview of relevant literature and the modern perception of free trade agreements and South African agricultural trade. It offers a systematic account of discussions on regional trade agreements under GATT/WTO, welfare analysis of free trade agreements, what free trade agreements means for agricultural trade, the impact of free trade agreements, South African trade liberalization and the methodology involved in bilateral trade flows using gravity model.

Empirically, many different techniques have been employed from simple trade share indices to the large scale computable general equilibrium models. The general conclusion from these studies is that regional trade agreements create more trade than they diverts from low-cost producers and hence generate welfare gains from member countries with little negative effects on the rest of the world.

Agricultural trading environment is different from other sectors. Aggregate trade creation and trade diversion are not sufficient to infer the welfare effects of RTAs on agricultural commodity trade. There has been increasing use of CGE models to investigate the possible effects of FTA. The CGE models have been influential in analyzing the welfare effects, some serious questions have been raised about the empirical validity of these models. The parameter selection criteria have been criticized to be unsound and also CGE studies have been seen to be prospective rather than retrospective, that is, looking back at what happened. However, econometric approach has also been performed to estimate trade and the welfare effects of major FTAs in recent literature. Econometric evaluation has advantage over other tools as they can be

appraised with standard statistical criteria and will compliment other analytical tools such as CGE.

Rapidly growing literature on gravity model is aimed at measuring and understanding the trade effects of FTAs. Many of the studies that used gravity model uses aggregate data, only a few uses disaggregated data. The focus of this study therefore is to analyze the effect of SADCFTA on South African agricultural trade using meat of bovine(SITC 0111), maize (SITC 044) and wheat (SITC 041) with commodity specific data and gravity model.

CHAPTER 3

OVERVIEW OF SOUTH AFRICAN MEAT OF BOVINE, MAIZE AND WHEAT TRADE

3.1 Introduction

South Africa covers an area of about 1,220,088 square kilometers. Roughly 84 percent of the total area is used for agriculture and forestry, of which approximately 80 percent consists of natural veldt, which varies from semi-desert vegetation to the highly productive grasslands of the high rainfall areas (Bahta, 2004).

According to the department of agriculture, forestry and fisheries (DAFF, 2011), the largest area of farmland planted with field crops is maize, followed by wheat and, to a lesser extent, sugar cane and sunflower seed. The grain industry is one of the largest in South Africa and is a very strategic one. The Economic Review of South African Agriculture stated that the gross income from field crops decreased by 14.1 percent to R27 617 million for the year ended 31 December 2009.

Nearly 80 percent of agricultural land in South Africa is mainly suitable for extensive livestock farming. Livestock are also kept in other areas, usually in combination with other farming enterprises. Stockbreeders concentrate mainly on developing breeds that are well adapted to diverse weather and environmental conditions. The livestock sector contributes up to 49 percent of agricultural output. South Africa generally produces 85 percent of its meat requirements, while the remaining 15 percent is imported from Namibia, Botswana, Swaziland, Australia, New Zealand and Europe. The livestock industry is the largest national agricultural sector (DAFF, 2011).

3.2 South African production and trade in selected agricultural products; meat of bovine, maize and wheat.

The beef industry became totally deregulated in 1997. Prior to the commencement of deregulation in the 1990's, the industry was controlled by various policies, such as the distinction between controlled and uncontrolled areas, restrictions on the creation of abattoirs, the settlements and other activities such as mining, crops, forestry and conservation. Cattle producers vary from highly sophisticated commercial producers to communal subsistence producers (DAFF, 2011).

Beef is produced throughout South Africa; the amount produced depends on the infrastructure such as feedlots and abattoirs. South Africa has highly developed transport infrastructure that allows movement of cattle and calves from one area to another, even from other countries such as Namibia (DAFF, 2011).

Figure 3.1 shows the comparison of beef production in South Africa provinces, Mpumalanga has the greatest share of beef production in South Africa accounting for 22 percent of the beef produced in 2010 followed by Free State, Gauteng and North West accounting for 19 percent, 13 percent and 12 percent respectively. Kwazulu-Natal produced 11 percent while Eastern Cape, Northern Cape and Limpopo produced 6 percent each and Western Cape produced 5 percent.

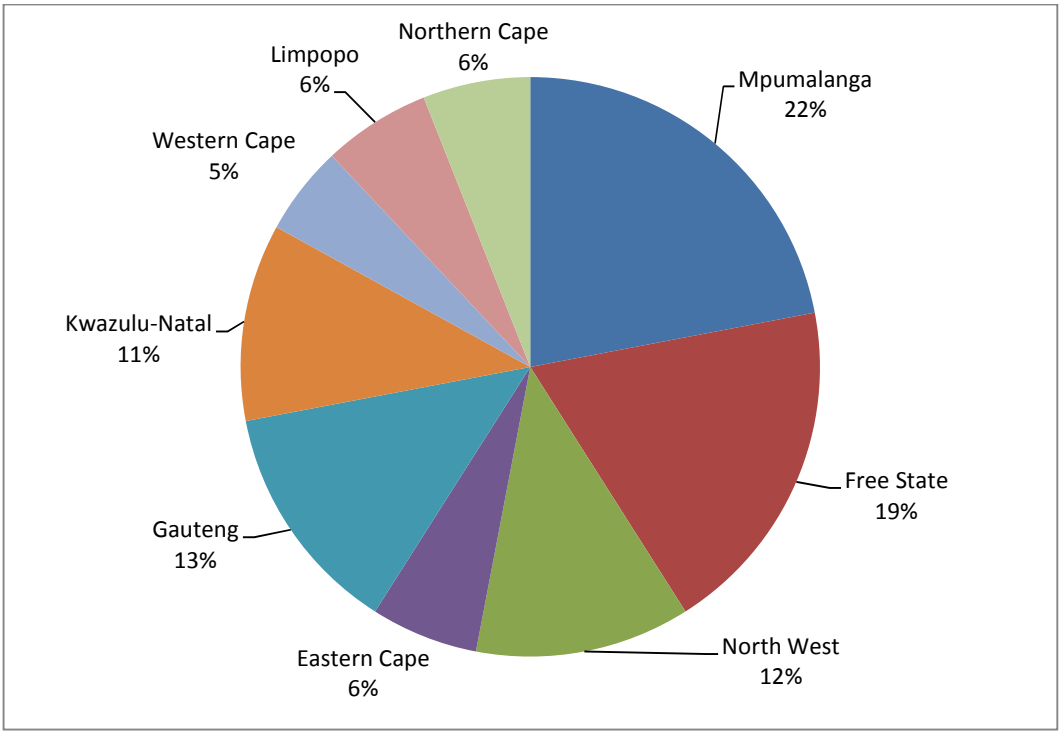


Figure 3.1**: Beef production per province**
Source: Red Meat Levy, 2010

3.2.1.1 Beef Export by South Africa

Beef exports increased significantly in 2001 and 2002 in both quantity and value. In 2003, the quantity of beef exported declined but remained higher than the 1999 level before declining to the lowest level in 2005 and fluctuated between 2 million and 4 million kilograms from 2006 to 2009 (DAFF, 2011).

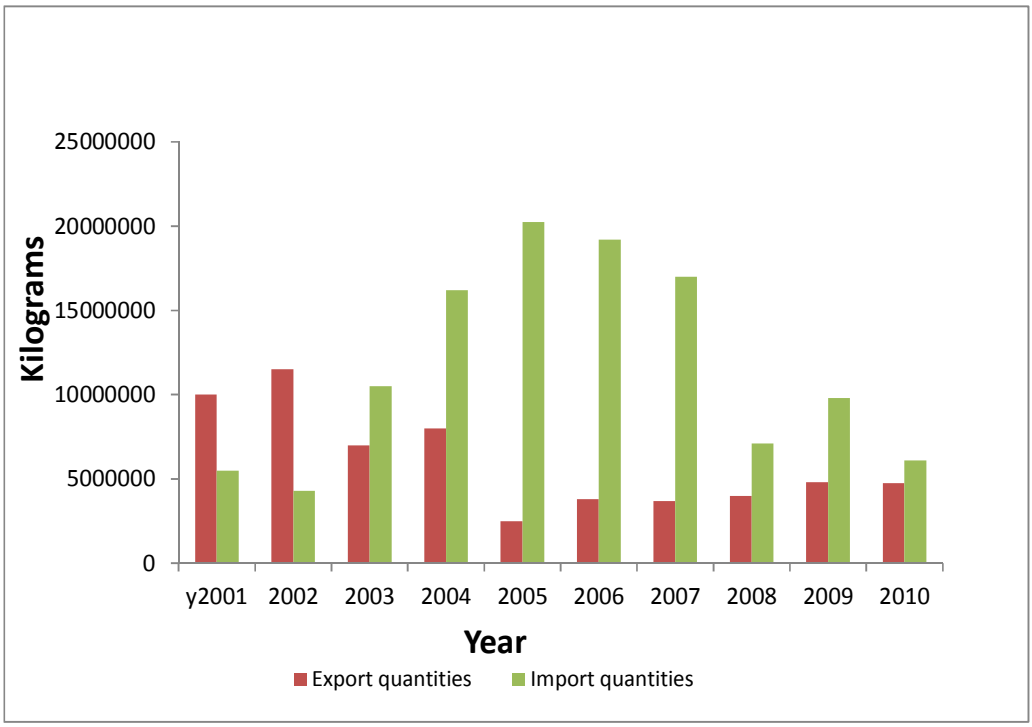


Figure 3.2: **South Africa beef exports and imports quantities**

Source: Author's diagram based on data from Quantec, 2011.

South Africa's exports of beef were higher than imports in 2001 and 2002. This was due to weaker Rand that stimulated exports of beef from South Africa and neighboring countries to the European Union and Asia. There was a 59 percent decrease in the year 2010 compared to 2001.

South Africa exported 3,986,948 kilograms of beef in 2010 yielding an export value of R156 million. The quantity and the value for exports of beef are shown in Figure 3.3. This figure indicates that the beef exports quantity increased significantly in 2002, but exports start decreasing in a fluctuating trend in 2003, again it start moving in an increasing trend from 2006 to 2009 (DAFF, 2011).

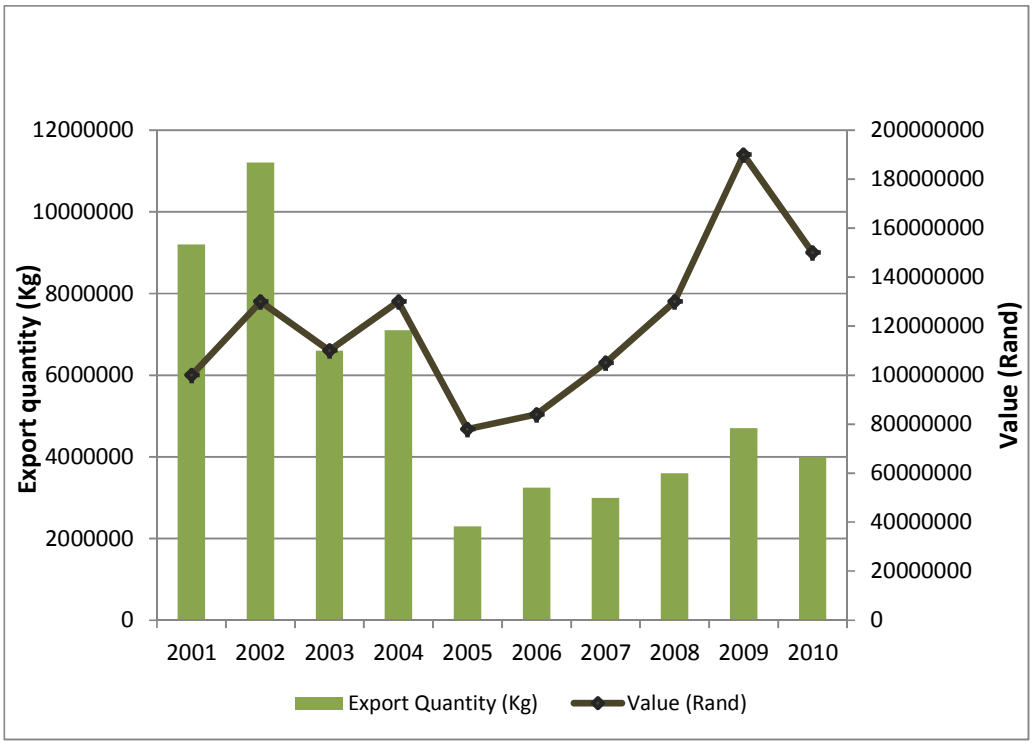


Figure 3.3**: South Africa beef export**

Source: Authors diagram based on data from Quantec, 2011.

South Africa exports beef mainly to SADC and European Union (EU) throughout this period. EU has a lion share of the exports of beef from the year 2001 to 2004. The main destinations are Germany and The Netherlands.

In the SADC region, figure 3.4 shows that in the last decade Mozambique was the main market for South African beef export except in 2002 and 2008. During those periods, i.e. 2002 and 2008, Angola took the lead, which made it the second country to obtain the highest beef exports from South Africa. In 2010, Mozambique controlled 36 percent of South Africa beef export, followed by Angola with 18 percent, then Democratic Republic of Congo followed with 12 percent. The three SADC countries are the net importers because together they constitute 66 percent, the other six countries share 27 percent and the remaining 7 percent is allocated to the rest of the SADC countries (DAFF, 2011).

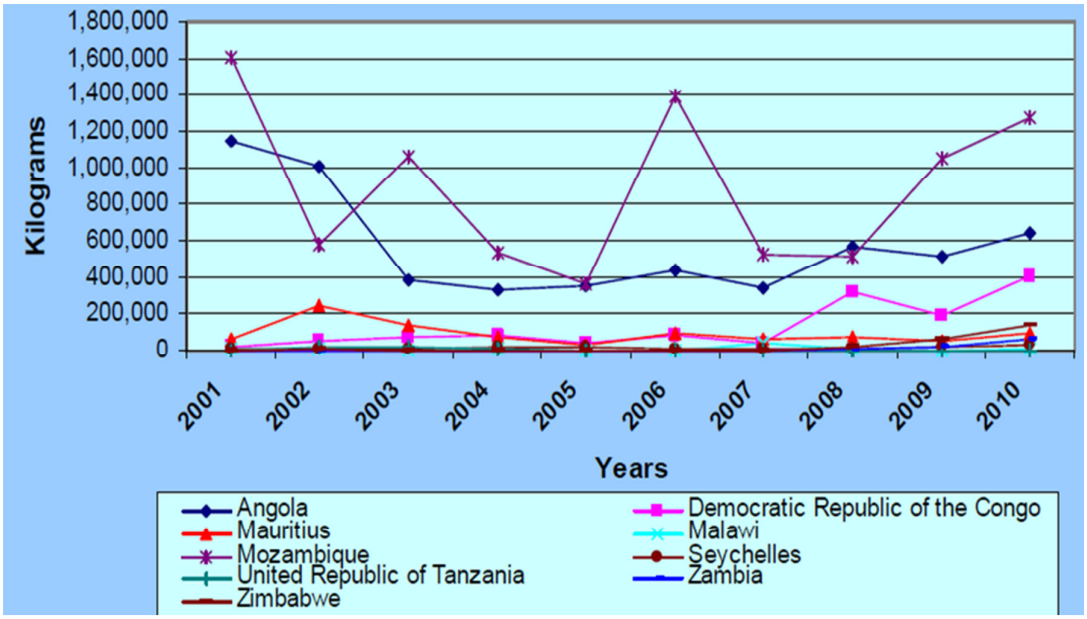


Figure 3.4: South Africa beef export quantities to SADC countries

Source: Quantec, 2011

Africa also has an upper hand of the highest export of beef in quantity from 2005 to 2010 .South African export beef to West Africa, Nigeria is the leading recipient followed by Ghana throughout the decade. In 2003 both Nigeria and Ghana reached a peak of 154 000 Kg and 44 000 Kg of South African beef exports respectively (DAFF, 2011).

3.2.1.2 South African beef (meat of bovine) imports

South Africa imported approximately 6 million kilograms of beef in 2010 at an estimated value of R87 million. The import quantity showed a significant decline to 5.5 million kilogram in 2010 compared to 9 million kilogram in 2009 which is about 39 percent decrease. These declines might have been caused by global economic meltdown that occurred in 2008. Figure 3.5 shows the imports of beef from 2001 to 2010.

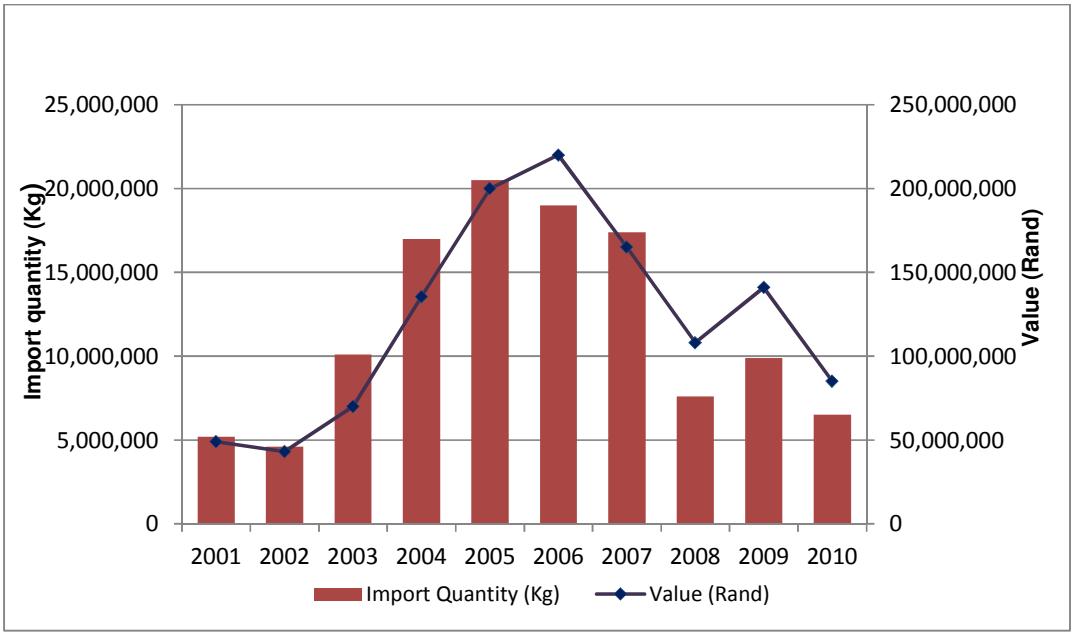


Figure 3.5:**Beef imports**
Source: Authors diagram based on data from Quantec, 2011.

The imports value and quantity of beef followed the same trend throughout the last decade. Both reached the lowest level in 2001 and 2002, before increasing steadily from 2003 to 2007. In general beef imports increased by 10 percent in 2010 compared to 2001. The main supplier of beef to South Africa was America from 2002 to 2010. The beef quantity from America has been increasing from the year 2002. The highest quantities of beef imports from South America originated from Brazil, Uruguay, Argentina and Paraguay and have been competing for dominance throughout the period. However, in 2011, India is the main supplier of beef to South Africa, followed by Australia (DAFF, 2011)

3.2.2 Maize production in South Africa

Maize is the most important grain crop in South Africa and Southern African region, being both the major feed grain and the staple food for the majority of the South African population. Maize is the second largest crop produced in South Africa after sugar cane. The maize industry is important to the economy both as an employer and earner of foreign currency because of its multiplier effects. As a multiplier effect, maize also

serve as a raw material for manufactured products such as paper, paint, textiles, medicine and food (DAFF, 2011).

Maize is produced throughout South Africa with Free State, Mpumalanga and North West provinces being the largest producers, accounting for approximately 84 percent of total production, while the remaining 16 percent is produced by the remaining six provinces. The industry is divided into commercial and developing agriculture. Commercial agriculture produces about 98 percent of maize in South Africa, while the remaining 2 percent is produced by the developing agriculture. Over the past decade, area planted for maize has significantly fluctuated, with a peak in 2007/08 season, while 2005/06 season had the lowest area planted during the decade (DAFF, 2011).

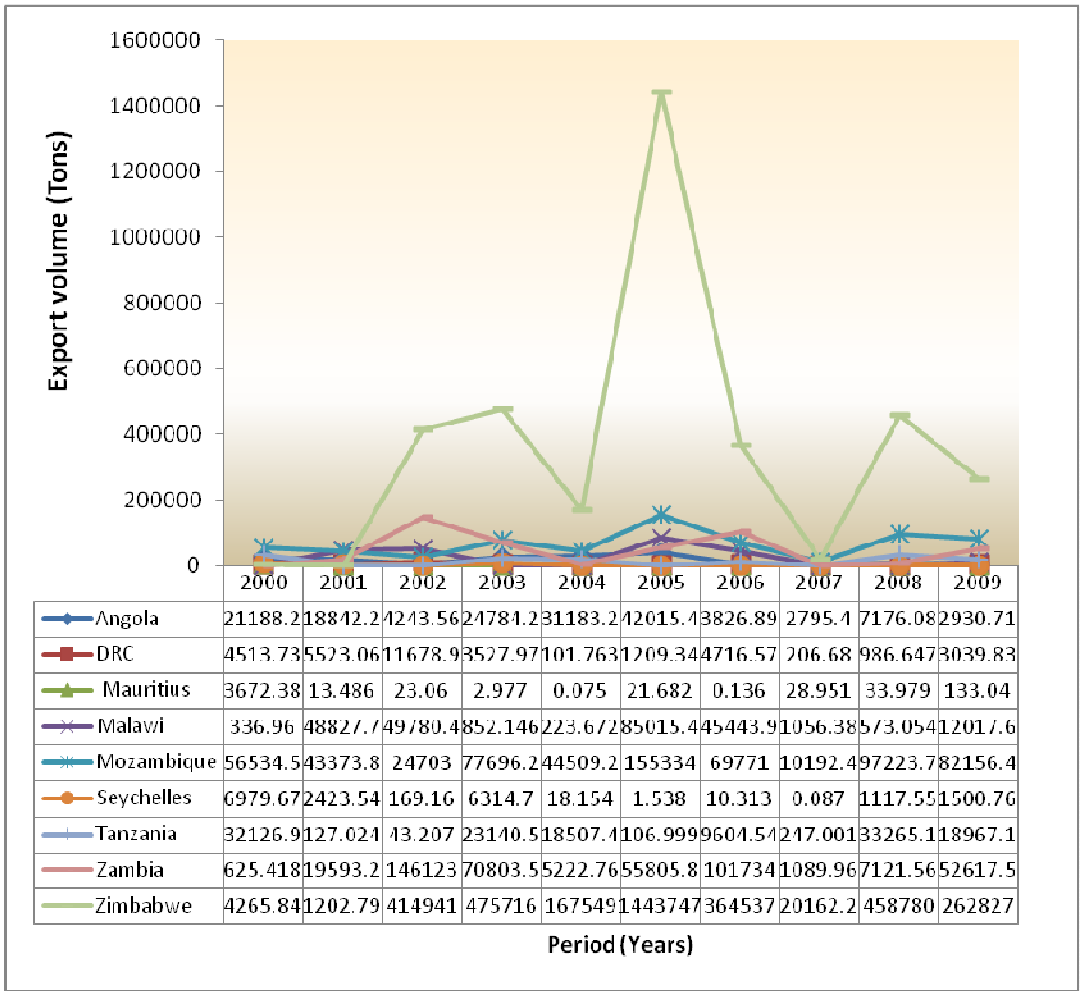
Figure 3.6**: Total Production of maize and Area planted**
Source: Authors diagram based on data from Abstract of Agricultural Statistics, 2011.

Figure 3.6 shows that the area planted to maize experienced an increase from the 2006/07 production year to the 2007/08 production year accompanied by a corresponding increase in the total production. This increase is attributable to increases in the average producer prices during the two production periods. This was followed by

reduced plantings in 2008/09 season leading to lower production volumes (DAFF, 2011).

3.2.2.1 Maize export by South Africa

The maize industry exports mostly to SADC countries mainly Botswana, Lesotho, Namibia, Swaziland, Zimbabwe, Mozambique, Zambia, and Mauritius. Figure 3.7 indicates that Zimbabwe is the main destination of South Africa export market for maize as a result of food shortages in Zimbabwe. This is caused by the political instability in Zimbabwe. As easily observed from the figure, maize exports to Zimbabwe fluctuated over the ten year's period with a peak in 2005 and off peak in 2007. The value of maize exports to Zimbabwe declined during the year 2009 while exports to Zambia increased slightly during the same period. Exports of maize to other countries in the SADC region such as Angola, Malawi, Tanzania, Mozambique, Zambia, DRC, Mauritius and Seychelles have shown a relatively stable trend compared to those destined to Zimbabwe (DAFF, 2011).



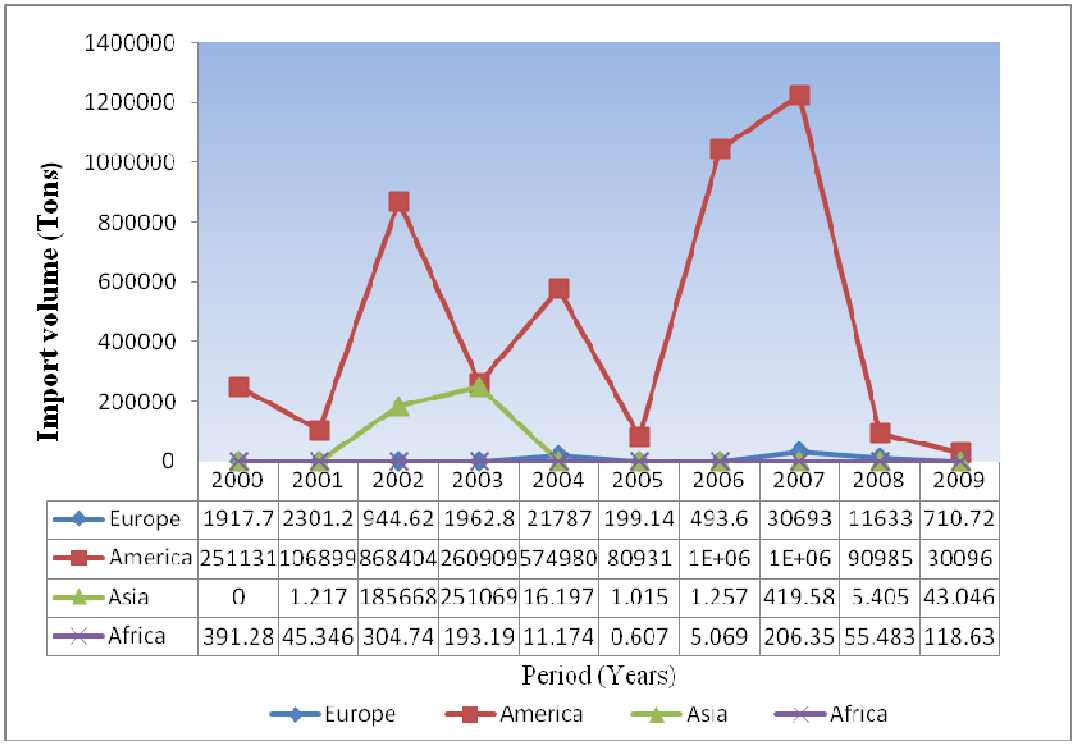
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Angola	21188.2	18842.2	4243.56	24784.2	31183.2	42015.4	3826.89	2795.4	7176.08	2930.71
DRC	4513.73	5523.06	11678.9	3527.97	101.763	1209.34	4716.57	206.68	986.647	3039.83
Mauritius	3672.38	13.486	23.06	2.977	0.075	21.682	0.136	28.951	33.979	133.04
Malawi	336.96	4882[illegible]	49780.4	852.146	223.672	85015.4	45443.9	1056.38	573.054	12017.6
Mozambique	56534.5	43373.8	24703	77696.2	44509.2	155334	69771	10192.4	97223.7	82156.4
Seychelles	6979.67	2423.54	169.16	6314.7	18.154	1.538	10.313	0.087	1117.55	1500.76
Tanzania	32126.9	127.024	43.207	23140.5	18507.4	106.999	9604.54	247.001	33265.1	18967.1
Zambia	625.418	19593.2	146123	70803.5	5222.76	55805.8	101734	1089.96	7121.56	52617.5
Zimbabwe	4265.84	1202.79	414941	475716	167549	1443747	364537	20162.2	458780	262827

Figure 3.7**: Volume of maize exports to SADC countries.**
Source: Quantec, 2011.

3.2.2.2 Maize imports to South Africa

As indicated in figure 3.8. South Africa imports maize mainly from the America, Asia, Europe and Africa. The major maize import markets are from the Americas followed by Asia and Africa. During the last decade, the value of maize imports from the Americas fluctuated tremendously with peaks attained during 2002 and 2007 while there is off peaks in imports in 2008 and 2009. Imports of maize from the Americas and other regions declined substantially between the years 2008 and 2009, because local production was very high. There were also marginal increases in the volume of maize imports from Asia between the period 2001 and 2004. The year 2009 was characterized

by lower volumes of maize imports from all the regions. Between 2000 and 2009 maize imports were mainly from Argentina with intermittent imports recorded from Brazil and Chile (DAFF, 2011).



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Europe	1917.7	2301.2	944.62	1962.8	21787	199.14	493.6	30693	11633	710.72
America	251131	106899	868404	260909	574980	80931	1E+06	1E+06	90985	30096
Asia	0	1.217	185668	251069	16.197	1.015	1.257	419.58	5.405	43.046
Africa	391.28	45.346	304.74	193.19	11.174	0.607	5.069	206.35	55.483	118.63

Figure 3.8**: Volume of maize imports from various regions.**

Source: DAFF, 2011.

Though, imports of maize from North America Free Trade Area (NAFTA) have shown significant declines from 2003 until 2009; while maize imports from South America have increased phenomenally, particularly between 2006 and 2007, followed by a decline in 2008 and 2009 (DAFF, 2011).

3.2.3 Wheat production in South Africa

According to DAFF (2011), wheat is produced throughout South Africa with the Western Cape, Northern Cape and Free State provinces being the largest producers accounting for 81 percent of total wheat production during the 2010 season. Smaller quantities of wheat are also produced in other provinces such as Kwazulu-Natal, Eastern

Cape, Gauteng and Mpumalanga. These provinces contributed 6 percent (combined) of the country's total wheat production.

According to Food and Agricultural Organization (FAO, 2011), South Africa is the largest producer of wheat in the SADC region and the fourth largest producer from the African continent. Globally, South Africa is ranked 37 in terms of wheat production, with China being the world's leader in production. Wheat area planted in South Africa have been relatively stable at an average of about 764 000 hectares per annum from 2001 to 2010 as shown in figure 3.9.

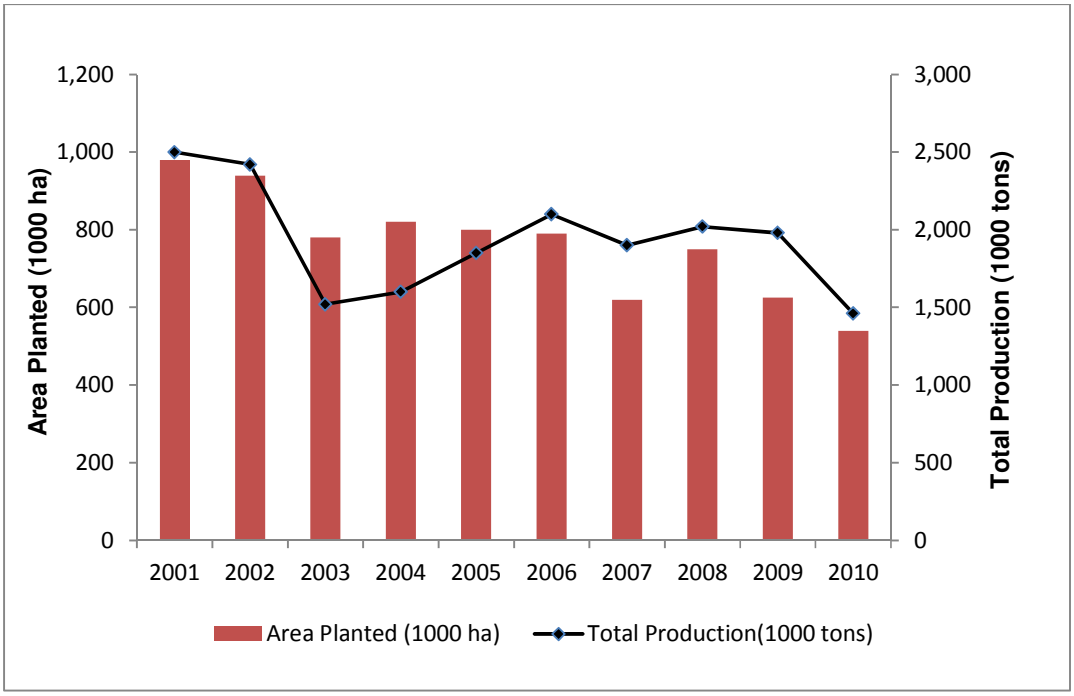


Figure 3.9**: Total wheat production and area planted.**
Source: Author's diagram based on data from DAFF, 2011.

3.2.3.1 Wheat exports by South Africa

Figure 3.10 indicates that South Africa was relatively competitive in exporting wheat between the years 2001 and 2007. During this period South Africa exported wheat and wheat products for less as a result of lower producer prices both domestically and in the international markets. In 2001, wheat exports were relatively higher and it declined

dramatically between the years 2002 and 2006 mainly as a result of declining levels of local production and increasing local consumption of wheat products. South Africa's wheat flour exports mainly to SADC countries such Botswana, Namibia, Lesotho and Swaziland as the Democratic Republic of Congo, Zambia, Zimbabwe and Mozambique. The greatest share of South Africa's wheat exports were destined Zimbabwe and Mozambique (DAFF, 2011).

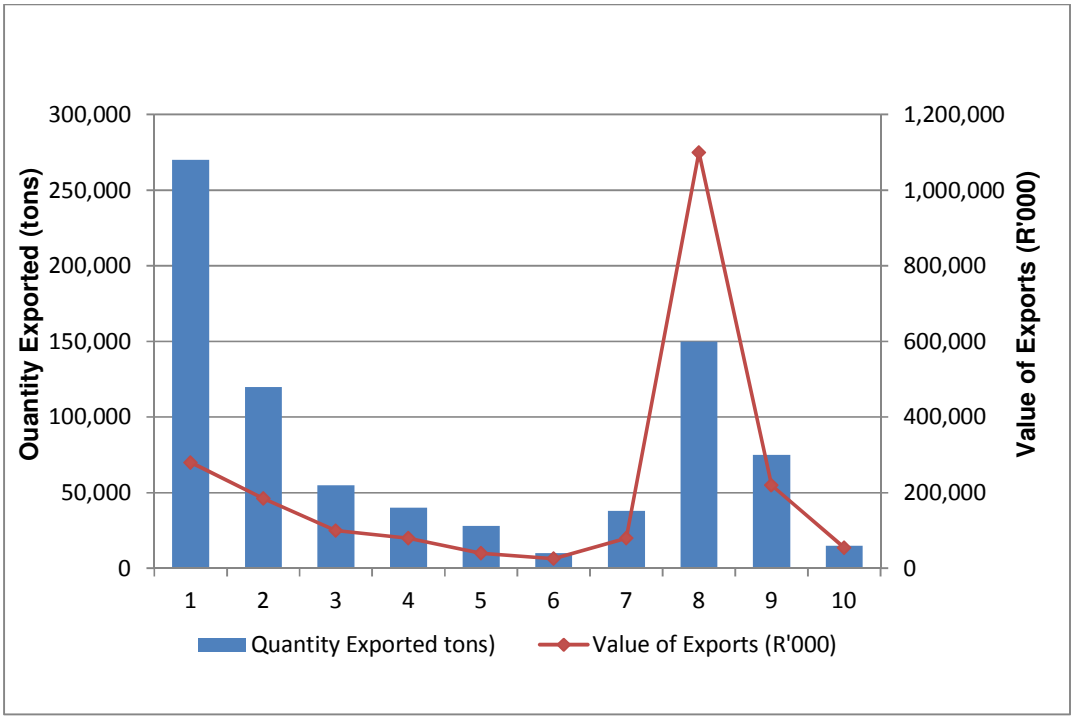


Figure 3.10**: Wheat export**
Source: Author's diagram based on data from Quantec, 2011.

Wheat exports from South Africa to the rest of the world fluctuated considerably within the last decade. Exports of wheat are mainly from the Gauteng, Kwazulu-Natal and Western Cape Provinces; with the Gauteng Province having the greatest share in the value of wheat exports between 2001 and 2010. Gauteng accounted about 82 percent of the country's total value of wheat exports (DAFF, 2011).

3.2.3.2 Wheat import by South Africa

According to DAFF (2011), South Africa imports wheat to supplement domestic production. Therefore, South Africa is a net importer of wheat with a self-sufficiency index of around 80 percent to 85 percent. South Africa imports wheat from Argentina, Australia, France, UK and the USA.

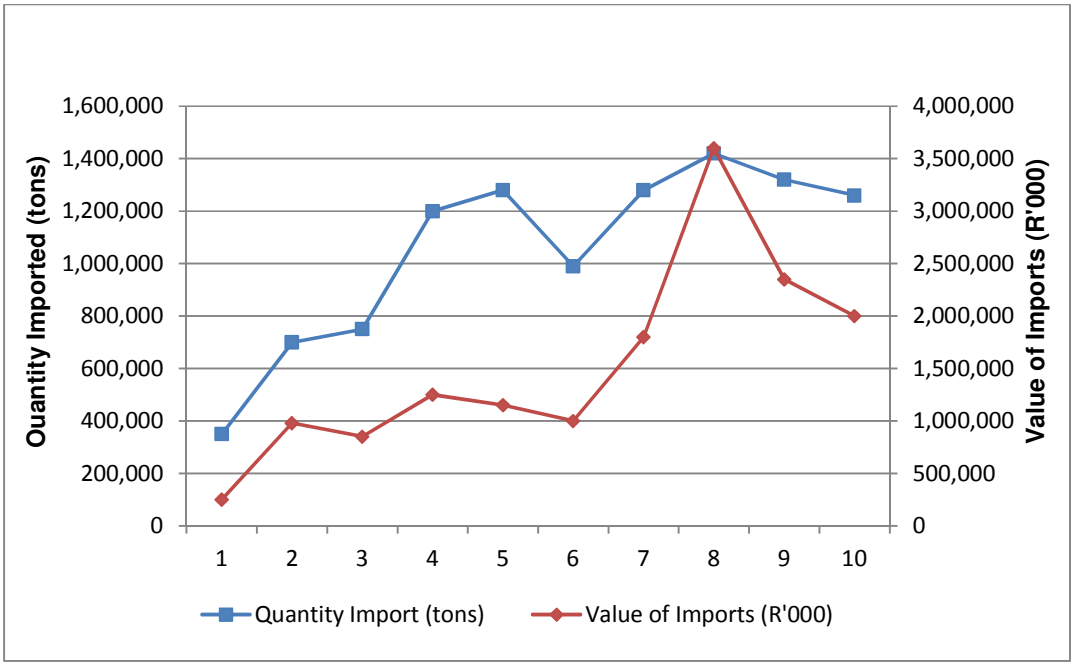


Figure 3.11**: Import of wheat by South Africa**
Source: Author's diagram based on data from DAFF, 2011.

Figure 3.11 indicates that wheat imports fluctuated over the past decades. Before 2003, the quantities of wheat imported were lower than 0.8 million tons mainly due to the larger production volumes that were experienced locally during 2001 and 2002 seasons. On average, South Africa imported about 1.04 million tons per annum from 2001 to 2010. The major source of wheat import is Americas which accounted for about 61 percent over the past decade followed by Europe and Oceania countries with 29 percent and 8 percent respectively (DAFF, 2011).

South Africa imports wheat mainly from South America and NAFTA (North American Free Trade Area). The volume of wheat imports from NAFTA experienced a continual

increase from the year 2003 until a peak was reached in 2005, followed by a decline until 2009 due to increased local production (DAFF, 2011). Between 2006 and 2010 South Africa has experienced a massive 14 percent increase in the value of wheat imports from the rest of the world.

3.3 Conclusion

This chapter provided an overview of the production and trade in the beef (meat of bovine), maize and wheat sub sectors of South African agriculture. Mozambique has the lion share of 36 percent of South African beef export in Southern Africa Development Community Free Trade Area (SADC FTA) followed by Angola and Democratic Republic of Congo (DRC) with 18 percent and 12 percent export quota respectively. Beef import over the past decade was mainly from Brazil, Uruguay, Argentina and Paraguay, but in 2011, India was the major supplier of beef to South Africa.

Maize is the most important grain crop in South Africa. It is the second largest crop produced after sugar cane. The industry is important to the economy both as an employer and earner of foreign currency because of its multiplier effects. Free State, Mpumalanga and North West provinces accounts for 84 percent of total maize production in South Africa. About 98 percent of maize was produced by commercial agriculture, while the remaining 2 percent comes from subsistence agriculture. Zimbabwe is the major export destination for South Africa maize export from SADC region in the past decade. The country also imports maize mainly from the Americas, Asia, Europe and Africa.

South Africa is the largest producer of wheat in the SADC region and the fourth largest producer from the African continent. Wheat area planted in South Africa have been relatively stable at an average of about 764 000 hectares per annum. Wheat is produced throughout South Africa with the Western Cape, Northern Cape and Free State provinces being the largest producers accounting for 81 percent of total wheat production. The main destination of wheat exports are SADC countries with Zimbabwe and Mozambique having the greatest share of the export. However, South Africa still

imports wheat to meet local consumption with a self-sufficiency index of around 80 percent to 85 percent. Import is mainly from Argentina, Australia, France, UK and the USA.

CHAPTER 4

METHODOLOGY AND DATA USED

4.1 Introduction

The purpose of this chapter is to explain an empirical gravity model, which will be used to evaluate the trade impacts of SADCFTA on South African agricultural trade. The gravity model continues to be an important model in international economics. It's continued popularity is not only due to its consistent results, but also because of its relatively compact specification, which makes it appealing for analyzing regional and international agreements designed to promote trade (Baier & Bergstrand, 2007; Grant & Lambert, 2008; Vollrath *et al*., 2009). The next section provides the empirical specification of the general gravity model, followed by the description of data used; modeling technique to estimate the gravity equation and section five gives the summary of the chapter.

4.2 Gravity model specification

The gravity model of bilateral trade states that the volume of trade between two countries is proportional to their gross domestic income and inversely related to trade barriers between them. The main element of focus for gravity models has been the flow of an identified variable and the model specifies that a flow from origin *i* to destination *j* is determined by supply conditions at the origin, by demand conditions at the destination and by stimulating or restraining forces relating to the specific flow between *i* and *j* (Biker, 2009). Empirical research has generated a number of alternative specifications for the gravity model of international trade. In the context of international trade, the basic gravity model is writing as:

$$X_{ijt} = \beta_0 GDP_{it}^{\beta_1} GDP_{jt}^{\beta_2} POP_{it}^{\beta_3} POP_{jt}^{\beta_4} DIST_{ij}^{\beta_5} U_{ijt} \quad (1)$$

Where:

X_{ijt} is the total bilateral trade flows (export and imports) between country i and country j in year t in agricultural products

GDP_{it} is the income of country i in year t

GDP_{jt} is the income of country j in year t

POP_{it} is the population of country i in year t

POP_{jt} is the population of country j in year t

$DIST_{ij}$ is the distance from the economic center of country i to that of j

U_{ijt} is the log- normally distributed error term with E ($\ln \upsilon_{ij}$) = 0 and

β_0 is the intercept (constant).

4.3 Data description and sources

This study concentrates on South African data for agricultural exports and imports to/from SADC member states and EU-15 countries for meat of bovine, maize and wheat commodities from 2000 to 2011. The EU-15 countries considered as the main trade partners of these specific commodities are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherland, Portugal, Spain, Sweden and United Kingdom. This period was chosen to track the evolution of the trade pattern of SADCFTA. As its signatories implemented SADCFTA in 2008, a comparison between pre-SADCFTA and post-SADCFTA econometric estimates will generate useful information about trade effects of SADCFTA.

However, it is a formidable challenge for researchers to conduct a before and after comparison of the effects of the SADC FTA due to the paucity of reliable data for the Pre-SADC FTA period. Hence, this study mainly focus on the magnitude and changes in the estimated coefficients over the selected period. Table 4.1 presents the list of the variables used in this study and data sources.

Table 4.1: Variables and Data Sources

Variables	**Source**
Trade flows (exports plus imports)	UN COMTRADE
GDP	World Bank development indicators (WDI)
Distance	Centre d'Etudes Prospectives et d'Informations Internationales, CEPII
Common Language	CEPII
Colony	CEPII
Borders	CEPII
FTAs	World Trade Organization database.
SADC	World Trade Organization database.

Note: All the data are based on 2012 figures.

Source: Author's observation.

As shown in Table 4.1, bilateral trade flow data was obtained from the United Nations Commodity Trade Statistics database (UNComtrade, 2012); the study applies real trade data and it had already being deflated using Consumer Price Index (CPI). The dataset is supplemented by data from the Department of Agriculture, Forestry and Fisheries database (DAFF). DAFF provides yearly statistical data on imports and exports in quantity and value by commodities and partner countries. Data on gross domestic product (GDP) (note: GDP was deflated by the Consumer Price Index) and population were sourced from the World Bank Development Indicators (WDI) database, while the

data on common language, border adjacency, colonial ties and distance were taken from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII, 2012). CEPII uses the great circle formula to calculate the geographic distance between countries, referenced by latitudes and longitudes of the largest urban agglomerations in terms of population. The great circle is the shortest distance between any two points on the surface of a sphere measured along a path on the surface of the sphere (as opposed to going through the sphere's interior). The great circle can be calculated as follows:

$$a = \sin^2(\Delta\varphi/2) + \cos(\varphi_1).\cos(\varphi_2).\sin^2(\Delta\lambda/2)$$
$$c = 2.a \tan2(\sqrt{a}, \sqrt{(1-a)})$$
$$d = R.c$$

Where a is area, φ is latitude, λ is longitude, d is distance, R is earth's radius (mean radius = 6,371km).

For this study, agricultural commodities used are classified under two different categories. Namely: beef (meat of bovine) and grains (maize and wheat). Table 4.2 gives a complete description of the three commodities used for this study with respect to the Standard International Trade Classification (SITC) Codes. In each category, the study uses annual total bilateral trade flows (exports and imports) for 14 countries in SADC and EU-15.

Table 4.2: Agricultural commodities and SITC codes

Commodity	SITC codes and description
Beef	0111: Meat of bovine animals, fresh, chilled, or frozen
Maize	044: Maize
Wheat	041: Wheat

Source: COMTRADE statistics, 2012

From Table 4.3 the combined income of the SADC market is US$651.65 billion and comprises a total population of 279.33 million according to 2012 World Bank development indicators. South Africa is the biggest economy with a Gross Domestic

Product (GDP) of US$408.24 billion, representing 64 percent of the total SADC market. South Africa has approximately 51 million people going by the 2011 census, second to Democratic Republic of Congo with the largest population of 67.8 million in the SADC region. The region includes several dynamic economies, such as Angola being the fastest growing economy, with an estimated growth rate of 21 percent. Other countries in the region such as Malawi, Mozambique and Tanzania show GDP growth of 7 percent and above.

Table 4.3: SADC member states, their population and GDP

S/N	**Country**	**Population**	**GDP (US$ million)**
1	Angola	19,618,432	100,099.0
2	Botswana	2,030,738	17,627.44
3	Democratic Republic of Congo	67,757,577	15,642.23
4	Lesotho	2,193,843	2,426.20
5	Madagascar	20,714,000	8,720.54
6	Malawi	15,380,888	5,700.38
7	Mauritius	1,286,051	11,313.45
8	Mozambique	23,929,708	12,797.75
9	Namibia	2,324,004	12,300.69
10	South Africa	50,586,757	408,236.75
11	Swaziland	1,067,773	3,977.75
12	Tanzania	46,218,486	23,705.30
13	Zambia	13,474,959	19,206.01
14	Zimbabwe	12,754,378	9,900.0
	TOTAL	**279,337,594**	**651,653**

Note: Madagascar is currently suspended from SADC.

Source: World Bank database, 2012.

4.4 Modeling framework to estimate the gravity equation

Based on equation (1), a gravity model using natural logarithms is specified as:

$$InX_{ijt} = \beta_0 + \beta_1 InGDP_{it} + \beta_2 InGDP_{jt} + \beta_3 InPOP_{it} + \beta_4 InPOP_{jt} + \beta_5 InDIST_{ij} + \beta_6 InZ_{ij} + U_{ijt} \quad (2)$$

In equation (2) above, β_0, β_1, β_2, β_3, β_4, $\beta_5$and β_6 are coefficients to be estimated, while U_{ijt} is the error term which captures other shocks and chance events which might influence bilateral trade between two trading partners. In the above equation, Z_{ij} represents the dummy variables used to capture the impact of FTA. Thus, equation (2) represents the basic gravity trade model where income is assumed to positively affect bilateral trade and distance will be expected to have a negative effect on trade flows. Though researchers agree to the empirical model specification represented in equation (2), i.e., trade is the dependent variable while GDP and distance are the core explanatory variables, contention still exists as to which other variables are to be included in the extended gravity trade model (Maringwa, 2009).

Among the multitudes of possible explanatory variables, a free trade agreement (FTA) variable, in the form of a dummy has been one of such potential variables included in augmented gravity model. According to Jayasinghe and Sarker (2007), the FTA dummies enable us to isolate two distinct effects, trade creation and trade diversion, which FTAs may exert on trade flows. Thus, a FTA variable has, among other things, been included in the equation to estimate the possible amount of trade creation and trade diversion emanating from the SADCFTA: (i) SADC, a regional bloc dummy and (ii) SADCO, an openness dummy. This research will follow Frankel and Wei (1995) and Jayasinghe and Sarker (2007) and Maringwa (2009) gravity model specifications, and estimate the following gravity model:

$$X_{ijt} = \beta_0 + \beta_1 InGDP_{it} + \beta_2 InGDP_{jt} + \beta_3 InPOP_{it} + \beta_4 InPOP_{jt} + \beta_5 InDIST_{ij} + \beta_6 Coml_{ij} + \beta_7 Coly_{ij} + \beta_8 Border_{ij} + \beta_9 SADC_{ij} + \beta_{10} SADC0_{ij} + U_{ijt} \quad (3)$$

Where $SADC_{ij}$ represents the existence of a regional trade agreement between country *i* and country *j* in equation (3). The SADCO*ij* dummy, on the other hand, captures the

degree of openness of SADC members' imports from the rest of the world. Equation (3) will be estimated independently for the three important agricultural commodities, namely; meat of bovine, maize and wheat.

4.4.1 Handling the problem of zero values

There has been the issue of zero observation common with trade data. The reported zero observations immediately pose an empirical problem, as the dependent variable is the natural logarithm of bilateral trade (exports plus imports). Log transformation is only valid for $X_{ijt} > 0$. Therefore, the use of logarithmic transformation to estimate gravity model creates a problem when trade is zero, because the natural logarithm of zero cannot be taken, it is simple undefined. Therefore, dropping the zero observation had been suggested, but this procedure would result in biased parameter estimates as there may be valid reasons why certain bilateral trade flows are zero (Brada & Mendez, 1985; Bikker, 1987 and Frankel *et al*., 1997).

To overcome this problem, this study adopt Eichengreen and Irwin (1998), Head and Ries (1998), Sandberg and Martin (2001), and Sandberg *et al*., (2006), in which a value of one is added to the dependent variable before taking the natural logarithm. Thus, the dependent variable becomes $X_{ijt}^* = X_{ijt} + 1$. In the cases where there is no observed bilateral trade, i.e., where $X_{ijt} = 0$, $X_{ijt}^* = 1$, and $\ln X_{ijt}^* = \ln(1) = 0$. Subsequently, in the cases where $X_{ijt} > 0$ the dependent variable becomes $\ln X_{ijt}^* = \ln(X_{ijt}+1)$, which should not be significantly different from $\ln(X_{ijt})$.

4.4.2 Heteroscedasticity problem

Another problem frequently encountered with trade data is the problem of heteroskedasticity. This is indeed a severe problem, both in the traditional gravity equation introduced by Tinbergen (1962) and in a gravity equation that takes into account multilateral resistance terms or fixed effects as suggested by Anderson and Wincoop (2003). Interpreting the parameters of log-linearized models estimated by ordinary least squares (OLS) as elasticities can be highly misleading in the presence of

heteroskedasticity. In the presence of heteroskedasticity, estimates obtained using log-linearized model are severely biased, distorting the interpretation of the model (Silva & Tenreyro, 2006).

The ordinary least square (OLS) is not an efficient estimator in the presence of heteroskedasticity (Manning & Mullahy, 2001; and Silva & Tenreyro, 2006). It has therefore been suggested by Silva and Tenreyro (2006) that gravity model should be estimated in their multiplicative form and proposed a simple pseudo maximum likelihood (PML) estimation technique. They argued that besides being consistent in the presence of heteroskedastivity, the method also provides a natural way to deal with zero values of dependent variable. This study will adopt the Poison Pseudo-Maximum Likelihood (PPML) estimator for the analysis.

4.4.3 Regression error specification test (RESET)

Heteroskedasticy robust regression error specification test (RESET) (Ramsey, 1969) would be carried out to check for the adequacy of the estimated model. The test is a general specification test for the linear regression model. It tests whether non-linear combinations of the fitted values help explain the dependent variable. The intuition behind the test is that, if non-linear combinations of the explanatory variables have any power in explaining the dependent variable, the model is mis-specified. The model is explained with the following equations:

$$\hat{y} = E\{\mathcal{Y}|x\} = \beta x.$$

The Ramsey test then tests whether $(\beta x)^2, (\beta x)^3 \ldots, (\beta x)^k$ has any power in explaining $\mathcal{Y}$. This is executed by estimating the following linear regression:

$$\mathcal{Y} = \alpha x + \gamma_1 \hat{y}^2 + \cdots + \gamma_{k-1} \hat{y}^k + \epsilon,$$

Then testing, by means of an F-test whether γ_1 through γ_{k-1} are zero. If the null-hypothesis that all γ coefficients are zero is rejected, then the model suffers from misspecification.

In interpreting the effect of this dummy, a positive and statistically significant estimated coefficient of the regional bloc in a particular product equation and estimation period implies that the intra-regional trade has been stimulated by the implementation of the free trade agreement. In this case, the estimated coefficient will be indicating the amount of additional trade, beyond the level of their economic and geographic characteristics would allow, that had taken place among SADC countries as a result of the implementation of commitments under the SADC FTA. This, according to Aitken (1973) and Endoh (1999), will be interpreted to reflect the trade creation effects of SADC FTA implementation.

Because of the double logarithmic specification of the estimated function, the parameter estimates of the GDP_i, GDP_j and distance variables can be interpreted as elasticities. As an example, in equation (3), β_1 represents the percentage change in X_{ijt} induces by one percent change in GDP_i. As dummy variables cannot be expressed in log form, the parameter estimates should be interpreted with care. The percentage effect of dummy variable can be calculated by subtracting one from the exponent of the regression coefficient and then multiplies the results by 100 (Halvoren & Palmquist, 1980).

Table 4.4: Gravity model independent variables and expected signs

Independent Variable	Description	Expected Sign
GDP_{it}	Gross domestic production for the exporting country *i*	+
GDP_{jt}	Gross domestic production for importing country *j*	+
POP_{it}	Population for exporting country *i*	-
POP_{jt}	Population for importing country *j*	-
DIST	Distance between countries *i* and *j*	-
Comlangij	Dummy variable;=1 if country *i* and *j* have a common official language	+
Colonyyij	Dummy variable;=1 if country *i* and *j* have colonial ties	+, -
Combordij	Dummy variable;= 1 if country *i* and *j* are contiguous	+
SADCij	Dummy variable;=1 if country *i* and *j* both are members of the free trade agreement, 0 otherwise	+
$SADCO_{ij}$	Dummy variable;=1 if country *i* is a net importer from a non SADC member *j*, 0 otherwise	+, -

Source: Author's observation

In the estimation of equation (3), expectations of the estimated signs for the explanatory variables as shown in Table 4. 4 would be as follows: first, GPD_i and GDP_j would have positive coefficients, due to direct relationship between GDP and import demand. The assumption is that larger economy trade more than smaller economies. For a given size of the economy, as countries become more developed, they tend to specialized more in production and trade. In turn, richer economies tend to trade more than poorer economies. The GDP captures the importance of size of total economy or income as a determinant of trade (Frankel & Wei, 1998 and Gilbert *et al*., 2000).

The coefficients for distance would have to be a negative sign, given that greater distances tend to increase transportation costs and information costs. It is expected that the estimated coefficient of the distance variable would be declining in magnitude over time due to advance transportation technology. Since the distance between two trading

points does not change notably, a significant change in transportation technology will sharply reduce per unit cost of transportation. It is however possible to obtain a positive coefficient of the distance variable. This is still a possibility; it is yet to be established in empirical literature.

4.5 Conclusion

This chapter discussed the empirical gravity model and the sources of data used for the study. The main element of focus for gravity models has been the flow of commodities and the model specifies that a flow from origin *i* to destination *j* is determined by supply conditions at the origin, by demand conditions at the destination and by stimulating or restraining forces relating to the specific flow between *i* and *j.*

The use of logarithmic transformation to estimate the gravity model creates an immediate problem when trade is zero, because log transformation is valid for $X_{ijt} > 0$. Thus dropping the zero observation had been suggested. This procedure however results in biased parameter estimates as there may be valid reasons why certain bilateral trade flows are zero. To overcome this problem of zero trade, a value of one is added to the dependent variable before taking the natural logarithm, thus, it becomes $X_{ijt}^* = X_{ijt} + 1$. In the cases where there is no observed bilateral trade, i.e., where $X_{ijt} = 0$, $X_{ijt}^* = 1$, and $\ln X_{ijt}^* = \ln(1) = 0$. Subsequently, in the cases where $X_{ijt} > 0$ the dependent variable becomes $\ln X_{ijt}^* = \ln(X_{ijt}+1)$, which should not be significantly different from $\ln(X_{ijt})$.

Among the multitudes of possible explanatory variables used for the gravity model, SADC dummy has been one of such potential variables. The SADC and SADCO dummies enable us to isolate the two distinct effects, trade creation and trade diversion, which FTAs may exert on trade flows. Empirical results of the analysis followed in chapter five.

CHAPTER 5

RESULTS AND DISCUSSION

5.1 Introduction

This chapter presents the results of the gravity model as explained in chapter 4. It particularly explains the factors included in the gravity model that make a significant contribution to explain the impact of SADC Free Trade Agreement on South African agricultural trade. The applied regression method used is the Poisson Pseudo Maximum Likelihood (PPML) to determine the significance of variables within the model. The PPML was preferred to OLS method of estimation because in the presence of heteroskedasticity the standard OLS methods can severely bias the estimated coefficients, casting doubt on the empirical findings; instead, PPML is robust to different patterns of heteroskedasticity and, in addition, provides a natural way to deal with zeroes in trade data.

5.2 The gravity model estimation

As explained in chapter 4, equation (3) was estimated first with the standard OLS, using the logarithm of trade as the dependent variable and the results are presented in Appendix A. Estimating the OLS allow to test for the presence of heteroskedasticity in the data for all the three agricultural commodities. Based on the results of the White tests as reported in Tables 5.1, 5.2 and 5.3, the data set used for this study exhibit heteroskedasticity error.

From Table 5.1, 5.2 and 5.3, the White test statistic is highly significant at 1 percent, we therefore reject the null hypothesis that there is no heteroscedasticity. To correct for this phenomenon, this study uses Pseudo Poisson Maximum Likelihood estimator (PPML) which is less affected by heteroskedasticity.

Table 5.1: Heteroskedasticity White Test for Meat of bovine dataset

F-statistic	5.354938	Prob. F(53,177)	0.0000
R-squared	142.2718	Prob.Chi-Square(53)	0.0000

Source: Author's estimation

Table 5.2: Heteroskedasticity White Test for Maize dataset

F-statistic	4.953069	Prob. F(53,204)	0.0000
R-squared	145.1799	Prob. Chi-Square(53)	0.0000

Source: Author's estimation

Table 5.3: Heteroskedasticity White Test for Wheat dataset

F-statistic	3.787835	Prob. F(53,135)	0.0000
R-squared	113.0071	Prob. Chi-Square(53)	0.0000

Source: Author's estimation

Heteroskedasticy robust regression error specification test (RESET) (Ramsey, 1969) was also carried out to check for the adequacy of the estimated model. The p-values of the tests check whether the particular pattern of heteroskedasticity assumed by the models is appropriate or not. The p-values of 0.091 indicate that the models estimated by the PPLM method are adequate as reported in Table 5.4. These results show that the estimated coefficient is insignificantly different from zero at the usual 5 percent level. This implies that the Poisson PML regression estimated provides no evidence of misspecification of the gravity model. The PPML results are presented in Tables 5.5 through 5.7.

Table 5.4: RESET test (p-values)

Test (Null hypothesis)	Trade > 0	Full Sample
GNS (for PPML)	0.1244	0.091
Park (OLS)	0.0000	0.0000

Source: Author's estimation

5.3 PPML results for SADC

Tables 5.5, 5.6 and 5.7 reports the estimated results for the three selected commodities traded by SADC member states. The Poisson regression/Maximum Likelihood R-square are 0.51, 0.48 and 0.59 for meat of bovine, maize and wheat respectively which were at satisfactory levels for panel data analysis. Poisson regression does not have an equivalent and the same interpretation with the R-squared found in OLS regression.

The estimated GDP coefficients have the expected positive signs in all the equations and are significant at the 5 percent level, except in the wheat regression where the GDP is not significant. Poisson estimates reveal that the coefficients on exporter's and importer's GDPs in the gravity model are not, as generally believed, close to 1. The results therefore indicate that there is a statistically significant positive relationship between bilateral trade and income of partners. These make good economic sense: all things being equal, larger countries in SADC in terms of GDP (Angola, Botswana, Democratic Republic of Congo, Tanzania and Zambia) trade more with South Africa than small countries (like Lesotho and Swaziland) in the selected agricultural commodities, which are supported by the standard gravity literature.

We presume, like other studies on gravity model of trade, the direct air distance is a reasonable proxy for transportation cost. However, it must be noted that transportation cost will not always increase monotonically with distance (Frankel, 1997). It is expected that there is a large transaction cost associated with other operations in the process of international trade compared to small marginal cost per kilometer of distance travelled.

As expected, the parameter estimates of distance variable are negative and statistically significant at 1 percent level during the period of study indicating that transportation costs act as a constraint to trade. A country faces higher trading costs if the port is not located in the economic center. The estimated PPML coefficient of distance for meat of bovine is -1.025. This means that when the distance between South Africa and any of the SADC countries increased by 1.0 percent, trade in meat of bovine between them falls by 1.025 percent. The estimated coefficient of distance for maize and wheat are -0.22 and -0.169 respectively. This also means that when the distance increases by 1 percent, trade in maize and wheat falls by 0.22 and 0.169 percent respectively. This lower estimate suggests a smaller role for transportation costs in the determination of trade patterns.

The signs expected for population coefficients are ambiguous, and the literature had not tended to find a consistent sign for the population of the exporting and importing country. The regression results for population shows positive and negative signs for the exporting and importing countries respectively for meat of bovine and wheat. But for maize, population has a negative sign for both exporting and importing countries. The coefficient of the dummy for common language variable was positive but not significantly different from zero. The positive sign is as expected because common language among countries facilitates trade negotiations. It is expected that countries that speak the same language would trade more. Two countries that speak the same language will trade twice to three times as much as pairs that do not share a common language. Therefore, common language is seen to directly lower translation costs.

The coefficient of the borders dummy variable was positive and statistically significant at the 1 percent level indicating that trade tends to increase, if countries shared a common land border, i.e., there is a positive relationship between the adjacency variable and trade between countries. The coefficient of the Colony dummy variable (history) was negative but not statistically significant even at the 10 percent level but had the

expected sign which is negative indicating that colonial ties play no role in determining trade flows.

5.4 Dummy effect

Empirical results reported in Tables 5.5, 5.6 and 5.7 suggested that there is a significant positive SADC (regional dummy) effects on meat of bovine and maize during the period of study. In the meat of bovine trade, the estimated coefficient of SADC is 2.45, which is statistically significant at 1 percent. This suggests there have been a net trade creation and an increasing intra-bloc bias for meat of bovine as a result of the SADCFTA. For example, in terms of US dollars, for the meat of bovine trade, South Africa exports to Zimbabwe increased from U.S. $1,000 in 2001 to U.S. $21.778 million in 2011.

In the case of maize trade, the coefficient of SADC is 1.05 which is positive and statistically significant at 1 percent. This implies that the intra-regional trade in the commodity has been stimulated by the implementation of the free trade agreement. Maize trade among SADC member countries has increased tremendously over the last decade. This is clearly significant after the implementation of the SADCFTA in 2008. In terms of dollars, South Africa maize export to Zimbabwe in 2009 alone is as high as U.S. $309.406 million. SADC members traded 94 percent of maize among themselves than they traded with the rest of the world. Maize has being the major staple food for the people in Southern Africa region.

However, in the case of wheat, the estimated coefficient of SADC is positive and not statistically significant. From this analysis, we cannot identify any strong bloc effect on wheat trade in SADC. This may be due to the fact that wheat is a sensitive product for South Africa and it enjoys protection. These results were consistent with the findings of other studies such as Maringwa 2009. This study shows that the relative magnitudes of the estimated intra SADC bloc effects are different at the commodity level.

Looking at explicit product categories, evidence of a significant regional trade bias is found in meat of bovine and maize trade, but a significant positive bloc effect could not be established for wheat trade during the period. These results are based on the signs and size of the SADC dummy for the selected commodities. Thus, there is evidence to support that SADCFTA has been successful in promoting trade in meat of bovine and maize among its members.

5.5 Trade diversion effect

Observing the level of changes in SADCO (the openness dummy), can give insights into the presence of trade diversion effects. The effect explain that whether there are reductions in the level of imports by SADC members from the rest of the world relative to the level of exports by members to rest of the world over time. The study deals with the openness coefficients. The relevant results are reported in Tables 5.5, 5.6 and 5.7.

The results of the SADCO dummy for meat of bovine and maize shows negative and not statistically significant. This implies that SADC member states have been importing less of the two commodities from the rest of the world over the period of research, which indicates that SADC members have reduced their net imports from the rest of world. The result of the SADCO dummy for wheat shows it is positive and statistically significant at 1 percent, therefore implying that SADC member states have been importing more from the rest of the world over the period of research than from South Africa which is the largest producer in the region, thereby necessitating a trade diversion in the case of wheat in SADC.

Table 5.5: Poisson regression/maximum likelihood estimate for meat of bovine as dependent variable.

Explanatory variables	**Parameter**	**Standard error**
Intercept	-16.66252	3.640224
$LNGDP_i$	0.439593**	0.222335
$LNGDP_j$	0.81287***	0.033154
$LNPOP_i$	3.198109***	1.232094
$LNPOP_j$	-0.006864***	0.030693
LNDISTANCE	-1.025723***	0.158462
COMMON BORDER	1.175304***	0.193042
COMLANG	0.071759*	0.086251
COLONY	-0.029860***	0.094274
SADC (regional dummy)	2.452922***	0.299529
SADCO (Openness dummy)	-0.162474	0.104313
R^2	**0.51**	***** = 0.01**
Log Likelihood	**2626.95**	**** = 0.05**
LR Statistics	**285.38**	*** = 0.1**
LR Prob.	**0.0000**	**(level of Significance)**

Source: Author's estimation

Table 5.6: Poisson regression/maximum likelihood estimate for maize as dependent variable**.**

Explanatory variables	**Parameter**	**Standard error**
Intercept	1.819854	3.274904
$LNGDP_i$	0.219177	0.178080
$LNGDP_j$	0.64481**	0.026575
$LNPOP_i$	-1.442262	0.982020
$LNPOP_j$	-0.116349***	0.026025
LNDISTANCE	-0.220323***	0.153974
COMMON BORDER	0.263804***	0.102304
COMLANG	0.113272**	0.065885
COLONY	0.155440**	0.071206
SADC (Regional dummy)	1.059860***	0.228289
SADCO (Openness dummy)	-0.084724	0.057616
R^2	**0.48**	***** = 0.01**
Log Likelihood	**4011.77**	**** = 0.05**
LR Statistics	**201.72**	*** = 0.1**
LR Prob.	**0.0000**	**(level of Significance)**

Source: Author's estimation

Table 5.7: Poisson regression/maximum likelihood estimate for wheat as dependent variable.

Explanatory variables	**Parameter**	**Standard error**
Intercept	-11.78872	6.963587
$LNGDP_i$	0.646120	0.401231
$LNGDP_j$	-0.83310	0.081519
$LNPOP_i$	4.875035*	2.567028
$LNPOP_j$	-0.430172***	0.111868
LNDISTANCE	-0.169425	0.208866
COMMON BORDER	-0.111090	0.208794
COMLANG	-0.346846	0.262250
COLONY	0.599151**	0.249646
SADC (Regional dummy)	0.376329	0.735066
SADCO(Openness dummy)	1.135973***	0.257408
R^2	**0.59**	***** = 0.01**
Log Likelihood	**1223.69**	**** = 0.05**
LR Statistics	**606.09**	*** = 0.1**
LR Prob.	**0.000000**	**(level of Significance)**

Source: Author's estimation

5.6 Conclusion

This chapter reports the results of the gravity model. Firstly, it tests for the presence of heteroskedasticity error which was confirmed to be present in the dataset and this was adequately corrected using Poisson maximum likelihood which is robust to different patterns of heteroskedasticity. Secondly, it checked for the adequacy of the estimated model by performing a heteroskedasticy robust regression error specification test (RESET). The Poisson regression provides no evidence of misspecification of the gravity model using the PPML.

The study analyze the effects of SADC FTA on South African trade using three agricultural commodities i.e., meat of bovine, maize and wheat from the period of 2001 to 2011.

The result suggests that the coefficients of all the three continuous variables, GDP, population and distance are statistically significant. The GDP coefficient was positive as expected and statistically significant at the 1 percent level as expected. This is as a result of the positive relationship between trade and the income of trading countries. The coefficient of distance variable was negative and significant at the 1 percent level indicating that transportation costs act as a constraint to trade.

The border dummy variable was positive and statistically significant at the 1 percent level indicating that trade tends to increase if countries shared a common land border. There has been a significant increase in meat of bovine and maize trade among SADC members during the period of research. For these two agricultural commodities, intra-SADC trade has the major share when compared with the rest of the world.

Empirical results suggested that there is a significant positive SADC (regional dummy) effects on meat of bovine and maize, but positive and non-significant for wheat during the period of study. There have been a net trade creation effects and an increasing intra-SADC bloc bias for meat of bovine and also the intra-regional trade in maize has been stimulated by the implementation of the free trade agreement. Maize trade among SADC countries has increased tremendously over the last decade. This is clearly significant after the implementation of the SADCFTA in 2008.

However, in the case of wheat trade, we cannot identify any strong bloc effect. The SADCO (openness dummy) for wheat shows a positive and statistically significant coefficient, therefore implying that SADC member states have been importing more from the rest of the world than from South Africa which is the largest producer in the region. There has been a trade diversion effect in the case of wheat.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This study has attempted to estimate the impact of SADC Free Trade Agreements on South African agricultural trade using selected agricultural products. The products considered in the study, as specified under the Standard International Trade Classification (SITC) code, were meat of bovine animals (SITC 0111), maize (SITC 044) and wheat (SITC 041). This study used gravity model using data from 2000 – 2011.

The explosion of Regional Trade Agreements during the last two decades intensified the discussion on the merits of regional integration. Literatures are addressing the issue of regionalism based on the welfare effects and likely impacts on multilateralism. Regional integration was viewed by a group of trade economist as reducing global welfare by acting as a stumbling bloc to multilateral trade. The other group argued that regional trade agreements are likely to raise global welfare and acts as a building bloc to multilateral trade.

Different techniques, from trade share indices to large scale computable general equilibrium (CGE) models, have been employed by researchers to analyse the trade and welfare effects of FTAs. While there is no satisfactory way to test the validity of CGE, descriptive analyses are also unable to analyse trade creation and diversion effects of FTAs. Some studies have employed econometric estimation to assess the impact of FTAs on trade in agricultural commodities. Gravity model which is an example of econometric estimation has become attractive to evaluate the trade creation and trade diversion effects of FTAs in recent years.

Therefore, this study used gravity model to determine the extent of SADC intra-regional trade and the potential trade diversion effects for the three agricultural commodities separately. A panel regression was estimated using Poisson Pseudo Maximum Likelihood method.

6.2 Summary of findings

The overall trade creation and trade diversion effects of SADCFTA were analyzed for bilateral trade flows using the gravity model. The overall effects of regional trade agreements are positive and significant indicating that trade agreements induce and generate trade among member countries.

The positive and significant GDP coefficients confirm that bilateral trade is affected by the trading partner's incomes. The negative but statistically significant coefficients of the distance variable indicate the trade barrier impact of transportation costs. From the estimated results for SADC, lower estimate for distance suggests a smaller role for transport costs in the determination of trade patterns. The result also revealed that trade flows can increase, if the countries share a common land border which was positive and statistically significant for SADC. The coefficient of the Colony dummy variable (history) was negative but not statistically significant even at the 10 percent level but had the expected sign which is negative.

There has been significant increase in meat of bovine and maize trade among SADC members during the study period. This study finds that there is a great intra-regional trade bias for meat of bovine and maize than for wheat. The SADC members trade more with South Africa in the two commodities than with the rest of the world. This study provides insights into the presence of trade creation effects.

But estimated coefficient of the openness dummy indicated that there is an increase in the import of wheat, while there is a decrease in meat of bovine and maize imports by South Africa from the rest of the world. This is an indication that the SADCFTA

promotes trade among members vigorously, while displacing trade with non-members in meat of bovine and maize.

6.3 Policy implications

The major findings from this study suggest that SADCFTA has served to boost trade among its members. While this study does not produce specific information regarding the extent of trade creation and trade diversion for the three commodities attributable to the SADCFTA, the results indicated the presence of significant trade creation and diversion effects. The results are informative and useful in identifying trade creation and trade diversion effects of SADCFTA on South African agricultural trade. It signifies the importance of analyzing the effects of regional trade agreements for major agricultural commodities.

Therefore, this research would argue that, SADC free trade agreements have yielded some increase on trade flows, but it can be improved upon. In situations where there are no significant increases on trade flows, the reason may not necessarily be that the agreements are not a good strategy, but the issues have to do with implementation and commitment to make them work. The policy makers should redesign international trade policy in order to ensure that the SADCFTA boost welfare of its members.

6.4 Achievements and limitations of the thesis

This study estimated the impact of SADC Free Trade Agreements on South African agricultural trade using selected agricultural products through the application of a gravity model based on data from 2000 – 2011. The results indicated that, there have been trade creation effects for meat of bovine and maize, but a trade diversion effect in the case of wheat. The analysis reveals that the applied gravity model is an appropriate analytical tool for addressing the study's objectives. This is particularly true when compared with trade share indices to large scale computable general equilibrium (CGE) models, which have been employed by researchers to analyse the trade and welfare effects of FTAs.

Thus, the contribution of this study stems from its focus on the impact of SADC Free Trade Agreements on South African agricultural trade using a gravity model. The analysis is exploratory in that it does not try to mimic. Rather, it tries to further our understanding of the relative importance of FTAs. This study showed that trade can be influenced positively when countries participate in regional trade agreements. It also provides valuable information about commodity specific effect of SADCFTA on South African agricultural trade.

However it has some limitations. A closer look at these limitations provides directions for future research. The dependent variable in this study is total bilateral trade. It imposes restriction on the coefficients of exports and imports, which may not be justifiable. Therefore, future research should estimate separate equations for exports and imports instead of total trade. Another limitation is that the study analyzes SADCFTA impact on only three agricultural commodities, more products can be analyzed for deeper understanding of the effects of FTA on South African agricultural trade.

6.5 Further study and recommendations

The study leads to some suggestions for further research and advancements. According to the agreed tariff phase-down schedules by SADCFTA, 85 percent of all product lines should be trading at zero tariffs by 2008. The remaining 15 percent, constituting sensitive products, will have tariff barriers removed from 2008 to 2012.Which means full liberalization of trade is expected by the end of 2012. Hence, in order to assess the progress of the FTA, it is imperative to carry out a further study by assessing the impact of the full liberalization of trade in agricultural sector.

SADCFTA member states need to improve on data collection and storage method in order to help to improve on data availability for economic analysis that will help in guiding policy makers and policy formulation. It must also be noted that free trade agreement is not a bullet solution to welfare improvements. Other factors, such as production, specialization and competitiveness must be seriously considered during policy formulations.

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APPENDIX A

A1. Ordinary Least Square estimate for Maize as dependent variable.

Explanatory variables	**Parameter**	**t statistic**
Intercept	4.438601	0.121381
$LNGDP_i$	2.569342	1.259225
$LNGDP_j$	0.439834*	1.694569
$LNPOP_i$	-16.00991	-1.432646
$LNPOP_j$	1.139366***	4.618937
LNDISTANCE	-2.802459*	-1.608439
COMMON BORDER	3.535448***	4.734547
COMLANG	0.934204	1.255151
COLONY	1.825444**	2.245635
SADC (regional dummy)	10.22851***	4.997592
SADCO (Openness dummy)	-0.780577	-1.049502
R^2	**0.27**	

Note: *** is 0.01, ** is 0.05 and * is 0.1 level of significance.

Source: Author's estimation

A2. Ordinary Least Square estimate for meat of bovine as dependent variable.

Explanatory variables	**Parameter**	**t statistic**
Intercept	-146.2654	-4.822081
$LNGDP_i$	-3.810679**	-2.044723
$LNGDP_j$	1.284443***	5.911639
$LNPOP_i$	27.90956**	2.573671
$LNPOP_j$	-0.173077*	-0.738186
LNDISTANCE	8.433344***	8.642078
COMMON BORDER	9.690994***	7.364270
COMLANG	-0.975986	-1.189023
COLONY	0.165564	0.158238
SADC (regional dummy)	19.33501***	12.34152
SADCO (Openness dummy)	-0.558318	-0.854292
R^2	**0.36**	

Note: *** is 0.01, ** is 0.05 and * is 0.1 level of significance

Source: Author's estimation

A3. Ordinary Least Square estimate for wheat as dependent variable.

Explanatory variables	**Parameter**	**t statistic**
Intercept	-77.24132	-1.851214
$LNGDP_i$	4.021629	1.596245
$LNGDP_j$	0.371228	0.805634
$LNPOP_i$	-2.27078**	-2.133270
$LNPOP_j$	-1.841905***	-4.131437
LNDISTANCE	-0.498315**	-2.712311
COMMON BORDER	-0.990594***	-3.770320
COMLANG	0.090236*	0.098692
COLONY	2.804147***	4.029147
SADC (regional dummy)	0.573129	0.179631
SADCO (Openness dummy)	4.968572***	4.952997
R^2	**0.42**	

Note: *** is 0.01, ** is 0.05 and * is 0.1 level of significance

Source: Author's estimation