IMPLICATIONS OF TRADE LIBERALISATION AND ECONOMIC GROWTH FOR SOUTH AFRICAN AGRICULTURAL INDUSTRIES

by

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I declare that this dissertation hereby submitted by me for the PhD 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 any other university/facility. Copyright of this study lies with the University of the Free State.

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Mogos Yakob Teweldemedhin Date

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ABSTRACT

The main aim of this study is to examine the impact of trade liberalisation on agriculture's ability to contribute to economic growth and poverty reduction in South Africa. Several secondary objectives were examined that address: (i) the impact of trade liberalisation on the South African agricultural international trade performance; (ii) the relationship between trade liberalisation and poverty alleviation; (iii) the impact of trade liberalisation on Total Factor Productivity (TFP) in agricultural industries, and (iv) the short-term source of agricultural adjustments. Different methodologies were applied to achieve the specified sub-objectives, including calculation of the Intra-Industrial Trade (IIT) coefficients' (with its key determinants) Gravity model, the Error Correction Vector Model and the Exact Maximum Likelihood method.

The Gini coefficient of exports and imports was calculated as 0.55 and 0.62, respectively. The aggregate, with respect to the South African agricultural IIT, was higher than the average attributed to advanced countries. This shows that South Africa needs to reinforce the position of a bilateral agreement, which should be accompanied by regional or even multilateral liberalisation. The econometric analysis conducted on determinants of high IIT, gives a more magnified effect of the coefficients of export to import ratios and the TIMB (trade balance). If the South African industries implement and increase trade liberalisation

on the diversified level of industrial specialisation, the IIT level would remain high, and significant economic gain might be achieved.

The gravity model finding shows that all variables were significant at one percent, and carried the expected sign. Only the EU dummy variable had an inverse relationship, implying that the EU trade agreement creates a negative impact on export capacity for South African farmers. Essentially, South African farmers are not in a position to compete with the subsidised farmers of the development involved. These results have several important policy implications for South Africa. Firstly, trade agreements, whether implemented unilaterally or bilaterally, will enhance potential trade flows between South Africa and other countries or regions. Secondly, from an export promotion standpoint, the distance variable in the model's results shows that importing countries' per capita income is elastic and significant in determining export. Therefore, it is important for South Africa to maintain trade links and, in order to realise export potential, to extend these to high per capita income countries or regions. On the other hand, to avoid vulnerability and potential crises in EU regions or countries where the largest proportion of South Africa's export is directed, it is important that South Africa continues to concentrate its export promotion efforts in other regions of the world.

The study has also tested the impact of trade liberalisation using both the cross-sectional and time series approach, covering nine agricultural commodities; the cross-sectional approach covered the period of 1995-2007, and the time-series covered the period of 1970-2007. Both approaches validate the above proposition with a high degree of statistical reliability.

Finally, the study identified the main sources of agricultural economic growth by categorising the variables into five main areas: cyclical reversion, structural policies and institutions, stabilisation policies, cyclical volatility and external conditions. The components of the structural policies and institutions category were found to be statistically significant, and were positive at the specified significance level (only RDGDP was related negatively). This implies that the growth was achieved with improved education, financial depth and trade openness. However, the negative relationship of RDGDP shows that the sector is suffering

from debt crisis. Subsequently, farmers need to follow an effective debt management system.

THE IMPACT OF TRADE LIBERALISATION ON SOUTH AFRICAN AGRICULTURAL INDUSTRIES

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UITREKSEL

Die hoofdoel met die studie is om vas te stel wat die impak van handelsvryheid is op die landbou se vermoë om 'n bydrae te maak tot ekonomiese groei en armoedeverligting in Suid-Afrika. Ondersoek is ingestel na verskeie sekondêre doelstellings, wat verband hou met: (i) die impak van handelsvryheid op die internasionale handelsprestasies van Suid-Afrikaanse landbou; (ii) die verhouding tussen handelsvryheid en armoedeverligting; (iii) die impak van handelsvryheid op Totale Faktor Produktiwiteit (TFP) in landbouindustrieë en (iv) die korttermyn- bron van landbou-aanpassings. Verskillende metodes is aangewend om die bepaalde sub-doelwitte te bereik, waaronder berekening van die Intra-Industriële Handels- (IIH) koëffisiënte (met die sleutel-bepalers) Gravitasiemodel, die Fout-herstellings Vektor-model en die Presiese Maksimum Waar-skynlikheidsmetode.

Die Gini-koëffisiënt van uit- en invoere is onderskeidelik bereken as 0,55 en 0,62. Die totaal ten opsigte van die IIH van die Suid-Afrikaanse landbou, was hoër as die gemiddeld wat aan gevorderde lande toegeskryf is. Dit bewys dat Suid-Afrika die posisie van 'n bilaterale ooreenkoms moet versterk en dat dit moet saamval met streeks- of selfs multilaterale vryheid. Die ekonomiese analise wat op bepalers van hoë IIH uitgevoer is, gee 'n duideliker beeld van die koëffisiënte van uit- en invoer-verhoudings en die TIMB (handelsbalans). As die Suid-Afrikaanse industrieë handelsvryheid op die uiteenlopende vlak van industriële spesialisering implementeer en verhoog, sal die IIH-vlak hoog bly en beduidende ekonomiese voordeel kan daaruit voortspruit.

Die bevinding aangaande die gravitasiemodel toon dat alle veranderlikes beduidend was teen een persent en dat dit die verwagte teken vertoon het. Slegs die ontwerpmodel van die EU het 'n omgekeerde verhouding en dit impliseer dat die EU-handelsooreenkoms 'n negatiewe impak op uitvoerkapasiteit vir Suid-Afrikaanse boere meebring. In wese, is Suid-Afrikaanse boere nie in 'n posisie om met die gesubsidieerde boere in die betrokke ontwikkeling mee te ding nie. Hierdie resultate hou verskeie belangrike beleidsimplikasies vir Suid-Afrika in. Eerstens, sal handelsooreenkomste wat óf unilateraal óf bilateraal geïmplementeer is, potensiële handelsvloei tussen Suid-Afrika en ander lande of streke bevorder. As dit uit die oogpunt van die bevordering van uitvoere benader word, dui die afstandsveran-derlike in die model se resultate tweedens daarop dat die inkomste per kapita van invoerlande elasties en beduidend is vir die bepaling van uitvoere. Daarom is dit belangrik vir Suid-Afrika om handelskakeling te handhaaf en om dit volgens lande en streke se kapita-inkomste uit te brei ten einde uitvoerpotensiaal te laat realiseer. Aan die ander kant, is dit belangrik vir Suid-Afrika om aan te hou om sy uitvoerbevor-deringspogings op ander wêreldstreke te konsentreer om kwesbaarheid en potensiële krisisse in EU-streke en –lande, waarop die grootste gedeelte van Suid-Afrika se uitvoere gerig is, te vermy.

Die studie het ook die impak van handels-vryheid deur gebruikmaking van sowel die kruis-seksie as die tydserie-benadering getoets op nege landboukommoditeite; die kruis-seksie benadering is aangewend gedurende die tydperk 1995-2007 en die tydseries het gestrek vanaf 1970-2007. Bogenoemde proposisie se geldigheid is met 'n hoë graad van statistiese betroubaarheid deur albei benaderings bewys.

Ten slotte, het die studie die hoofbronne van landbou-ekonomiese groei geïdentifiseer deur die kategorisering van die veranderlikes in vyf hoofgedeeltes: sikliese terugvalling, strukturele beleid en instellings, stabiliseringsbeleid, sikliese onbestendigheid en eksterne toestande. Die komponente van die strukturele beleid en instellings-kategorie het geblyk statisties-onbeduidend te wees. Dit was positief op die gespesifiseerde betekenisvlak (slegs RDGDP het 'n negatiewe verband getoon). Dit dui daarop dat die groei bereik is deur verbeterde opvoeding, finansiële diepte en handels-oopheid. Die negatiewe verhoudings in RDGDP dui egter daarop dat die sektor in 'n skuld-krisis gedompel is. Daarom is dit nodig vir boere om 'n doeltreffende skuldbestuurstelsel in te stel.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACF:	Auto-Correlation Function
ACF:	Auto-Correlation Function
ACP:	African, Caribbean and Pacific
ADF:	Augmented Dickey-Fuller
AGCI:	African Global Competitiveness Initiative
AGOA:	African Growth and Opportunity Act
AIC:	Akaike Information Criterion
AoA	Agreement on Agriculture
ARFIMA:	Auto-Regressive Fractionally Integrated Moving Average
ASEAN	Association of Southeast Asian Nations (Member countries: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam)
ASGISA:	Accelerated and Shared Growth Initiative for South Africa
CAEMC:	Central Africa Economic and Monetary Community
CBI:	Cross-Border Initiative
CGE	Computable General Equilibrium
COMESA:	Common Market for Eastern and Southern Africa
DFID:	Department for International Development
DoA:	National Department of Agriculture
EAC:	Commission for East African Cooperation
ECA:	Economic Commission for Africa
ECOWAS:	Economic Community of West African States
ECVM:	Error Correction Vector Model
EMLM:	Exact Maximum Likelihood method.
ERP	Effective Rate of Protection
EU	Europen Union
FAO	Food and Agricultural Organisation
FPE:	Final Prediction Error criterion
FTAs:	Free Trade Agreements
GATT:	General Agreement on Tariffs and Trade
GDP:	Gross Domestic Productivity
GEIS:	Generalised Export Incentive Scheme
GEP:	Global Economic Prospects
GSPs	Generalized System of Preferences
GVC:	Global Value Chain
HOS:	Heckscher-Ohlin-Samuelson
IIT:	Intra-Industrial Trade
IOC:	Indian Ocean Commission
ITC:	International Trade Centre
LDCs	Least Developed Countries
LR:	Likelihood Ratio
LSDV:	Least Square with Dummy Variables ()
MERCOSUR (Portuguese):	*Mercado Comum do Sul*,
MSE:	Mean Square Error
NAFTA:	North American Free Trade Agreement
NTBs:	Non-Tariff Barriers
OECD:	Organisation on Economic Co-Operation and Development
OLS:	Ordinary Least Square
PPP:	Purchasing Power Parity
PSE	Producer' Subsidy Equivalent

PTAs	Preferential Trading Agreements
RIFF:	Regional Integration Facilitation Forum
RoO	Rules of Origin
SACU:	Southern Africa Customs Union
SADC:	Southern African Development Community
SAM:	Social Accounting Matrix
SITC	Standard International Trade Classification
SS:	Stolper-Samuelson
SSA:	Sub Saharan Africa
TBT	Technical Barriers to Trade
TDCA:	Trade, Development and Cooperation Agreement
TFP:	Factor Productivity
TRQ	Tariff Rate Quota
UNCTAD	United Nations Conference on Trade and Development
US	United States of America
USA	United States of America
USDA	United States Department of Agriculture
WAEMU:	West African Economic and Monetary Union
WLS:	Weighted Least Square
WTO:	World Trade Organization

CHAPTER 1

INTRODUCTION

"I do not mean that others should be eased and you burdened, but that as a matter of equality your abundance at the present time should supply their want, so that their abundance may supply your want, that there may be equality." ***The Bible, 2 Corinthians 8: 13 and 14***

1.1 INTRODUCTION AND BACKGROUND

South Africa is the industrial giant of sub-Saharan Africa. A challenge facing the nation of South Africa is to ensure that agriculture continues to contribute to the national policy objectives of economic growth. In addition to the needs of the nation, agriculture is critical to South Africa's rural population. It is a major source of food and household income in rural areas.

According to the National Department of Agriculture (2005), agriculture is regarded as one of the means to reduce poverty, firstly through its contribution to total GDP and employment, and secondly because its 240 000 small farmers provide a livelihood to more than 1 million family members and to another 500 000 occasional workers. Furthermore, there are an estimated 3 million farmers, mostly in the communal areas of the former homelands, who produce food primarily to meet their families' needs and almost all of the productive and social activities of rural towns and service centres are dependent on primary agriculture and related activities (DoA, 2005). In addition, agriculture utilises the largest portion of South Africa's land and therefore forms the backbone of the rural economy. It is therefore clear that agriculture is regarded as one of the means through which Government can reach its growth objectives as articulated in the Integrated Rural Development Strategy and ASGISA.

Over the past decade, major changes in the agricultural business environment have taken place. These changes have affected agriculturalists and others who are either directly or indirectly involved in agricultural activities. The introduction of free trade has resulted in price fluctuations, which brought about a whole new dimension of risk. South Africa's agriculturalists were not always prepared to manage the resulting external competition (Taljaard, 2007).

In the 1960s and 1970s, African countries have been very sceptical about the virtues of free trade. Since the late 1980s, they have shown more interest in multilateral trade as well as negotiations. This reflects the combined effect of the following three factors, namely: dissatisfaction with the slow pace of regional integration; the belief that trade (if well managed), could play a critical role in confronting the development challenges facing the continent, and lastly, the widespread view that multilateral trade could promote as well as spur regional integration efforts. By increasing competition, multilateral trade liberalisation could force African governments to intensify regional integration efforts so as to reduce transactions costs through the development of regional infrastructure (Economic Commission for Africa (ECA), 2004).

During the last decade trade policy in South Africa has undergone several changes. These changes include multilateral reductions in tariffs and subsidies through the country's World Trade Organization (WTO) commitments, the signing of Free Trade Agreements (FTAs) and more recently, negotiations around future commitments to liberalisation both at multilateral level as well as regional level. These simultaneous developments have had an important influence on both *de facto* protections in the South African economy, as well as on welfare improvement (Organisation on Economic Co-Operation and Development (OECD), 2006).

The opening of the agricultural sector placed South Africa among the world's leading exporters of agro-food products such as wine, fresh fruit and sugar. The country is also an important trader in the African region. The beginning of the current decade witnessed particularly strong agricultural export oriented growth. South Africa's agricultural export revenues reached almost 9% of the total value of national exports. Europe is by far the largest destination, absorbing almost one-half of the country's agricultural exports (OECD, 2006). Agricultural imports are also growing, accounting for 5-6% of total annual imports since 2000 (OECD, 2006). However, Coetzee (2008) indicated that the current export trend shows that the capacity is declining, whereas import is growing tremendously. South Africa is to become a net importer of major food items.

South Africa has undertaken several major economic reforms and, among these, import liberalisation was a principal component. This reform, along with complementary changes in industrial policy and technology, was aimed at making South African industries more efficient, updating technology and competitiveness (Jonsson and Subramanian, 2001).

Given the fact that the main objective of import liberalisation was to improve industrial productivity, it is appropriate to ask how much import liberalisation has contributed to economic growth, better productivity and the improved performance of agricultural industries.

1.2 PROBLEM STATEMENT AND MOTIVATION

"Openness to trade increases poverty" is a statement made by anti-globalisation advocates. They argue that trade liberalisation is the systematic dismantling of trade barriers, which leads to high unemployment, less economic growth and high food prices. On the other hand, advocates of trade liberalisation have argued that it ensures availability of food and boosts rural incomes, thereby reducing poverty in the poorest countries (Manchine, 2005).

The successes of trade reform (trade liberalisation) in South Africa have resulted in mixed trends in economic growth. It is noticeable that output has grown but at a slow pace, and that output growth was not enough to generate an export-led growth boom similar to what has been seen in the East Asian manufacturing sector, in Latin America's agriculture and in other dynamic emerging economies (Edwards, 2004). The South African net trade sectors remain capital and skill intensive, which is paradoxical to the abundance of labour (Edwards and Golub, 2002; Tsikata, 1999; Jonsson and Subramanian, 2001). The formal employment of semi-skilled and unskilled labour declined despite the modest improvement of output growth. Data provided by the South African Standardised Industrial Database (2004) (in Edwards, 2004) indicates that over 700 000 semi-skilled and unskilled workers lost their formal employment in manufacturing, mining and services between 1990 and 1998 (Edwards, 2004).

The integration of the South African sectors into the international economy has led researchers and policy-makers to question the possible links between trade liberalisation, structural change

and factor productivity growth (Edwards and Golub, 2002; Golub, 2000; Bhorat and Hodge, 1999; Fedderke et al., 2003; Birdi et al., 2002). Yet, there is still no consensus on the impact that trade liberalisation has on agricultural employment and factor returns relative to other influences such as technological change and factor market rigidities. Edwards and Golub (2002), Bhorat and Hodge (1999) and Birdi et al. (2002) argue that trade liberalisation negatively affected employment, which resulted in poor productivity. In contrast to this argument, Fedderke et al. (2003) and Edwards and Golub (2002) argue that international trade relationships mean that adopting new technological change reduces the inefficient work force and improves productivity, which leads to better economic growth.

Edwards and Golub (2002) point out a number of reasons for the diversified and controversial researchers' findings on the impact of trade liberalisation and its relationship to labour productivity. Firstly, the middle-income countries (like South Africa) were excluded or were difficult to categorise either into developing or developed economy countries according to the Heckscher-Ohlin-Samuelson (HOS) model. Generally, most research has been used to analyse the impact of trade liberalisation in developed and developing countries. The Stolper-Samuelson (SS) theorem states that trade liberalisation is predicted to raise wage inequality in developed economies, but reduce wage inequality in developing economies. However, middle-income countries like South Africa compete with both developed and developing countries, and this can lead to potentially ambiguous outcomes arising from trade liberalisation (Edwards, 2004).

Secondly, the empirical applications disjuncture between empirical methodologies and testable hypotheses drawn from the HOS model frequently arise. For example, the Stolper-Samuelson theorem relates product price changes to factor returns and not to changes in employment. Thus far, only Fedderke et al. (2003) have directly analysed the relationship between product prices and factor returns in South Africa. The results showed that product price movements were biased. Furthermore, they concluded that the demand factors, and trade liberalisation related factors in particular, did not prove to carry a negative impact on labour in South Africa

(Fedderke et al. 2003). Moreover, Edwards and Golub (2002), Golub (2000) and Edwards (2004) analysed changes in the structure of trade or the factor content of trade and then inferred impacts on employment or wages. In these factor content studies, it was found that labour embedded in imports reduces the demand for domestic labour, while labour embedded in exports increases the demand for domestic labour. However, the factor-content approach lacks theoretical foundations and is not a strict application of the Stolper-Samuelson theorem as it uses trade flows, which are an endogenous outcome, to proxy price changes (Golub, 2000). Such relationship is only valid under restrictive assumptions regarding the nature of the production and consumption functions (Fedderke and Vase, 2004).

The third reason for diversification and controversial conclusions in the international trade studies is that most researchers lack consensus in the debate regarding whether to link trade liberalisation with economic growth or to export earnings. Further, there is inconsistency with respect to using tariff or non-tariff data in product prices. Generally, researchers fall short of seeing the impact of the long-run effect of trade flows in their methodology, and as a result, they reach different conclusions. The relationship between trade liberalisation, production, trade flows and employment has mostly been inferred from changing trends during the 1990s to the present. Such inferences are invalid for the South African economy as the 1990s were characterised by structural breaks such as the election of a democratic government, the ending of sanctions, a new macro-economic programme and new labour legislation (Holden, 2005; Edwards, 2004; Golub, 2000; Fedderke et al., 2003, and Van Niekerk, 2005).

In the final instance, the empirical research suggests that technological change has reduced the demand for labour, particularly for unskilled labour (Bhorat and Hodge, 1999; Edwards, 2001; Edwards, 2002 and Fedderke et al., 2003), and this does not cater for the possibility that the technological change may be trade-induced. In order to compete against cheaper foreign imports, firms may be forced to raise productivity through unskilled labour, thus preventing technical progress or defensive innovation, as stated by Wood (1995). Trade also increases skill-based technological transfers through imitating foreign technology or through the transfer of goods from developed countries (Pissarides, 1997).

Furthermore, Figini and Santarelli (2006) reported that the common problems many international studies share with respect to the impact of trade liberalisation are those aimed at achieving economic growth. These problems include the following:

- The low degree of comparability over time between countries due to the use of different income definitions (gross income, net income or expenditure) and units (such as person, household or household per capita);
- The choice of *ad hoc* procedures to deflate nominal values for changes in the cost of living;
- The underestimation of inequality and relative poverty due to underreporting in the household surveys, which is likely to be greater for the rich (Figini and Santarelli, 2006).

Therefore, when analysing economic growth variables, a researcher should bear in mind that economic indicators cannot be treated as fully comparable. As shown by Lanjouw and Lanjouw (2001), and Winters (2000 and 2004), some arrangements need to be made, such as:

- Purchasing Power Parity (PPP) adjustments, although not the best solution, must be used to correct for costs of living across countries;
- Non-wage income and taxation should be adequately treated when conducting country-level analyses (Figini and Santarelli, 2006).

The recent emerging and conflicting empirical evidence indicates a need to do more focused research on the implications of an open trade regime in the agricultural sector and its role in fostering economic growth. This is because one cannot merely derive from the literature that a more open trade regime for agriculture alone will foster economic growth in South Africa.

Therefore it is necessary to provide answers to the following questions:

- Have the current open trade regimes followed by South Africa, and in particular in the agricultural sector, culminated in the necessary economic growth?
- Are the current policies sufficiently sequenced and linked to provide support to an open trade regime?

- To which regional trading block must South Africa give more weight for its agricultural products, and what could the impact of a trading partner's distance and the exchange rate regime be?

Therefore, this study is relevant from a policy perspective, as trade liberalisation constitutes part of a crucial policy element in the government's current efforts to boost the underlying supply capacity of the economy.

1.3 OBJECTIVES

Flowing from the questions above, the overall objective of the study is to examine the impact of trade liberalisation and different Free Trade Agreements (FTAs) on agriculture's ability to contribute to economic growth; specifically, it will examine the empirical relationship between trade liberalisation, international trade flow in the agricultural industry and Total Factor Productivity (TFP).

Extending from the overall objective, the following sub-objectives are addressed:

- The impact of trade liberalisation on agriculture's ability to contribute to export earning,
- The extent of international market access and trade balance in the agricultural sector,
- An assessment of different regional trading block agreements and their trade flows in agricultural products (on selected agricultural products), including the impact of a trading partner's distance from South Africa and the exchange rate,
- The relationship between trade liberalisation and total agricultural factor productivity is examined by looking at the impact on third world economic growth over short-run and long-run scenarios,
- The main determinants of agricultural economic growth in the South African agricultural industry.

1.4 DATA AND METHODOLOGY

Data for this study was obtained from the South African Reserve Bank, Statistics South Africa, the National Department of Agriculture, the National Department of Trade and Industry and International Trade Centre (ITC). The study applies micro- and macro-level data to estimate the level of South Africa's agricultural growth caused by the effect of trade liberalisation.

In order to examine the impact of trade liberalisation on different Free Trade Agreements (FTAs), and to quantify agriculture's ability to contribute to economic growth and poverty reduction, different methodologies were used to help address and analyse each of the specific objectives highlighted above. The study uses mainly econometric analytical methods combined with different index coefficient calculations to achieve the aforementioned objectives.

To examine the impact of trade liberalisation on agriculture's ability to contribute to export earning (to achieve objective 1), the Gini coefficient is applied to measure the distribution of South Africa export/import to different destination/origin countries (using cross-sectional data 2007). A higher Gini coefficient indicates that the trading pattern is fairly diversified among export/import destination/origin countries. To verify this finding over long-run observation, the second analytical tool, namely the Intra-Industrial Trade (IIT) coefficient (with its key determinants of IIT), was applied. To identify the relationship among the determinants of IIT variables, the Ordinary Least Square (OLS) econometrical model is also necessary to support the results (that achieves objective 2). This key determinant of the IIT model is drawn from the theoretical and empirical literature. The model follows the general modelling of IIT determinants as developed by Oleh and Peter (1997), and it is applied to the aggregate agriculture IIT of South African agricultural trade from 1965 to 2007.

To address objective 3, the Gravity model was applied to test the potential benefit from bilateral export/import. The model measures the regional trading block agreement and its trade flow. It determines potential trade through a combination of macro-economic variables such as size, income, distance, exchange rates, prices etc. between trading partners included in this model.

Co-integrations between trade liberalisation and Total Factor Productivity (TFP) were included to test the short- and long-run relationship between trade liberalisation and TFP and the subsequent impact on economic growth. Both cross-sectional and time-series data is applied. For cross-sectional analysis, data was pooled from 1995 to 2007 for nine South African agricultural commodities (namely, sorghum, wheat, dry beans, soybeans, oats, groundnuts, sugar, maize and beef).

Lastly, to identify determinants of agricultural growth, the Exact Maximum Likelihood (EML) method is used to examine the major determinants of economic growth, and its relationship to trade liberalisation. Following the general modelling of Norman and Raimundo (2002), the study uses Exact Maximum Likelihood to estimate the variation of a growth regression.

A detailed description of each technique is provided in the subsequent chapters.

1.5 CONTRIBUTION OF THE STUDY

The study is directive from a policy perspective, as trade liberalisation constitutes an important element in the government's efforts to boost the underlying supply capacity of the economy. From a research perspective, the empirical results of this study would be timeous as South Africa affords the opportunity for an in-depth case study on account of significant variation in trade policy orientation and productivity performance across the agriculture sector. South Africa also has a wide variation in its degree of openness, owing both to external sanctions under the apartheid regime and to trade liberalisation and this make the study more comprehensive.

The study results show how the South African agricultural sector benefited from trade liberalisation and leads to a forward-looking assessment with respect to how the sector should be handled. It also considers the question of which regional trading block South Africa should give more emphasis to in order to promote economic growth and poverty reduction. Furthermore, the study aims to provide a policy formulation base that may benefit the agricultural sector.

Specific changes in trade volumes, patterns and prices offer interest to many stakeholders in agriculture. Results of this study can indicate sectors within the industry that could potentially

gain from trade liberalisation. Thus, it can be useful to trade with participants in exporting and importing countries, including producers, processors, shippers, and policy-makers.

This study also is of interest to other researchers whose areas of study are in commodity trade, regional integration or international trade. Governmental and non-governmental trade related agencies would find the results of this study useful in trade negotiations and analysis.

1.6 OUTLINE OF THE STUDY

The study is primarily concerned with the role of trade liberalisation and different Free Trade Agreements (FTAs) on agriculture's ability to contribute to economic growth; more specifically, it examines the empirical relationship between trade liberalisation and international trade flow in the agricultural industry in light of South Africa's effort to integrate its economy with the rest of the world's. To sufficiently address this objective, **Chapter 2** provides a review of relevant literature regarding the role of international trade agreements in creating market access to third world countries, further highlighting how some processes and policy changes that South Africa follows have led to the prevailing situation with respect to market access. It also presents factors that explicitly have an influence in the success and potential of trade agreements understood to influence market access. Further, it provides an overview of the current debate on trade liberalisation in the context of economic growth and poverty alleviation.

Chapter 3 provides a description of the role of agriculture in the South African economy, the South African agricultural output compositions and its trade flow. It also presents the current challenges that the South African agricultural sector is facing. It continues to examine the empirical relationship between trade liberalisation and international trade flow in the agricultural industry, addressing their contribution to the economy using a detailed methodological discussion; the motivation and model development is discussed in **Chapter 4.**

Chapter 5 provides an assessment of gains from trade liberalisation; the role of the exchange rate and distance in international market access is dealt with in **Chapter 6**. Here, a Gravity Regression model is applied. Thereafter, the relationship between trade liberalisation, total

agricultural factor productivity and economic growth is analysed in **Chapter 7**. Finally, **Chapter 8** provides the overall conclusions and recommendations of the research.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides a review of relevant literature regarding the relationship between economic growth and trade liberalisation. It provides a systematic account of the stylised facts that characterise economic growth and the current critical debate on the impact of trade liberalisation; it further presents the complexity and interpretation of trade liberalisation in African economies. It also revisits the question of what drives long-run economic growth, and draws upon various methods of analyses after introducing potential approaches to analyse international trade and patterns of trade.

2.2 AGRICULTURAL GROWTH AND ECONOMIC DEVELOPMENT

Development economists in general and agricultural economists in particular have long focused on how agriculture can best contribute to overall economic growth and modernisation. Many early analysts (Rosenstein-Rodan, 1943; Lewis, 1954; Scitovsky, 1954; Hirschman, 1958; Jorgenson, 1961; Fei and Ranis, 1961, in Stringer and Pingali, 2004) highlighted agriculture's abundant resources and ability to transfer surpluses to the more important industrial sector. The conventional approach to the roles of agriculture in development concentrated on agriculture's important market-mediated linkages, such as: (i) providing labour for an urbanised industrial work force; (ii) producing food for expanding populations with higher incomes; (iii) supplying savings for investment in industry; (iv) enlarging markets for industrial output; (v) providing export earnings to pay for imported capital goods; and (vi) producing primary materials for agro-processing industries (Johnston and Mellor, 1961; Ranis *et al.,* 1990; Delgado *et al.*, 1994, in Pingali, 1997, and Timmer, 1988 and 2002).

There are good reasons why these early approaches focused on agriculture's economic role as being a one-way path involving the flow of resources towards the industrial sector and urban centres. In agrarian societies with few trading opportunities, most resources are devoted to the provision of food. As national income rises, the demand for food increases much more slowly than with other goods and services. As a result, value added from the farm household's own labour, land and capital as a share of the gross value of agricultural output – falls over time (Pingali, 1997). Farmers' increasing use of purchased intermediate inputs and off-farm services adds to the relative decline of the producing agriculture sector, per sector (Timmer, 1988, 2002; Pingali, 1997).

Rapid agricultural productivity growth is a prerequisite for the market mediated linkages to be mutually beneficial. Productivity growth that resulted from agricultural R&D has had an enormous impact on food supplies and food prices, and consequently, has been beneficial to food security and poverty reduction (Hayami and Herdt, 1977; Pinstrup-Andersen *et al.,* 1976; Binswanger, 1980; Hazell and Haggblade, 1993, in Stringer and Pingali, 2004).

Agricultural productivity growth also triggers the generation of non-market mediated linkages between the agricultural sector and the rest of the economy. These include the indirect contributions of a vibrant agricultural sector to: food security and poverty alleviation; taking on a safety net and buffering role, and the supply of environmental services (FAO, 2004a). While direct contribution to private farm households is tangible, easy to understand and simple to quantify, its numerous indirect benefits tend to be overlooked in assessing rates of returns. Dorward, Kydd, Morrison and Urey (2004) mention that ignoring the whole range of economic and social contributions of agriculture underestimates the returns to investment in the sector.

Substantial empirical evidence exists on the positive relationship between agricultural growth and economic development (see Dorward *et al*., 2004). The transformation of agriculture from its traditional subsistence roots, induced by technical change, to a modern and ultimately industrialised agriculture sector is a phenomenon observed across the developing world. However, there are also a large number of countries that have stalled in the transformation

process, or have yet to 'get agriculture moving. These countries are always classified as the 'least developed'. Pingali (1997) showed that even within countries that are well on the path towards agricultural transformation, there are significant inter-regional differences (for example, in eastern India). Some of the reasons that lead to the poor performance of agriculture in eastern India are outlined as follows:

i) Low and inelastic demand for agricultural output due to low population density and poor market access conditions;

ii) Poor provision of public goods investments in rural areas;

iii) Lack of technology R&D with respect to commodities and environments important to the poor;

iv) A high share of agro-climatically constrained land resources; and

v) Institutional barriers to enhancing productivity growth.

Therefore, it is a basic research question to ask whether globalisation will make a difference: Will trade integration and increased global interconnectedness enhance or impede the process of agricultural transformation for countries (especially many African countries) that have successfully used agriculture as an 'engine of growth? This study tries to answer the above critical questions within the context of South African agricultural industries, by accessing factors affecting the important determinants of economic growth.

2.3 DETERMINANTS OF ECONOMIC GROWTH

A large variety of economic and social variables can be put forward as determinants of economic growth. Norman and Raimundo (2002) defined and categorised the economic variables by dividing them into five groups: cyclical reversion, structural policies and institutions, stabilisation policies, transitional convergence and external conditions.

2.3.1 Cyclical reversion

Researchers could not come to a consensus with regard to the question of modified output growth and whether it is responsible for the decline in the volatility of output or a decline in the difference between recessions and expansions, or both (Aghion, Philippe, Romain and Kenneth, 2004).

Although the main objective of any economic growth study is to account for long-run trends in economic growth, in practice, most of the researchers work with relatively short time periods (five- or ten-year averages) for both econometric estimation and forecasts. At these frequencies, cyclical effects are bound to play a role, as stated by Aghion *et al.* (2004).

It is important to include some explanatory variables that are not standard in the long-run growth literature but that do capture important elements of the business cycle. One of them deals with cyclical reversion in the long-run trend. Other cyclical factors are included under the category of stabilisation policies, which is introduced below. Therefore, this research accounts for cyclical reversion by including the output gap as a growth determinant at the start of each period. In addition to improving the regression fit, this controls the initial output gap, which allows and avoids overestimating the speed of transitional convergence inferred from the coefficient on initial per capita output. The output gap used in the regression is obtained as the difference between potential and actual GDP around the start of the period. The Baxter-King filter is then used to decompose GDP and estimate an annual series of potential (trend) and cyclical output for each country in the sample (Aghion *et al.*, 2004).

2.3.2 Structural policies and institutions

The underlying theme of all of the endogenous growth literature is that the rate of economic growth can be affected by public policies. Disagreement arises over which policies are most conducive to growth and/or the sequence in which policy changes must be undertaken, but everyone agrees that Government can and do influence long-run growth in either case. While theoretical work usually focuses on one policy or on a combination of a few policies, empirical work tends to be comprehensive in considering a wide array of policy and institutional

determinants of growth (Levine, Loayza and Beck, 2000). Education, financial systems, trade liberalisation and government support are major factors of structural and institutional arrangements that are needed to drive economic growth.

The second variable under this category is related to financial depth. A well-functioning financial system promotes the economic growth rate and can influence economic efficiency through different channels. Financial markets facilitate risk diversification by trading, pooling and hedging financial instruments (Levine *et al*., 2000).

The third category associated with economic growth is trade liberalisation. The literature points out five channels through which trade affects economic growth (Lederman and Luisea, 1997). Firstly, trade liberalisation leads to higher specialisation. Secondly, it can expand potential markets, which allows domestic firms to take advantage of economies of scale. Thirdly, trade liberalisation diffuses both technological innovations and improves managerial practices. Fourthly, freer trade tends to lessen anti-competitive practices for domestic firms. Lastly, trade liberalisation reduces the incentives for industries to conduct unproductive rent-seeking activities.

The majority of empirical evidence indicates that the relationship between economic growth and international openness is indeed positive. That reflects a virtuous cycle by which higher openness leads to economic growth improvement, which, in turn, generates larger trade (Lederman and Luisea, 1997).

Government support is another important structural policy related to the government's spending in rural infrastructure, agricultural research, health and education to stimulate agricultural growth. This definitely leads to greater employment, income-earning and better opportunities to access cheaper food prices (Lederman and Luisea, 1997). Well-structured and effectively managed government expenditures can possibly enhance investments. Governments need to allocate adequate budgets to agricultural research, to irrigation development and rural infrastructure (including roads and electricity), thereby contributing directly to economic growth (Department for International Development (DFID), 2005).

2.3.3 Stabilisation policies

The stabilisation of macro-economic variables not only affects the cyclical fluctuations, but also long-run economic growth. In fact, an argument can be made that cyclical and trend growth are interrelated processes (Fatás, Mihov and Rose, 2004), which implies that macro-economic stabilisation and crisis-related variables have an impact on short-term horizons and the long-run performance of the economy (Fischer, 1993). Fiscal monetary and financial policies can contribute to a stable macro-economic environment and avoidance of financial and balance-of-payments crises. This is important for long-run economic growth. Reducing uncertainty, encouraging firm investment, reducing societal disputes for the distribution of *ex post* rents (for instance, between owners and employees in the face of unexpectedly high inflation), and allowing economic agents to concentrate on productive activities (rather than trying to manage high risk) all benefit economic growth (Fisher, 1993).

2.3.4 Transitional convergence

One of the main implications that the neoclassical growth models take into account is transitional dynamics. This concept shows that the growth rate depends on the initial position of the economy (Turnovsky, 2002). The 'conditional convergence' hypothesis maintains that poor countries could possibly show faster economic growth than the richer countries because of decreasing returns to the scale of production (Turnovsky, 2002).

2.3.5 External conditions

A country's economic activities and growth are shaped not only by internal factors, but also by external conditions. These have an influence on the domestic economy in both the short- and long-run. There is ample evidence of transmission of cycles across countries via international trade, external financial flows, and investors' perceptions of the expected profitability of the global economy (Kanji and Barrientos, 2002). Changes in long-run trends can also be spread across countries. This is achieved through, for example, the demonstrative effect of economic reforms and the diffusion of technological progress (Keller, 2002).

We take external conditions into account by including two additional variables in the growth regression, i.e., the terms-of-trade shocks affecting each country individually and a period-specific shift affecting all countries in the sample. Terms-of-trade shocks capture changes in both the international demand for a country's exports and the cost of production and consumption inputs (Easterly, 2001, and Fischer, 1993).

The period-specific shifts (or time dummy variables) summarise the prevalent global conditions at a given period of time and reflect worldwide recessions and booms, changes in the allocation and cost of international capital flows, and technological innovations (Easterly, 2001).

2.4 CRITICAL DEBATE ON THE IMPACT OF TRADE LIBERALISATION ON ECONOMIC GROWTH

Economic growth and the impact of trade liberalisation on poverty reduction remains controversial among researchers (Daniel and Sunday, 2002). The basic rationale is that, if growth distribution is neutral among countries (regions), and both trade liberalisation and economic reforms favour more open trade, then it can be argued that trade liberalisation should be beneficial to poverty reduction. However, the evidence suggests that the issue is much more complex and controversial (Figini and Santarelli, 2006).

Rodriguez and Rodrik (1999) have criticised arguments that associate trade openness with more rapid economic growth. They indicated that there is lack of control of the indicators of economic growth. Rodrik (1998) argues that trade policy on its own is also an unreliable instrument in generating successful agricultural productivity and economic growth, due to inefficiencies in delivering improved market access, geopolitical interests and other factors.

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

Ravallion (2001) takes a more prudent position, pointing to the need for more country-specific research. However, in the years since trade liberalisation, both poverty and inequality have decreased.

Santos-Paulino and Thirlwall (2004) were even more critical of the effect of trade liberalisation on a country's economic growth. This study was conducted on 22 developing countries, and revealed that the adoption of trade liberalisation policies stimulated both export and import growth. Thus, trade liberalisation is likely to have exerted a net positive effect on the economic growth over the three decades of their research.

Manchin (2005) concentrated on African, Caribbean and Pacific (ACP) countries, using threshold estimation to test preferential access to the EU. The study found that ACP countries have been unsuccessful in taking advantage of the preferential access status. For instance, the share of world export from ACP countries fell from 3.4% in 1976 to 1.9% in 2000; similarly, the share of EU imports from ACP countries decreased from 6.7% in 1976 to 3.11% in 2002. The trend indicates that these countries need to consider their decision of whether to request preferences, and must take into account the cost of production factors, quality of products, competitiveness, quality of infrastructure and institutional qualities.

More specifically, Lewis, Robinson and Thierfelder (1999) developed a multi-country model that focused on southern Africa, and analysed the impact of tariff reduction on African economies both in a regional and global context. The model is used as a simulation laboratory to sort out the relative empirical importance of different types of trade liberalisation. The empirical results and conclusions showed that the South African economy is not large enough to serve as a growth pole for the SADC region. Moreover, the study showed that access to EU markets provided substantially bigger gains for the rest of the southern African countries. However, certain sectors in southern Africa benefited more from global tariff reductions than from a trilateral FTA between the EU, South Africa and the rest of the southern African countries.

Jonsson and Subramanian (2001) also tested the proposition that trade liberalisation is beneficial to the dynamic efficiency of South Africa, and used both the cross-sectional and time-series approach, covering different manufacturing sectors (the food industry was included in their study) for the period of 1990-1999. Both approaches validate the above proposition with a high degree of statistical reliability. The results obtained indicate that trade liberalisation 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.

The lack of a theoretical framework regarding the impact of trade liberalisation on poverty reduction and the conflicting empirical evidence that has emerged over recent years indicates a need to do more focused research on the implications that an open trade regime has on the agricultural sector and on its role in fostering economic growth. One cannot derive from the current literature that a more open trade regime for agriculture alone fosters economic growth in South Africa.

2.5 THE ROLE OF AGRICULTURE IN GENERATING ECONOMIC GROWTH AND REDUCING POVERTY

Most research approaches are based on the premise of agriculture's importance in poverty reduction, which goes far beyond its direct impact on farmers' incomes. There is ample evidence that increasing agricultural productivity has benefited millions by creating job opportunities and providing higher incomes to farms (Bryceson, 1999b). Subsequently, cheaper food prices result for the consumer. More importantly, it can provide a spur to economic development outside agriculture. As evidence from Department of International Development (2005) indicates that agricultural growth is highly effective in reducing poverty, for example every 1% increase in per capita agricultural output led to a 1.61% increase in the incomes in the poorest countries. Furthermore, Thirtle et al. (2001) cross-country analysis study in Africa also shows that on average, every 1% increase in agricultural yields a reduction of number of people living on less than US$1 a day by 0.83%. Further this study indictes that every additional $1 of farm income leads to a further income up to $3 elsewhere in the economy. This implies "the multipliers" effect of agricultural contribution to the rest of the economy is three times as large as non-agricultural contribution (Bryceson, 1999b).

Diversification of investment is a key factor for sustained poverty reduction and economic growth for poor countries. However, it is important to increase agricultural productivity that enables countries to take the initial step towards prosperity. This is particularly the case for labour-intensive, small-scale agriculture, which has strong links to economic growth in other areas. No poor country has ever successfully reduced poverty or achieved economic growth through agriculture alone; however, almost none of the rich countries have achieved economic growth without first increasing agricultural productivity (FAO, 2003).

The positive relationship between agricultural growth and overall economic growth is empirically well-established (Kieran and Karl, 2007). Evidence consistently shows that agricultural growth is highly effective in reducing poverty. Gallup *et al.* (1997) (in Department for International Development (DFID), 2005) showed that every 1% increase in per capita agricultural output leads to a 1.61% increase in the income of the poor.

Reversing recent disappointing trends in agriculture's performance is critical if poor countries are to escape from the trap of slow economic growth and poverty. This is particularly true in sub-Saharan Africa, where growth in agricultural output has barely kept pace with population growth. Productivity has stagnated, slowing wider economic growth and exacerbating poverty. In comparison with Asia, where the green revolution took place, the rate of economic growth from agricultural productivity has begun to slow, and there are serious consequences for further poverty reduction in that part of the world (FAO, 2003).

It is challenging to increase agricultural productivity in many of the world's poorest countries. A difficult setting for agricultural development (particularly for small farmers) has emerged due to a shortage of land and water, and factors such as climate change, an inequitable global trading system, depressed commodity prices and HIV/AIDS. This has led to scepticism as to whether agriculture can still deliver economic growth and reduce poverty in today's challenging context. Nevertheless, while a second green revolution on the scale of Asia's transformation may not be possible today, evidence suggests that farmers in Africa and other priority areas can overcome these challenges and achieve significant improvements in productivity (DFID, 2005). A major

change in agriculture's performance in the world's poorest countries is possible and must be achieved if millions of people are to escape poverty. Although the precise pathway to achieving poverty reduction needs to be debated within individual countries, the DFID (2005) has provided a number of guiding principles that are generally applicable to third world countries.

2.6 COMPLEXITY OF ECONOMIC GROWTH, AGRICULTURAL TRADE LIBERALISATION AND POVERTY REDUCTION LINKAGE

Whilst the contribution of economic growth to poverty reduction is well-established (e.g., the Economic Commission for Africa, 2005), identifying the poverty impacts of trade reforms is problematic.

Firstly, the nature of 'poverty' is contested. Conway (2004) sets out the spectrum of definitions of poverty – from income poverty to the broader definitions that incorporate vulnerability and voice. He points out that empirical work has shown that the poor often make trade-offs between poverty and vulnerability, opting to minimise risk rather than maximise income. A wider conception of poverty can help explain why the poor find it hard to take advantage of the opportunities presented by trade liberalisation. Conway (2004) identified four channels through which trade liberalisation could affect poverty, including: consumption (prices faced by poor households); income (returns to labour, assets and production); provision of public goods (health, education etc.) and security (the capacity to mitigate risk and cope with shocks). In most cases, however, analysis has been conducted largely on the basis that poverty is aligned with income.

Secondly, when discussing trade liberalisation, it is important to distinguish between liberalisation of the country concerned and that of its trading partners. Both bring different costs and benefits. Own-liberalisation should benefit consumers by lowering prices, and reduce input costs for producers (although this is often reversed by accompanying exchange rate devaluations). However, producers may also face competition from cheap imports that can outweigh the benefits. Trade liberalisation by trading partners should improve both volumes and prices for exports, thereby benefiting export crop producers (DFID, 2005).

FAO (2003) studied the impact of import liberalisation in 14 countries and found that in many developing countries where there are trade reforms and unilateral trade liberalisation, there have been more frequent import surges by country and by product since the 1980s. Oxfam International (2002) found that a combination of import liberalisation and food aid reduced local rice production from more than 110 000 tonnes in 1985 to approximately 80 000 tonnes in 1995, and there were negative impacts on small producers.

Another study by Oxfam also found negative impacts on maize farmers in Mexico due to trade liberalisation under NAFTA (Oxfam, 2002). This is disputed by the US Department of Agriculture, which argues that Mexican producers buy and produce white corn for the purpose of human consumption. USDA claims that most of the corn that the US is sending to the Mexican market is yellow corn intended for livestock feed (USDA, 2003), but Oxfam (2002) affirms that white corn was previously fed to animals and has now been replaced by imported yellow corn, thereby reducing demand for domestically produced maize.

FAO (2004) studies in Africa show a positive and encouraging result on the reduction of inequality and food insecurity as a result of trade liberalisation. For example, in Uganda, there has been economic growth and trade reform-induced significant output increases in key export commodities, but there has been a very limited reduction in levels of undernourishment. Furthermore, there are sharp distinctions between regions within countries. In Ghana, where the agricultural supply response following reform has been positive, declines in food insecurity did not occur evenly across different groups. The proportion of households in Accra, Ghana, that are unable to meet minimum nutritional requirements declined by more than 80% (FAO, 2004).

A key reason for these complexities is that trade policy reform does not occur in isolation from other policy and institutional changes. Agricultural trade policy reform in many SSA economies has been a component of a wider package of reforms. The FAO (2004) argues that the exchange rate devaluations had a far more significant positive impact on domestic producer prices than changes in levels of border protection (FAO, 2004).

Furthermore, DFID (2005) studies show that, faced by the difficulty of isolating the impact of trade policy, analysts have largely resorted to *ex ante* analyses. The World Bank's Global Economic Prospects (GEP) of 2004 provides an example of a simulation exercise attempting to identify the number of individuals lifted out of poverty under a pro-poor trade reform scenario. Under this scenario, rich countries would be subject to a maximum agricultural tariff of 10% and an average of 5%; developing countries had tariffs of 15 and 10%, respectively (with similar changes in the manufacturing tariff). In addition, export subsidies would be eliminated and domestic support decoupled. This reduction in agricultural protectionism and domestic support is predicted to result in a gain of $193 billion by 2015 (two-thirds of the total gain from all merchandise trade reform). In terms of poverty reduction, the number of people living on less than $2 per day would fall by 144 million, with the greatest gains forecasted for the SSA area (DFID, 2005).

The GEP (2004) analysis has been criticised for ignoring preferential access or regional agreements in its model. Many reviewers suggest the attempts only took into account the reality, and that any liberalisation analysis would have (even if only partially) arrived at similar conclusions. In Achterbosch *et al.*'s study (2004), they found that partial reforms eroded preferences for African producers, and failed to provide compensatory improved market access to other markets.

Whilst Dorward *et al.* (2003) in DFID (2005) simulated CGE models to test the impact of policy change, the findings tended not to be sufficiently disaggregated to enable household level responses to policy change. According to this evidence, households respond quite differently to changes in price and non-price incentives. The estimated values presented in CGE assume an identical response across countries.

The arguments presented in the FAO (2003) report are summarised in Figure 2.1. It is based upon the flow charts in McCulloch *et al.* (2002) and is designed to map the link between liberalisation and poverty.

The figure below applies only to changes to a nation's specific national trade policy. The overall impact on food security will depend upon both national and foreign trade policy changes. The greatest challenge for developing countries may be that both sets of changes are likely to occur at the same time. This would result in a substantial overall change in the production, trade, labour and transfer entitlements of many potentially food insecure people (FAO, 2003).

What trade liberalisation proposed? ↓	→	Steps needed: 1. find out for each good (agricultural and non-agricultural): what is the world price? what is the domestic price? what is the current tariff (or tariff equivalent)? what is the proposed tariff (or other restriction)? 2. from this, identify the goods that may experience the biggest potential change in price.
Are the goods consumed or produced by vulnerable groups? ↓	→	Steps needed: 1. List the extent to which the goods supply entitlements go to potentially food insecure groups. 2. Identify those goods that are supply entitlements that are likely to experience a large price change.
Is the change in the border price likely to be passed on to poor consumers, or to the markets in which poor producers and labourers operate? ↓	→	Steps needed: 1. Identify the reasons why the price change may not be passed on. 2. Formulate structural and institutional reforms to improve price transmission, and where this will enhance entitlements. 3. Design complementary policies to offset price transmission, and where this will protect entitlements.
Will the new trade rules affect the feasibility of complementary government action (by reducing revenue or restricting subsidies)?	YES? →	Steps needed (if effects are adverse): 1. Put in place measures to diversify revenue sources if trade taxes are important. 2. Consider if there are alternative ways of achieving the ends sought that might avoid WTO restrictions.
	NO? →	Direct effects on food security likely to be limited.

Figure 2.1: Flowchart for Policy-Makers on National Trade Policy and Food Security

Source: McCulloch, Winters & Cirera (2002). *Trade Liberalisation and Poverty: A Handbook.* London: CEPR and DFID in FAO (2003).

2.7 AGRICULTURAL TRADE AND MARKET REFORMS IN AFRICA

African countries are at different stages of reforming their domestic, intra-regional and extra-regional agricultural markets. Governments have been successful at reforming less sensitive commodity markets, but have been slow at reforming the more sensitive ones. Several regional

Free Trade Areas (FTAs) have been established in Africa but extra-regional agricultural trade is still restricted. It is expected that building preferential conditions for expanded intra-regional marketing will take place prior to the lowering of trade barriers between regional trade groups and with the rest of the world (FAO, 2003).

2.7.1 Domestic market reforms in Africa

In Africa, the conflicting goal of maintaining food prices that are profitable for producers but affordable for consumers has been pursued through controlled marketing systems. Subsidies have been used to artificially raise prices for producers and lower them for consumers. SSA farmers need to be helped with respect to investing, especially when they are facing prices below their production costs, but agricultural subsidies have become fiscally unsustainable. This has led to domestic cereal market reforms in several African countries in the 1980s and 1990s (FAO, 2003). Management of this fiscal problem is often construed as being inappropriately antagonistic towards agricultural subsidies in SSA, given their use at incommensurably higher levels in industrialised countries. Domestic reforms in SSA meant modifying state interventions and policies to reduce marketing costs and government budget costs. FAO (2003) stipulated that the core policy changes that African countries have been implementing include:

- Removal of barriers to private sector involvement (e.g., licensing and movement controls on inputs and outputs);
- Deregulation of consumer and producer prices;
- Elimination of taxes and subsidies (implicit and explicit);
- Privatisation of state marketing or processing enterprises;
- Abolition of official monopolies (and agents of the state) and the opening of trade to competition.

A broad assessment of the agricultural reform in Africa shows three basic patterns. Firstly, some governments have implemented a committed programme of market reform. Examples in eastern and southern Africa would arguably include maize and fertiliser marketing in Mozambique and

Uganda. Mali and Ghana are two other countries commonly cited for their relatively steady adherence to cereal market reforms (World Bank, 2005). This category would also include countries where reforms may have been temporarily reversed, but over time have moved to a fundamentally market-oriented system (e.g., the United Republic of Tanzania's food markets). It is important to note that these cases are neither success stories nor failures when measures such as growth in GDP per capita and incidence of poverty are employed. On the other hand, the adherence to market reforms, for example, in cereal markets, has improved household food security (FAO, 2003). A second path includes countries that have openly resisted reform or re-imposed controls after some experimentation with reform. This category is characterised by transparent resistance to liberalisation (e.g., maize in Zimbabwe after 1998). The third form involves *de jure* liberalisation and *de facto* state control of marketing, where the state maintains control while ostensibly implementing liberalisation. The fertiliser markets in Zambia and Ethiopia and the coffee market in Malawi exemplify this category (Buccola and McCandlish, 1999, in FAO, 2003). It is difficult to argue that countries which have followed this path have succeeded or failed to reduce the incidence of poverty, but it is clear that private sector-led agricultural development has been severely stifled.

2.7.2 Intra-regional trade liberalisation in Africa

The liberalisation of domestic markets in Africa is taking place at a time when there is increasing renewal or creation of a number of regional trade arrangements. Countries in SSA share common colonial histories and characteristics, especially administrative and legal institutions. An increasing number of countries are coming together to forge stronger trading links among themselves (ECA, 2004). These trading blocs tend to allow for free movement of factors related to agricultural production, agricultural commodities and services. Intra-African trade could prove to be a key avenue for achieving sustainable economic development and preparing for competition and globalisation. Increased regional integration in trade and investment is expected to lead to an expansion in the agricultural sectors of exporting countries, and to an overall improvement in the region's competitiveness (ECA, 2003 and 2004).

Under regional trade liberalisation programmes, the core policy changes involve:

- Eliminating procedural barriers to free trade, e.g., import licences;
- Eliminating tariff and non-tariff barriers for intra-regional trade;
- Avoiding recourse to import bans and export prohibitions;
- Eliminating import levies and export tax;
- Adhering to a common external tariff in accordance with regional and WTO obligations.

Not all countries are signatories to regional trade protocols and, even after signing the protocols, trade tariffs still continue because the level of preparedness is low. Regional agreements that were active in the 1990s include the West African Economic and Monetary Union (WAEMU), the Regional Integration Facilitation Forum (RIFF) – formerly the Cross-Border Initiative (CBI) – the Southern Africa Customs Union (SACU) and the Central Africa Economic and Monetary Community (CAEMC). Regional trade agreements have also been created under the Southern African Development Community (SADC), the Common Market for Eastern and Southern Africa (COMESA), the Commission for East African Cooperation (EAC), the Indian Ocean Commission (IOC) and the Economic Community of West African States (ECOWAS) (see Table 2.1). With the exception of WAEMU, members of the other regional bodies have overlapping memberships or they may belong to two or more other trading blocs (ECA, 2003):

Table 2.1: Membership in Regional Trade Agreements of Selected African Countries

Regional Trade Agreements							
Country	**SADC**	**COMESA**	**SACU**	**RIFF**	**EAC**	**IOC**	**WAE**
Angola	X	X					
Benin							x
Botswana	X		X				
Burkina Faso				x			x
Burundi		X		x			
Comoros		X				x	
Democratic Republic of the Congo		X					
Côte d'Ivoire							x
Djibouti		X					
Egypt		X					
Eritrea		X					
Ethiopia		X					
Guinea Bissau							x
Kenya		X		x	x		
Lesotho	X		X				
Madagascar		X		x		x	
Malawi	X	X		x			
Mali							x
Mauritius	X			x		x	
Mozambique	X						
Namibia	X	X	X	x			
Niger							x
Rwanda		X		x			
Senegal							x
Seychelles	X	X		x		x	
South Africa	X		X				
Sudan		X					
Swaziland	X	X	X	x			
Tanzania, United	X	X		x	x	x	
Togo							x
Uganda		X			x		
Zambia	X	X		x			
Zimbabwe	X	X		x			

Source: ECA (2003)

2.7.3 Extra-regional trade reforms in Africa

Regional integration is not a new issue in Africa, and it dates back to 1910. However, the step was taken to ensure that members pursued a coordinated trade policy approach with regard to third parties (Grant, 2006). A common external tariff did exist. However, members had in reality been negotiating bilateral free trade arrangements. The members were forced to adhere to some

of the provisions of the agreement, especially concerning the tariff concessions offered (Grant, 2006).

The restrictions on extra-regional trade have been lowered to a maximum of 20% in the case of West African countries, whereas in southern Africa, the national tariffs are as high as 35% (Jonsson and Subramanian, 2001). A number of countries in Africa made significant progress towards opening up their economies to international trade during the 1990s (Jonsson and Subramanian, 2001). Open trade regimes participation has increased from 7% in the 1980s to 25% in the late 1990s. According to the IMF's assessment of trade regimes, as indicated in Table 2.2, Africa currently has the most restrictive tariff regimes and the highest average level of tariffs and tariff revenue as a ratio to GDP. Countries in eastern and southern Africa are more strongly protected than the remaining countries in Africa (Jonsson and Subramanian, 2001).

Despite these high tariffs, WTO agreements exempt Least Developed Countries from tariff reductions and allow lower commitments and longer implementation periods in developing countries as opposed to in developed countries. The majority of African states faces difficulties in balancing their budgets and cannot afford provision of support programmes and export subsidies to match developed countries' (Jonsson and Subramanian, 2001).

Table 2.2: IMF Trade Restrictiveness Index, Africa and Other Regions, 2000

Region	Overall Rating	NTB Rating	Tariff Rating	Average Tariff (%)
Sub-Saharan Africa	4.7	1.6	3.0	19.2
Eastern and southern Africa	5.6	1.8	3.5	20.3
Central and western Africa	4.3	1.4	3.0	18.9
Fast-growing countries of Asia	3.4	1.7	1.3	7.2
Asia, excluding fast-growing countries	5.0	1.9	2.4	13.8
Eastern Europe (early transition) & Baltic countries	1.9	1.1	1.4	8.0
Eastern Europe (late transition)	2.9	1.4	1.8	11.5
Former USSR	4.2	1.8	1.8	10.2
Middle East and North Africa	5.6	2.0	3.0	18.1
Western Hemisphere	4.1	1.8	1.8	11.7
Industrial countries	3.9	2.0	1.0	5.4

Source: Jonsson and Subramanian (2001)

2.7.4 Impact of trade liberalisation on agricultural productivity in Africa

There is a strong correlation between export expansion and economic growth, but the challenge is whether the small farmers in Africa can participate effectively in international specialisation. Such participation is only possible if farmers' productivity can increase and the costs and risks of engaging in trade are reduced (FAO, 2003). As trade liberilisation increases has influece to producer prices to decline and farm input costs to rise. That makes farmers unable to invest and commercialise their production activities, leading to structural transformation. Although there is some evidence that output marketing reforms in Africa have been associated with increases in land and labour productivity at an aggregate level, much of the increase is due to shifts in crop mix and the geographical location of production rather than because of the intensification of existing farming systems (FAO, 2003). There is even less evidence that food marketing reforms have promoted intensification of the key food crops. Crop mix shifts have often been towards crops whose output markets were not liberalised (e.g., cotton in Burkina Faso and Mali, groundnuts in Senegal and coffee in Rwanda). However, this does not imply that cash cropping incentives have not benefited from marketing policy reform in key subsistence crop sectors. It has been shown that the ability to ensure reliable and low-cost food for rural households is an important determinant of their ability to diversify into higher value non-food crops. Cash crop growers have benefited directly from pre-harvest support provided under commercial outgrower schemes. The development of credit markets to finance commercial cereal production remains a challenge (FAO, 2003).

2.7.5 Impact of reforms on agricultural trade in Africa

Regional integration is occurring, as evidenced by an increasing trend in trade volumes (ECA, 2003). The countries that benefit most are those with the capacity to respond to the new opportunities brought about by the domestic reforms prior to the establishment of regional Free Trade Areas (FTAs). It is strongly suspected that the volume of trade will increase significantly among countries who are members of regional FTAs, but it is less sure that this trade expansion will be extended to the rest of the world. It is also a challenge for SSA to increase intra-FTA trade

in the context of lower import protection on highly subsidised agricultural exports from industrialised countries (ECA, 2003). Cotton and tea exports from the region have been able to displace imports from Asia. This same impact has been observed in West Africa, where Sahel livestock products are being substituted for non-regional imports which are often heavily subsidised. The current picture in COMESA shows that there is more export concentration in regional trade than in extra-COMESA trade. While the CFA franc has been remarkably stable since 1947, it hindered competitiveness of countries in the West African Monetary and Economic Union (UMEOA). The overvaluation of the CFA franc meant that EU agricultural imports into the region were cheap. With its devaluation in 1994, the international competitiveness of countries in the CFA franc zone improved and this opened up opportunities for intra-regional trade in meat, cereal and other products. However, increased regional trade has not prevented increases in food imports from third world countries, particularly of wheat and poultry (OECD, 2006).

An alternative view is that trading blocs are not always good for international trading. Trading blocs create tariffs and barriers which inhibit free trade with third parties. The reverse argument is that international trade is not an endpoint in itself when it links trading partners with highly differentiated levels of productivity and competitiveness (OECD, 2006). Trade analysts have shown that increased intra-African trade occurs at the cost of reducing trade with the rest of the world, which explains Africa's continuous under-trading on the global market. Intra-regional trade is diverting trade from outside the trading blocs, but there is no evidence to suggest that there has been trade creation. If a partner country's production displaces production from more efficient non-members, this reduces welfare; when a partner country's production displaces higher cost domestic production, there is trade creation, which enhances welfare. In the Economic Outlook, the IMF (2001) in ECA (2003) states that it is more likely that trade diversion is taking place in Africa because of the higher trade barriers and relatively low levels of efficiency. The RIFF trading bloc may have reduced trade with the rest of the world and have created a relatively small expansion of intra-bloc trade. By contrast, CAEMC and WAEMU show no contraction in extra-regional trade. While these results are preliminary, the overall implication is that regional trade

integration has not as yet been a vehicle for substantial extra-African trade creation, even though extra-regional trade is not an end in itself (OECD, 2006).

A study by Mengistae and Pattillo (2002) in ECA (2003), which researched a few selected African countries, showed that exporting activities contributed a premium of 11 to 28% to productivity growth. One source of this gain is due to economies of scale, which are only possible when there is a production scale larger than in the small domestic market. They further found that direct exporters were four times more productive than indirect exporters. Those exporting to destinations outside of Africa were significantly more productive than those exporting within the region. This productivity growth is interpreted as being evidence of 'learning-by-exporting', a process wherein inexpensive technical information flows to exporters from their clients, and which lowers unit costs or improves product quality. There is evidence that greater openness to trade can boost long-term growth, largely through the impact on domestic competition and investment.

2.7.6 Impact of trade liberalisation on Africa's extra-regional agricultural trade flow

Although the volume of exports from SSA shows an increasing trend, earnings do not show a similar picture. Trends in the world prices of important commodities of the region are the determinant factors behind this weak performance. Between 1997 and 2001, cotton prices fell by 39% and coffee prices by 66%; the food price declined by 31% and the agricultural raw material price also fell by 20%. The decline in the terms of trade is the major reason for the marginalisation of the region. Despite the growth in exports from SSA, the SSA's share in world exports and imports has declined because SSA exports and imports are growing less than world exports and imports. Without any worldwide efforts to stop the current slump in prices, the expansion of exports will not produce the expected impacts at local level (Oxfam, 2002).

Domestic support programmes in some developed countries lead to cheaper imports into Africa, which weakens the capacity to supply these products regionally. This can be illustrated by the case of EU beef export subsidies. Imports into West Africa displaced Sahel meat exports to these countries. Programmes in a number of OECD countries have hurt millions of Africans who

depend on earnings from sugar, cotton, meat, groundnuts, fruit and vegetable exports for their livelihood. Some post-UR tariffs are high, for instance, tobacco in the United States, which is at 350%; in Japan, groundnuts and coffee are at 555% and 30%, respectively, and maize to the EU is at 84% (OECD, 2006). Nevertheless, many others have benefited from preferential access above world prices. On the other hand, a reduction of these domestic support programmes is also viewed as a threat to food security among net food importers in Africa, as there appears to be little manoeuvrability when it comes to ensuring food security through growth in agricultural productivity and more effective market coordination. The impact that eliminating export subsidies has on world prices and food security is not well researched (OECD, 2006).

2.8 IMPACT OF TRADE LIBERALISATION IN SUB-SAHARAN AFRICA

To date, Africa's promise to achieve economic growth has not yet been realised, and the economic performance of the region remains low (World Bank, 2005).

Table 2.3 presents the growth rate of the real GDP per capita for the two periods from 1981-1990 and 1991-2000. In the second period, all of the regions show a positive record, except the SSA region, which shows a negative performance (East Asia and Pacific regions record an increase of 6.4%, whereas SSA shows a decline of -0.4%). In the regions of East Asia, the Pacific and South Asia during the first period (1980-1990), the real GPD increased by 5.7 and 3.5%, respectively, whereas SSA had a decline of -1.6% (see Table 2.3) (World Bank, 2005).

Table 2.3: Growth Rate of Real GDP per Capita, 1981-2000 (Annual Average)

Regions	1981-1990	1991-2000
East Asia and Pacific	5.7	6.4
Latin America and Caribbean	-0.9	1.6
Middle East and North Africa	-0.6	1
South Asia	3.5	3.2
Sub-Saharan Africa	-1.2	-0.4

Source: World Bank (2005)

Various explanations have been given for the dismal economic performance of SSA; these explanations include factors such as poor domestic policies, geographical colonial legacy and an inhospitable external environment (ECA, 2004).

However, since the 1990s there has been an improvement in economic policy design and implementation in the region (ECA, 2004). In addition, several countries have made significant progress towards strengthening macro-economic stability and reinvigorating economic growth. Available data indicates that this has led to a modest improvement in economic performance (ECA, 2004). For example, in SSA the average annual real GDP growth increased from 2% in the period of 1984-1993 to 3.7% over the period of 1996-2001, and average annual inflation fell from 24.3% to 15.9% within the same period (Binswanger and Townsend, 2000). While the recent gain in economic performance in the region is welcome, its sustainability is in doubt. This is due to the largely adverse economic effects of the HIV/AIDS epidemic, the continued marginalisation of Africa in the global economy, and the inability to find far-reaching solutions to the problems created by the political instability, the 'brain drain', and high external debt (Binswanger and Townsend, 2000).

Furthermore, the simulated effect of the trade liberalisation reaction toward agricultural products in Africa shows mixed results (see Table 2.4). For example, Uganda is one of the few cases where incentives were improved for both food and cash crop producers. This did not automatically translate into an increased value for exports, largely because world prices are beyond the control of small-country exporters (Charles and Oliver, 2005).

Table 2.4: Impact of Trade Liberalisation on Growth, Africa

Sample	Food Crops	Cash Crops Exports
Nigeria (1970-92)	**Negative**	**Negative**
Uganda (1986-97)	**Positive**	**Positive**
SSA (1980-90)	**Mix**	**Positive**
Africa (1970-88)	**Mix**	**Mix**
Cross-countries (1980s)	**Negative**	**Positive**

Source: World Bank (2003)

Often, the anticipated benefits from trade liberalisation do not materialise because only limited or partial reforms are implemented. Furthermore, many countries face natural barriers to trade arising from geographical remoteness, especially land-locked countries, which encounter high transaction costs. In Uganda, for example, transport costs of coffee exports accrue an implicit tax equivalent of 24% of the value (Charles and Oliver, 2005).

Charles and Oliver (2005) further demonstrated patterns of tariff changes and trade performance in Table 2.5 and 2.6, respectively. The results show that trade performance was not determined by the tariff reduction. As a result the distribution of trade is not uniform across the regions. The reduction of tariffs does not neccessarly lead to the greatest increase in imports, and neither does export growth. Since, the broad pattern of trade in Africa is influenced by other factors, such as institutional arrangement, infrastructure, stability, etc. (see Table 2.5).

Table 2.5: The Pattern of Tariff Changes in Africa

	Average Scheduled Tariffs			% Change
Regions	**1980-85**	**1990-95**	**2000-02**	**1990-02**
North Africa	35.2	27.2	24.3	-10.7
West Africa	38.5	23.4	14.4	-38.5
Central Africa	33.1	20.4	16.4	-19.6
East Africa	32.5	26.12	16	-38.7
Southern Africa	19.5	17.7	12.9	-27.1

Source: Charles and Oliver (2005)

North Africa, the region with the highest tariffs and that reduced tariffs the least, actually saw a decline in imports and a very slow pace of growth in exports. Southern Africa has the lowest tariffs and a relatively higher liberalisation adoption rate, yet showed significant incremental increases in imports, although this was relatively small when compared to the import per GDP. Furthermore, there was an improvement in export growth, although it was not significant when compared to import growth (FAO, 2003).

Most West African countries show or follow more liberalised markets and lowered tariffs, and as a result show a higher import growth than the rest of Africa. However, they experience relatively modest export growth. This suggests a relationship between tariff reductions and import performance. East Africa was the region with the biggest tariff reduction since the 1990s, but it had low growth of imports and moderate growth of exports; conversely, Central Africa had the smallest tariff reduction in the SSA regions and recorded a moderate import growth, but the highest export growth. It is clear that trade performance, especially for exports, is only partially explained by tariff reductions (see Table 2.4).

Table 2.6: Trade Performance in Africa (Tariff Data Sample)

	Import/GDP			Export/GDP		
Regions	**90-92**	**98-00**	**% Change**	**90-92**	**98-00**	**% Change**
North Africa	34.1	32.1	-5.9	29.5	29.9	1.4
West Africa	32.3	38.4	18.9	26.5	29.5	1.3
Central Africa	27.3	30.8	12.8	23.6	28.4	20.3
East Africa	33.4	35.5	6.3	23	26.1	13.5
Southern Africa	30.6	37.2	21.6	26.6	30.8	15.8

Source: Charles and Oliver (2005)

2.9 FREE TRADE AGREEMENT AND REGIONAL INTEGRATION IN SADC

Countries in the SSA region are severely limited by supply and marketing constraints and subsequently cannot exploit market access opportunities that could be obtained through economic integration arrangements. Moreover, insufficient competitiveness in a number of export and production sectors still exists. The Rules of Origin, which encourage import substitution at a regional level, also exacerbate the problems associated with supply constraints within the region (Martine and Trudi, 2004).

The Rules of Origin have been tailored to facilitate trade and to ensure that only products originating from within the region gain access to the preferential status provided by the FTA (Ashipala and Haimbodi, 2003). SACU countries, in particular South Africa, have largely provided the motivation for the implementation of these rules.

Essentially, these requirements provide a form of intra-regional import substitution, or trade diversion, but at the same time they introduce a significant barrier to market access within the region, effectively drawing a distinction between SACU markets and non-SACU markets (Martine and Trudi, 2004).

The Rules of Origin hold promise for supporting the development of supply chains and Intra-Industry Trade (IIT) within the SADC; it presents considerable difficulties for most of the SADC members and many have inferred that, given the requirements, this will further limit market access to SACU. Many argue that these rules are much more stringent than what was in place before (Ashipala and Haimbodi, 2003). It is commonly argued that if the Rules of Origin were to

be fully implemented, the SACU could not supply the entire demand for inputs in the region (Martine and Trudi, 2004).

In terms of basic conditions affecting market structure, the single greatest obstacle to intra-regional trade is the transaction costs faced by individual firms. Market access is largely obstructed as a result of excessive transaction costs (Martine and Trudi, 2004).

Martine and Trudi (2004) categorised the Non-Tarff Barriers (NTBs) that impede trade in the region as follows:

- Communication problems;
- Customs procedures and charges;
- Transport problems;
- Lack of market information; and
- Other border procedures.

Furthermore, service supports (such as a functional financial system, adequate electricity and other technical support) restrict the potential of trade in the SADC region. The standardisation requirement and certification/technical arrangement is another bottleneck of Non-Tariff Barriers in the region (Martine and Trudi, 2004).

Again drawing from the theory on industrial organisation, one observes that the nature of the underlying market structure in which industries operate has significant implications for firm-level conduct and performance. Invisible trade barriers greatly increase the cost and risk of doing business, thereby affecting the competitiveness of firms in the global market and, above all, prohibit smaller firms' access to regional markets. These factors are explanatory variables for the low intra-regional trade, and should be considered when formulating industry support policies aimed at providing incentives for productivity enhancement, industrial development, investment and trade expansion (Martine and Trudi, 2004).

2.10 THE IMPACT OF TARIFF AND NON-TARIFF BARRIERS TO TRADE

2.10.1 TARIFF BARRIERS

Tariffs continue to be an impediment to greater intra-Africa trade. Table 5 indicates that each region applies a relatively high tariff rate to agricultural products. With reference to the existing trade patterns it should be noted that as a signatory to the SADC trade protocol, South Africa enjoys preferential access to SADC economies, many of which are also COMESA members. This may explain the high level of exports to SADC and COMESA countries.

Table 2.7: Tariff barriers to agricultural products

Economic community	MFN bound average	MFN applied average
ECOWAS	69.0	16.9
ECCAS	66.7	20.1
SADC (excluding SACU)	10.1	15.7
COMESA (excluding SACU)	90.7	20.0
AMU	69.4	17.6
SACU	71.4	9.1

Source: Daya, Ranoto and Letsoalo (2006)

In COMESA, ECOWAS, ECCAS and AMU member markets, South Africa faces each country's respective MFN tariff rate. ECCAS and COMESA have an average applied tariff of 20.1 % and 20 % respectively whilst ECOWAS' and AMU's average applied tariff is 16.9 % and 17.6 % respectively. The role of these tariffs in determining trade flows is highlighted by the fact that over the past ten years, the fastest growing regions for South African exports have been ECOWAS and the AMU – the regions with the lowest average applied tariffs (Table 3).

Relative to other African regions, SACU's average applied tariff is low at 9.1 %.

Preferential market access for SADC countries may explain why most imports from Africa come from the SADC region. The trade data indicates that imports from other African countries continue to lag behind imports from the rest of the world despite relatively low tariffs (Table 3). Tariff barriers in the South African market do not therefore appear to be a significant explanation for the low level of imports from other African countries. The next section examines some of the other possible explanations for this continued low level of imports from African partners.

Table 2.8: South Africa's Trade Profile with African Economic Communities

	Value of exports (millions of Rand)-2005	%age of global agricultural exports 2005	%age of African agricultural exports 2005	Average annual growth in exports 1996 to 2005	Leading export destinations	Value of imports (millions of Rand)-2005	%age of global agri-cultural imports 2005	%age of African agricultural imports 2005	%age annual growth in imports 1996 to 2005	Leading import suppliers
WORLD	25,937	100		10.28	United Kingdom; Netherlands; Zimbabwe	16,729	100		9.61	Brazil; Argentina; United States
AFRICA	6,206	23.93	100	12.49	Zimbabwe; Angola; Mozambique	1,309	7.82	100	7.25	Zimbabwe; Zambia; Malawi
ECOWAS	788	3.04	12.71	30.44	Nigeria; Ghana; Guinea	123	0.74	9.42	0.10	Côte d'Ivoire, Nigeria, Benin
ECCAS	910	3.51	14.66	3.44	(Angola; DRC); Congo; Cameroon; Equatorial Guinea	7	0.04	0.56	2.09	Burundi, Rwanda; Congo
SADC (excluding SACU)	4,636	17.87	74.69	11.79	Zimbabwe; Angola; Mozambique	1,041	6.22	79.47	11.17	Zimbabwe; Zambia; Malawi
COMESA (excluding SACU)	4,401	16.95	70.85	13.48	Kenya; Egypt; Uganda	1,057	6.32	80.79	9.98	Kenya; Egypt; Uganda
AMU	59	0.22	0.95	89.41	Algeria; Mauritania; Morocco	19	0.11	1.44	29.52	Morocco; Tunisia; Algeria

2.10.2 TECHNICAL AND NON-TARIFF BARRIERS TO TRADE

According to a report of the Economic Commission for Africa (ECA, 2005), African countries have been unable to foster development trading within the continent, since trade in Africa is significantly constrained by both tariff and non-tariff barriers.

Tariffs continue to be an impediment to greater intra-Africa trade. Each region in the continent applies a relatively high tariff rate to agricultural products. For example, ECCAS and COMESA have an average applied tariff of 20.1 % and 20 % respectively, whilst ECOWAS' and AMU's average applied tariff is approximately 16.9 % and 17.6 % respectively, and SACU's average applied tariff is around 9.1 %. The trade data indicates that imports from other African countries into South Africa continue to lag behind imports from the rest of the world despite the fact that relatively high tariffs and high transportation costs restrict the capacity of imports into South Africa (Daya *et al*., 2006). There are other factors impeding business in Africa that need to be addressed urgently.

According to the ECA (2005) report, factors that impede African trade fall into three broad categories: natural barriers, manmade barriers, and technical barriers:

- Natural barriers refer to supply-side and production constraints, including social and political conflict and infrastructure constraints. The supply-side constraints are those barriers that are related to production capacity, diversification potential and the range of products exported by a country. Such constraints range from political conditions, climatic conditions and land size to the availability of technology and human resources.
- Manmade constraints refer to import and export restrictions, customs formalities such as custom valuation, and SPS (sanitary and phytosanitary) measures.
- Technical barriers include regulations and standards that set out a product's specific characteristics such as size, shape, design and labelling or packaging of the product.

For example, the fact that the African continent is characterised by semi-arid countries with low population densities and a large number of landlocked countries has given rise to intrinsically high transport costs (Collier & Gunning, 1999). This is compounded by policy-induced

deficiencies of infrastructure coupled with inefficient and/or excessive bureaucracy, all serving to limit trade. The report of the ECA (2005) suggests that the quest for greater intra-Africa trade is hampered by inadequate infrastructure that acts as a major source of comparative disadvantage. High transaction costs related to infrastructure also further impede trade. Limoa and Venables (2000) in Daya *et al.* (2006) showed that a 10 % increase in transport costs results in a reduction in trade volumes of approximately 20 %.

The study by Daya *et al.* (2006) revealed that transport costs in Africa are estimated to be about 13 % while industrialised countries have transport costs estimated at only 5.5 %. Moreover, the ECA (2005) report showed that high transport costs are caused by inadequate infrastructural network and inefficient transport operations, especially in West and North Africa where there is a low level of road network distribution. The Southern African region, on the other hand, has a well-developed road network.

In addition, poor energy and telecommunications infrastructure further restricts the potential for greater intra-Africa trade. The inability to provide adequate and cost-effective energy services limits the production possibilities of an economy and hampers attempts at diversification. The incidence of unreliable and expensive energy across most African economies increases business costs (Collier & Gunning, 1999).

The quality of countries' institutions also hampers trade on the continent. Rodrik (2004) argued that institutional quality needs to be tied to the context of country-specific needs and objectives.

Rules of Origin (RoO) and non-tariff barriers (NTBs) are increasingly becoming important determinants of agricultural trade. Rules of origin are the criteria used to determine the nationality of a product. On the other hand, NTBs generally refer to any measure other than tariff which restricts or distorts trade. Least developed countries have been enjoying preferential market access to the developed country markets such as EU, Japan, USA, Canada and Australia. It is argued that though preferential market access has reduced the tariff barriers for most of the agricultural products exported by Least Developed Countries (LDCs), but stringent RoO and NTBs are limiting exports from the preference-receiving countries. The preferential

RoO attempt to prevent trade deflection by establishing criteria that ensure an adequate degree of transformation in a preference receiving country to justify allowing a good to benefit from the preference. Both RoO and NTBs vary from country to country and product to product. It is also observed that NTBs change over time and countries apply several types of NTBs for the same product. Therefore, a study on NTBs needs to cover a wide range of countries as well as products. However, it is not possible to study the NTBs imposed by and on all countries and the way they are faced by different countries with limited resources and time (OECD, 2006).

However, it is very difficult to acknowledge in Africa, this is in place that widespread acceptance that respect for the rule of law. Clearly defined property rights, a strong judicial system, and consistent and predictable monetary and fiscal policies grounded in macro-economic institutions are essential in promoting growth and attracting investment (Rodrik, 2004). However, in the context of most African countries, it is difficult to get the above-mentioned business preconditions in place in order to attract investors/industries where comparative advantage exists or competitive advantage could be created.

Corruption in African economies is often cited as a major deterrent to potential investors and traders. Countries with corrupt administrations and weak judiciaries will find it difficult to attract capital for investment in production and exports (Daya *et al.*, 2006).

2.11 APPROACHES TO ANALYSE INTERNATIONAL TRADE

Kanji *et al.* (2002) studied a number of additional approaches to analyse trade, economic growth and poverty linkages. They used Global Value Chain (GVC) analysis, generated data from the socio-economic processes analysis, as well as analysed environmental sustainability of trade policies. They provided a holistic theory of trade-(growth)-poverty linkages, and a useful toolkit of analytical approaches. The next section presents commonly used methodological approaches in analysing international trade and poverty linkage.

2.11.1 Cross-Countries or country-specific Regression

Cross-country regression is one of the methodological approaches used to estimate the impact of trade liberalisation on economic growth, as exemplified in a recent paper by Dollar and Kraay (2000). These authors first categorise developing countries as being either globalised or non-globalised based on changes in trade volumes and tariff rates, and linked them to poverty, supporting this with time-series Gini coefficients and income growth rates for average households versus the poorest quintile. They found no general trend in inequality among countries classified as globalised. However, the non-globalised regions tended to have higher rates of economic growth. This leads to the conclusion that globalisation tends to be associated with a decline in absolute poverty. Verifying this finding in a more rigorous manner, the authors undertook cross-country regression analysis, and determined that no systematic relationship exists between changes in trade volumes and changes in the income share of the poorest. Moreover, the result shows there is no statistical relationship between changes in trade volumes and changes in income inequality (Dollar and Kraay, 2000).

Rodrik (2004) offers a cogent critique of Dollar and Kraay's study. Generally, his remarks relate to issues with the data, to the difficulty of distinguishing between correlation and causation in cross-country regression analysis, and to the challenge of such results robust enough to be consistent when specification changes. Estimating the relationships that exist between trade policy, growth and poverty critically depends on finding an appropriate measurement of these variables, and on carefully sorting out omitted variable and endogeneity problems, all of which are quite challenging given the very limited data available. The fact that Dollar and Kraay include results obtained using Instrumental variables provides some reassurance against Rodrik's critique.

Kang (2003) focussed on the US wood product and analysed the impact of trade liberalisation on the development of the trade pattern between countries and regional trade blocking, and its impact on trade volume. Kang used the country-specific and product type regression, and the

model revealed that there is a significant change in the US trade structure after NAFTA comes into effect.

Another approach to trade, price changes and poverty reduction is provided by Burger, Van der Berg and Nieftagodien (2004). This study compared the living standards and consumption patterns of Black households in a South African sample. The data was from the income and expenditure survey of the 2000 census. The main drawback of the model used was about data quality, and this necessitated testing for measurement error on the parameter estimates of Engel equations for the South African households. The model used three alternative techniques to analyse, namely data cleaning, Instrumental variable estimation and repeated simulation. The results found that there is reasonable robustness in most parameter estimates. The results on consumption patterns are largely in agreement with international evidence. Consumption patterns of Black households are compared to the full sample of households. However, the study shows that there is not a close match in average expenditure: the top Black quintile's spending patterns differ remarkably from the consumption behaviour of Indian and Coloured households, and diverge even further from White consumption patterns.

The country-specific regression approach has a number of advantages with respect to linking trade and economic growth. Firstly, country- specific regression results are typically very close to being wholly accurate, and simulation models consider the sample representation. Secondly, country-specific regression may be able to account for some of the dynamic aspects of trade reform that are missed by static simulation models, which have limited traditional statistical tools for testing results and hypotheses and can only make predictions (Hertel and Reimer, 2004). Given the advantages and disadvantages associated with the country regression and simulation approaches, this study also uses the country- and product-specific approach, concentrating on the South African agricultural industry.

2.11.2 Partial-Equilibrium/Cost-of-Living Analysis

The second general methodology identified as a means of estimating the linkage between trade liberalisation and economics is the partial-equilibrium/cost-of-living analysis. However, all

above-mentioned methodologies are 'partially equilibrium' in nature, since they focus on one or a limited number of markets in an economy. Additionally, most can be considered as 'cost-of-living' studies as they tend to focus on household expenditure as a measure of poverty (Hertel *et al.,* 2001).

For example, Levinsohn, Berry and Friedman (1999) examined how the Indonesian economic crisis affected poor households in the country. The authors combined 1993 consumption data for 58 100 households, along with price changes due to the 1997-1998 crises, and their results showed that the low-income households were not affected by the international trade agreements.

This study had two principal drawbacks: Firstly, it focuses only on the consumption side and precludes calculation of its real effects. However, this may not have been critical for the particular application, because increases in nominal wages were overshadowed by increases in general commodity prices. Secondly, the analysis did not allow the effects of the crisis to be isolated from other phenomena, including the El Nino drought and widespread forest fires that occurred in the same period as the crisis.

Another approach that links trade, price changes and poverty is provided by Case (1998) in Hertel and Reimer (2004). This study quantifies the extent of trade reform with regard to South African household consumers, and uses household budget shares and estimates from a Linear Expenditure System that separately estimates for Black and White households. Budget shares and the demand system estimates were calculated using the national representative of the 1995 South African Living Standards Survey, which covered 43 794 individuals in 8848 households drawn from 360 clusters. The study found that the cost of reaching the household's initial level of utility fell by 2% for Black households and by 1% for White households. Levinsohn *et al*. (1999) critiqued this study and proposed that the potential effects of factor earnings do not enter into Case's analysis, despite the availability of employment and income information in the household survey.

2.11.3 General-Equilibrium Simulation

General equilibrium analysis was developed by Adelman and Robinson for Korea (1978) in Devarajan and Robinson (2002). The General Equilibrium model is widely used to assess the impact of economic shocks that reverberate across sectors and regions. This model generally is calibrated to a Social Accounting Matrix (SAM), which is a complete, consistent and disaggregated data system. The salient feature of Social Accounting Matrices is that they can be quantified at a single point in time, thus showing the interdependence of sectors and regions in the economy. General equilibrium models are typically based on neoclassical theories of firm and household behaviour, and the model is static in nature. That said, dynamic versions have also been developed to address certain types of issues (Devarajan and Robinson, 2002).

A study by Lofgren (1999) is representative of how general equilibrium models are applied to trade and poverty analysis. Lofgren investigated how reduced agricultural and industrial protection will affect representative Moroccan households in the short-run. The General Equilibrium model is multi-sector, single-region, static and calibrated to a 1994 Social Accounting Matrix which captures Morocco's pronounced rural/urban disparity with respect to economic structure, wages and education (Lofgren, 1999).

Lofgren's simulations assess the impact of removing border protection under different assumptions about labour market rigidity. Essentially, the results from the trade liberalisation in agriculture will result in gains for the country as a whole, while the rural poor lose out. Compensation in the form of government transfers as well as education and infrastructure investments for rural areas would likely be needed if liberalisation were to be pursued (Lofgren, 1999).

2.11.4 Micro-Macro Synthesis

This approach is characterised by its sequential, two-step nature. A general equilibrium model is used to get commodity and factor price changes, then is calibrated to a post-simulation framework. That calculates the effects of actual or highly disaggregated representative households (Hertel and Reimer, 2004).

This two-step approach is similarly employed in some cases of partial-equilibrium/cost-of-living analyses. A limitation of this approach is that the post-simulation analysis is favoured by general equilibrium practitioners, and the reactions of households' commodity and factor price changes in the post-simulation analysis are not transmitted back to the general equilibrium model (Hertel and Reimer, 2004).

The General Equilibrium model is linked to the micro-simulation model through: (i) the wage level; (ii) the income level for the informal self-employed sector; (iii) the number of wage workers and those that are self-employed in the labour market segment, and (iv) the consumption costs. The micro-simulation model solves and generates equilibrium values and changes that are consistent with the results from the general equilibrium model (Robilliard, Bourguignon, and Robinson, 2001). The case study on Indonesia showed that the poverty increase over the 1997-98 period was due to the El Nino drought and financial situation (Robilliard *et al.*, 2001).

Considering the availability of data and the study's objectives, the study needed to apply different methodologies that suited the specific objective.

2.12 MODEL SPECIFICATION

Addressing objective 1: to examine the impact that trade liberalisation has on agriculture's ability to contribute to export earning (net-exporter).

In an effort to gain a better understanding of the impact of trade liberalisation on the export capacity of the agricultural industry in South Africa, a starting point should be to examine South Africa's current agricultural trade. A useful tool in this regard is the Gini coefficient. To further support the findings of the Gini coefficient, it is necessary to examine the degree of concentration for both export and import capability, and the Intra-Industrial Trade coefficient (IIT) (this addresses objective 2).

In trade literature, the amount of intra-industry trade, or trade in similar goods, is often taken as a measure of the diversity, degree of specialisation and the degree of technical sophistication of a country's industrial sector. This can be used to infer a country's ability to compete in a changing environment (Oleh and Peter, 1997).

The extent of market concentration is determined by various factors, such as consumer preferences that result in different trade streams; trade barriers prohibiting or restricting trade between different regions and certain products or product types; trade agreements and trade incentives; infrastructure; political stability or instability in a country, and the ability to pay, which is a function of income (Lubbe, 1992).

2.12.1 The Gini coefficient

The Gini coefficient is defined graphically as a ratio of two surfaces and it involves the summation of all vertical deviations between the Lorenz curve and the perfect equality line. The Gini coefficient was developed to measure the degree of concentration (inequality) of a variable in a distribution of its elements. It compares the Lorenz curve of a ranked empirical distribution with the line of perfect equality. This line assumes that each element has the same contribution to the total summation of the values of a variable. The Gini coefficient ranges between 0, where there is no concentration (perfect equality), and 1, representing total concentration (perfect inequality). The closer the coefficient is to 1, the more unequal the distribution (Brian and Jeans, 2005).

2.12.2 The Intra-Industrial Trade (IIT) coefficient

The second analytical tool that should be applied is an Intra-Industrial Trade (IIT) coefficient, along with its key determinants. To determine attributes that contribute to high IIT, an Ordinary Least Square (OLS) econometrical model should be applied; in this instance, it looked specifically at the case of South African agriculture, covering data from 1965 to 2007. This tool is useful for measuring the level of concentration and patterns in trade. As Lubbe (1992) states, in order to evaluate countries' international trade performance, concentration indices may be used as proxies for determining specialisation and the market power of a country. This study explores the South African level of specialisation and/or diversification in agricultural trade.

Why do countries import and export the products of the same industry at the same time, or import and export the same kinds of goods?

According to Grimwade (2000), "An explanation cannot be found within the framework of classical or neo-classical trade theory. The latter predicts only inter-industry specialisation and trade". However, this is far from the case.

The traditional model of trade was set out by David Ricardo and Heckscher-Ohlin, who both produced models that tried to explain the occurrence of international trade. Both models used the idea of comparative advantage and an explanation of why countries trade. However, many economists have made the point that these models provide no explanation of intra-industry trade as, under their assumptions, countries with identical factor endowments would not trade and produce goods domestically. Hence, over the past three decades as intra-industry trade has developed, many economists have looked at other explanations (Krugman and Obstfeld, 1991, cited in Grimwade, 2000).

An attempt to explain IIT was made by Finger (1975, cited in Grimwade, 2000), who thought that occurrence of inter-industry trade was 'unremarkable', as existing classifications place goods of heterogeneous factor endowments in a single industry. However, evidence shows that even when industries are disaggregated to extremely fine levels, IIT still occurs, so this argument can be ignored.

Another noteworthy model is that of Flavey and Kierzkowski (1987, cited in Grimwade, 2000). Flavey and Kierzkowski produced a model that tried to remove the idea that all products are produced under identical technical conditions. The model showed that goods are distinguished by the perceived quality of those goods on the demand side, and that high quality goods are generally produced under conditions of high capital intensity. However, this model has also been dismissed because it brought about questions as to whether it addressed IIT, as it offers no concensus regarding the trading of goods with similar factor endowments (Brander and James, 1987, cited in Grimwade, 2000).

However, the most comprehensive and widely accepted explanation, at least within economic theory, is that of Krugman's (1994) new trade theory. Krugman argues that economies specialise to take advantage of increasing returns, and do not follow differences in regional

endowments (as contended by neoclassical theory). In particular, trade allows countries to specialise in a limited variety of production and thus, reap the advantages of increasing returns (i.e., economies of scale) without reducing the variety of goods available for consumption (Donald, 1995, in Grimwade, 2000).

Yet, Donald (1995, in Grimwade, 2000) believed that both the Heckscher-Ohlin and Ricardian models were still relevant in explaining intra-industry trade. He developed the Heckscher-Ohlin-Ricardo model, which showed that, even with constant returns to scale, the intra-industry trade could still occur under the traditional setting. The Heckscher-Ohlin-Ricardo model explained that countries of identical factor endowments would still trade due to differences in technology as this would encourage specialisation and therefore trade, in exactly the same manner that was set out in the Ricardian model.

In trade literature, the amount of intra-industry trade, or trade in similar goods, is often taken as a measure of the diversity, degree of specialisation and the degree of technical sophistication of a country's industrial sector. This can be used to infer a country's ability to compete in a changing environment (Oleh and Peter, 1997).

The value of 'IIT' lies between 0 and 1; zero indicates a low trade balance, while a value closer to 1 indicates a high rate of importing/exporting of the same or similar products by the sector.

The key determinant of the IIT model is drawn from the theoretical and empirical literature. The model follows the general modelling of IIT determinants as developed by Oleh and Peter (1997), and is specified for the South African agricultural aggregate IIT over the period of 1965 to 2007.

2.12.3 Empirical Foundation of Gravity Model

This model examines the linkage between trade liberalisation (regional trading bloc) and agricultural products trade flows. The basic trade gravity model relates to the measuring of bilateral trade and the economic mass of the two countries, and the distance between them.

The Gravity model develops a gravity equation for potential bilateral exports. It determines potential trade through combining macro-economic variables (size, income, exchange rates,

prices etc.) of trade partners. Indicators of transportation costs between countries and more generally, market access variables, are also added.

The Gravity model (referred to by social scientists as the modified Law of Gravitation) takes into account the population size of two places and their distance from each other. Since larger places attract people, ideas and commodities more than smaller places, and places closer together have a greater attraction, the Gravity model incorporates these two features (Carrillo, 2002).

The Gravity model has been widely used to analyse bilateral trade flows between country pairs. According to Brulhart and Kelly (1999), typical gravity models include the following variables as determinants of trade:

i) Export supply, captured by economic factors (national output or output per capita) affecting trade flows in exporting countries;

ii) Import demand, captured by economic factors (income or income per capita) affecting trade flows in the importing countries; and

iii) Transportation cost, captured using geographical distance and other variables representing policy and cultural barriers to trade.

An alternative explanation of the Gravity model is presented in the following diagram using a simple supply and demand framework. According to Polder (2000), exporting and importing countries are the main objects in a gravity model. As shown in Figure 6.1, the Gravity model is presented graphically and shows the potential supply and demand (determined by the sizes of the economies) to predict the potential trade flow between the trading partner countries. This flow is subject to certain trade resistance factors that are improved by trade arrangements. As Kang (2003) stated in his study, the GDP of the exporting and importing countries and the distance between the trading partners can be presented as economic size and trade barriers, respectively.

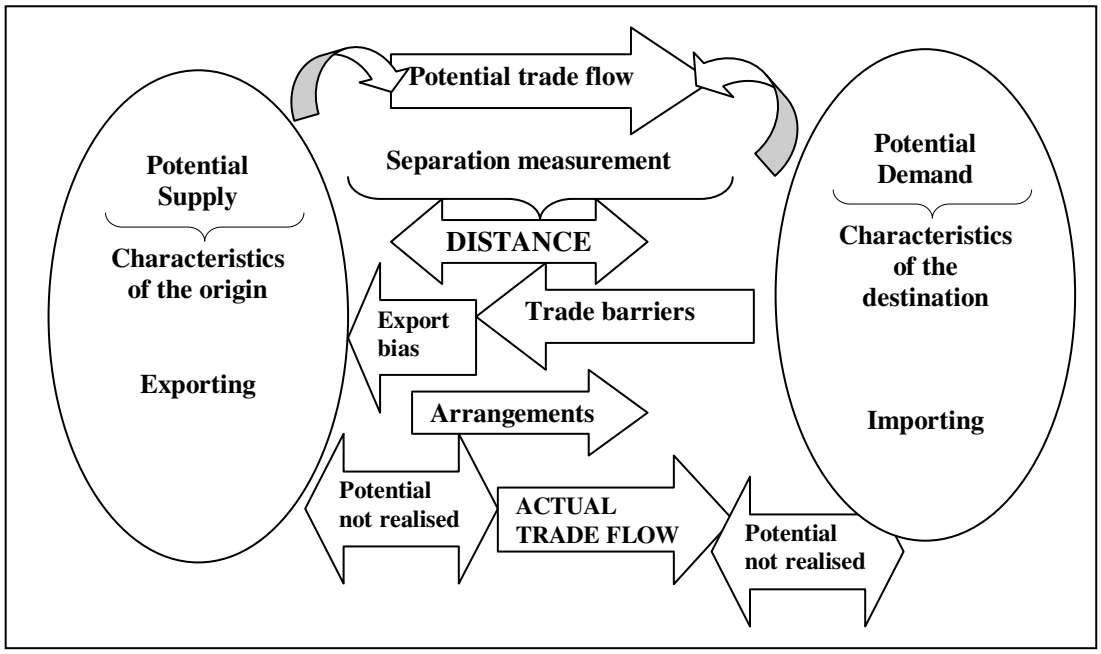

Figure 2.2: Design of Gravity Model

Source: The Department of Trade and Industry of South Africa (2005)

The Gravity model has been successfully applied for over forty years to explain trade flows in empirical literature. Thus, using a gravity model, the magnitude of trade flows can be estimated among trading countries. The gravity equation can be expressed in two forms. One of the standards of the Gravity model is determined by size of the economies and distance (Kang, 2003). The augmented gravity model equation is formed by adding more variables into the standard gravity model.

The sizes of the economies of both the exporting and the importing country are represented by their GDP and population size. The distance between the countries and a dummy for a possible trade arrangement reflects trade resistance. This can be disaggregated per sector, thus providing information on the areas that South Africa could exploit. The reasons behind why the potential is not realised will have to be investigated. This will assist the government in its bilateral trade negotiations and identify areas for government intervention. This can be expanded to analyse sectoral determinants (Kang, 2003).

In this case, the Gravity model is used to explain trade patterns and to determine trade potential.

This research paper is conducted as follows:

- Firstly, it selects a sample of countries that have supposedly reached their trade potential. Bilateral trade flows between these countries are then considered in a symmetric manner.
- A gravity equation explaining bilateral exports within the sample is then estimated.
- This equation is used in simulation exercises to determine natural bilateral trade between any two countries, given the availability of data on distance, GDP and population numbers.

2.12.4 Co-integration modelling

This study follows the general modelling of Jonsson and Subramanian (2001) to test the co-integration relationship between trade liberalisation and Total Factor Productivity (TFP). Dummy variables have been included to capture the impact of trade agreements. Both cross-sectional and time-series data is applied. For cross-sectional analysis, data was pooled from 1995 to 2007 with respect to nine South African agricultural commodities (namely, sorghum, wheat, dry beans, soybeans, oats, groundnuts, sugar, maize and beef). Furthermore, the Exact Maximum Likelihood (EML) method should be applied so as to examine the major determinants of economic growth and its relationship to trade liberalisation.

The growing empirical literature on EML estimation demonstrates how its repeated sampling principle estimation procedures ensure efficiency and consistency of the method. The advantage of EML is the dependability of the long-term process and characterisation; this is due to the highly intensive computational dimension system, as used by Lardic and Mignon (2004).

According to Emmanuel, Sandrine and Val´ Erie (2004), the EML method procedure is used as a residual-based test of the hypothesis of no co-integration versus the alternative of fractional co-integration. The pertinence of the method lies in using all information concerning the short- and long-term behaviour of the series since it simultaneously estimates all parameters of the Auto-Regressive Fractionally Integrated Moving Average (ARFIMA) (p, d, q) estimation

procedures representation. Moreover, the application allows one to test the null hypothesis of a unit root (d = 1) against the alternative of fractional integration (d < 1).

2.13 CONCLUSIONS

From the literature reviewed in this chapter it is clear to trade economists that the term 'market access' is generally associated with the ability of developing country's exporters to sell to developed country markets. In this discussion, the interest is not in this (albeit important) issue, but in the access that domestic producers have to, for example, input and output markets and services. A motivating factor for researching this issue in the context of the current negotiations on global trade reform is that there is an impact on resource-poor farmers due to increased exposure to competition. Furthermore, the review has displayed the strong link that exists between poverty elimination and agricultural development. Embedded in this line of thinking is the acknowledgement that increased food production also leads to better income generation opportunities. However, with this background in mind, trade liberalisation and global inter-connectedness pose new opportunities and challenges for developing countries, which need access to vast volumes of studies on how this affects the performance of agriculture in developing countries. This is important because (i) agriculture is one of the central contributors to food security in most developing countries, both via its direct contribution to the availability of food and indirectly, as it is a key engine of economic development and hence improved access to food; (ii) agriculture is one of the most heavily distorted sectors in many countries and has, as a result, received significant attention in recent rounds of trade negotiations.

Oxfam (2000) asked whether small-scale farmers can compete in a liberalised environment and whether there is a need to retain some level of protection. Sharma (2000, in Oxfam, 2000) noted that small-scale farmers may be pushed out of the sub-sector because of missing markets for the poor and the resultant higher costs of production. A key question that arises in relation to the IFAD statement on market access is therefore: what form of protective market exclusion would be required and what is the associated economic cost, i.e., what is the cost-benefit ratio of intervention? This chapter has introduced a number of unresolved debates that require further

investigation regarding the relationship between trade liberalisation and agricultural growth, and consequently, food security.

Lack of concensus on the theoretical framework underpinning the impact of trade liberalisation on economic growth, and the conflicting empirical evidence that has emerged over recent years, indicates a need to do more focused research on the implications of open trade regimes in the agricultural sector and their role in fostering economic growth. This is because one cannot merely derive from the literature that a more open trade regime for agriculture alone will foster economic growth in South Africa. However, before embarking on this analysis, it is important to put the study in context by describing the role of agriculture in the South African economy and by focussing on the challenges facing the sector.

CHAPTER 3

OVERVIEW OF THE SOUTH AFRICAN AGRICULTURAL SECTOR AND ITS TRADE DEVELPOMENT

3.1 INTRODUCTION

This chapter provides an overview of the South African agricultural industry, and its role in the economy and output composition. This chapter also presents the challenges that are facing regional and free trade agreements. It also revisits the development of trade policy, and the role of regional integration and free trade agreements into trade flows and economic growth.

3.2 ROLE OF AGRICULTURE IN THE SOUTH AFRICAN ECONOMY

South African agriculture, despite being small in terms of its direct share of the total gross domestic product, remains a significant provider of employment. This is especially true in the rural areas. According to the National Department of Agriculture (DoA) (2008), it is also a major earner of foreign exchange.

From 1950 to 1987, agricultural output grew on average at the annual rate of 2.5% before it declined by an average annual rate of 2.1% between 1987 and 1995. Between 1997 and 2007, output showed a small growth of about 1% annual average. When comparison is made between 2006 and 2007, one sees a 13% contraction in total agricultural production from the previous year, and that the sector picked up slightly by 0.3% during 2007. This slow pick-up was mainly due to good weather prospects, persistent high prices and the overall economic upswing (DoA, 2008).

However, the average annual contribution of South African agriculture total GDP and employment has dropped from 7.7% and 1.64million jobs to 3.2% and 0.63million jobs, respectively, from 1970 to 2007 (DoA, 2008).

Even though the trend of output fundamentally shows a continuous decline, the logic remains unchanged: the greatest reduction in poverty will come from combining liberalisation and investment in agriculture where significant improvements in productivity are possible, and these improvements will in turn stimulate economic growth through linkages to the wider economy. In addition, poverty reduction will be aided by directing limited public resources towards agricultural development where yield increases are less likely (Smith and Haddad, 2002).

Agriculture's prominent yet indirect role in the economy is a function of backward and forward linkages to other sectors. Purchases of goods such as fertilisers, chemicals and implements form backward linkages with the manufacturing sector, while forward linkages are established through the supply of raw materials to the manufacturing industry. About 68% of agricultural output is used as intermediate products. Agriculture is therefore a crucial sector and an important engine for growth for the rest of the economy.

There are about 50 000 commercial farmers in the sector. In 2005, total agricultural exports were worth about R26 billion (accounting for 9% of the total exports). The commercial farmers employ about 1 million workers, which is about 11% of the total formal employment of the country (DoA, 2008).

There are about 240 000 small farmers who provide a livelihood to more than 1 million family members and occasional employment to another 500 000 people. Furthermore, there are about 4 million farmers, mostly residing in the communal areas. These farmers produce food primarily to meet the needs of their families. About 40% of the country's total population depends primarily on agriculture and related industries (Siyabulela, 2005).

It is therefore clear that agriculture is regarded as one of the means through which government can reach its growth objectives articulated in the Integrated Rural Development Strategy and Accelerated and Shared Growth Initiative for South Africa *(*ASGISA).

3.3 THE SOUTH AFRICAN AGRICULTURAL OUTPUT COMPOSITION AND PRICE TREND

In 2007 total agricultural production was estimated as being 0.6% lower than in 2006. The volume of crop production declined by 7.8% as a result of the El Nino phenomenon, the low average rainfall occurrence and the effect of global warming. In addition, technological advancement was also a key factor in agricultural productivity.

Field crops (such as Maize, wheat, Grain Sorghum, Groundnuts, Sunflower, Soya-beans, Barely, Rye, Dry-beans, Cotton and Lucerne) increased by 32.4% and 41.9% in 2006 and 2007, respectively. Due to inflation in the price of summer grains, winter cereals and dry beans, the average price increase was about 44.7%. Field crop production increased from 18.1 billion to 24.3 billion tons during the period of 2005/06 and 2006/07 (DoA, 2008). Specifically, prices of winter grains increased substantially. For example, oilseed prices, hay prices, cotton prices and dry beans prices increased by 100.6%, 79.9%, 53.1%, 31.3% and 25.9%, respectively. Summer grain prices increased by 24.9%, tobacco prices by 10.7%, and sugarcane prices by 7.0%.

Table 3.1 presents the comparison between the percentage change in producer price and farm income (2006/07 and 2007/08). The table shows that the producer prices were about 41% higher than farm income, which increased by 27%. This implies that field crop farmers experienced a greater cost price squeeze. The farmers experienced high input prices and low output prices. For example, in horticulture and animal production, the percentage change is almost the same. This might be due to the nature of the field crop, which mainly has a short-term investment characteristic that is likely to be influenced by price instability. The other farming systems encompass medium- or long-term farming enterprises that take long periods of time to adjust to the price change within the system.

Table 3.1 Producer price and farm income (in % change): 2006/07 to 2007/08

Percentage changes from the previous year		
	Producer prices	**Farm income**
Field crops	41.20%	26.70%
Horticultural products	14.90%	16.80%
Animal products	14.80%	18.30%

Source: DoA (2008)

Maize stock in South Africa at the end of September 2007 was at its lowest levels in the last eight years. This was due to the reduction in the area planted in the 2006/07 season. The total production was estimated to be 7.3 million tons in 2007/2008. The production was estimated to be 48.5% higher than in the previous season. This was because productive areas were expected to receive enough rainfall (DoA, 2008).

The production in the horticultural sector shows better productivity, and increased from 19.9 billion tons in 2006 to 22.7 billion tons in 2007. Producer prices of horticultural products show an average increase of 20.6%. Prices of vegetables and fruits increased by 25.7% and 10.5%, respectively, whereas prices of animal products increased by 14.8%. On average, the price of milk, pastoral products, poultry and slaughtered stock changed by 41%, 3%, 15.1%, 10.5% and 8.2%, respectively (DoA, 2008). It is estimated that there are about 2254 producers of fresh fruit, 1174 of stone fruit, 954 producers of dry and table grapes, and 700 producers of pome fruit (DoA, 2008).

Active participation of farmers in high-value crops can potentially result in a high income, and will likely result in increased real estate loan demand. Agricultural loan demand is driven by investment in machinery, equipment and grain storage facilities. Therefore, high-value crop prices and increasing crop production may lead to an increase in loans as producers boost production expenses to maximise yield (DoA, 2008).

The total farming debt in 2007 was estimated to be R41.4 billion, which is R37.8 billion more than in 2006. Generally, farming expenses were higher in 2007, due to high prices of most important inputs such as fertilisers, building and fencing materials, and farm services (DoA, 2008).

Figure 3.1 shows the indices of the volume of agricultural production from 1993/94 up to 2006/07. The estimated total volume of agricultural production in 2006/07 was only 1.1% higher than in the period of 2005/06. The volume of field-crop production and horticulture reflected an average drop of 1.6% and 2.1%, respectively, for the period of 2006/07 and 2005/2006. However, animal production increased by 5% during the same period.

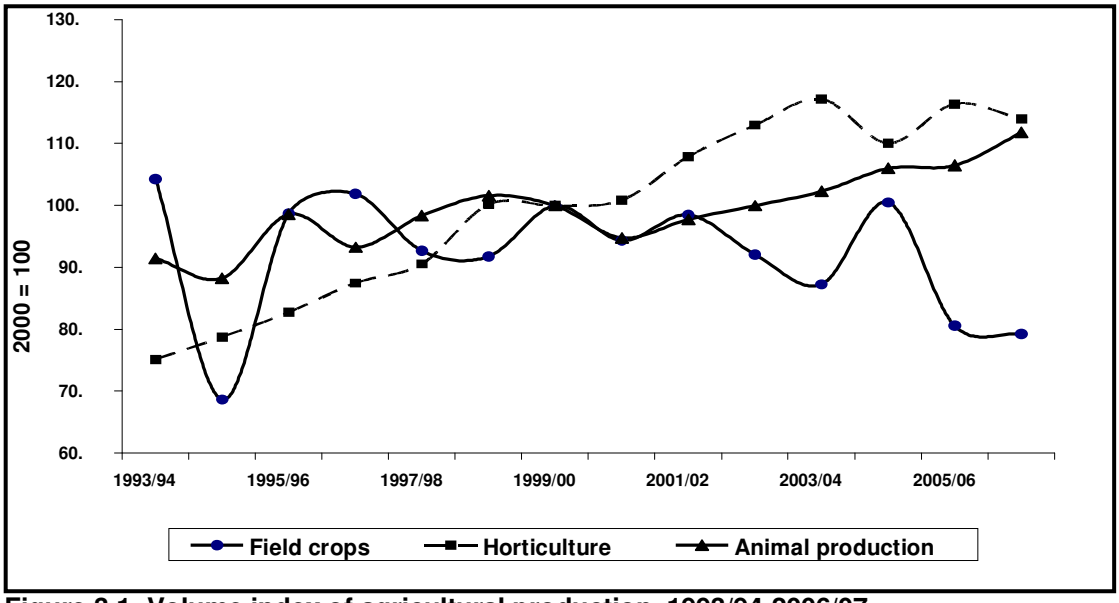

Figure 3.1: Volume index of agricultural production, 1993/94-2006/07
Source: DoA (2008)

Figure 3.2 and Figure 3.3 show the structure of output in South African agriculture for different periods. Figure 3.2 shows that animal production accounts for 37%, field crops account for 47% and horticulture account for about 16%. Given the fact that most of the country is unsuited for cultivation, it is not surprising that the largest component of production comes from livestock production (see Figure 3.2).

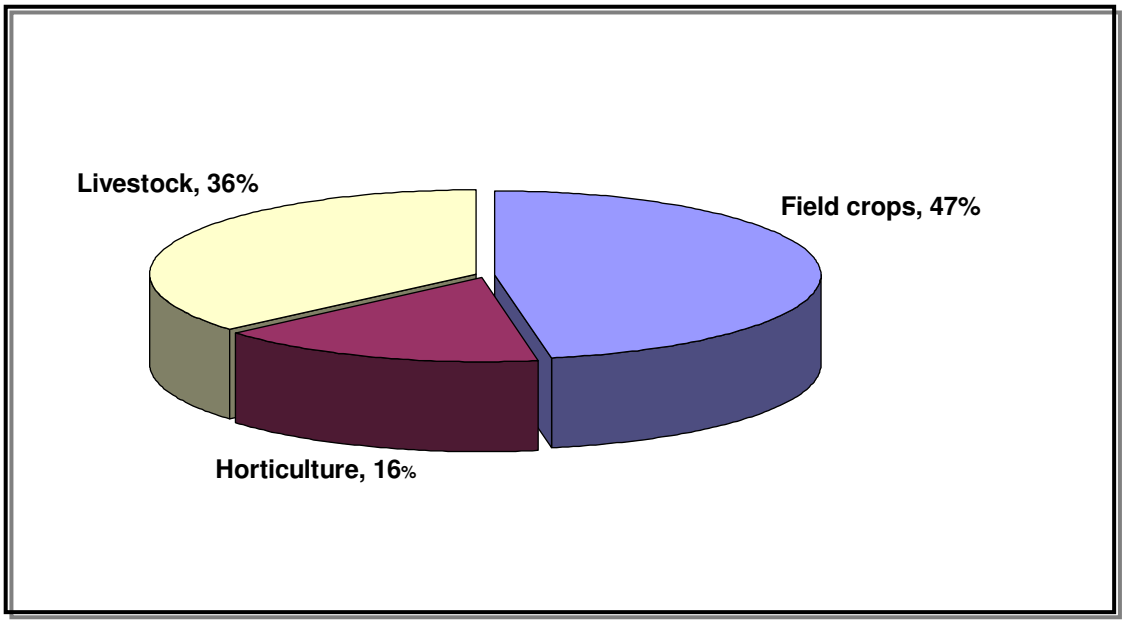

Figure 3.2: Gross value of agricultural production over the period of 1975-80
Source: DoA(2008)

When a comparison is made between these two periods (Figure 3.2 and 3.4), field crop production shows a decline by almost half of the total output (see Figure 3.2). In this period, animal and horticultural production increased their share of production by 5% and 11%, respectively. The former is due to the increase in intensive livestock production whereas the latter might be due to the impact of trade liberalisation on foreign trade and the country's re-entry into the international trading regime.

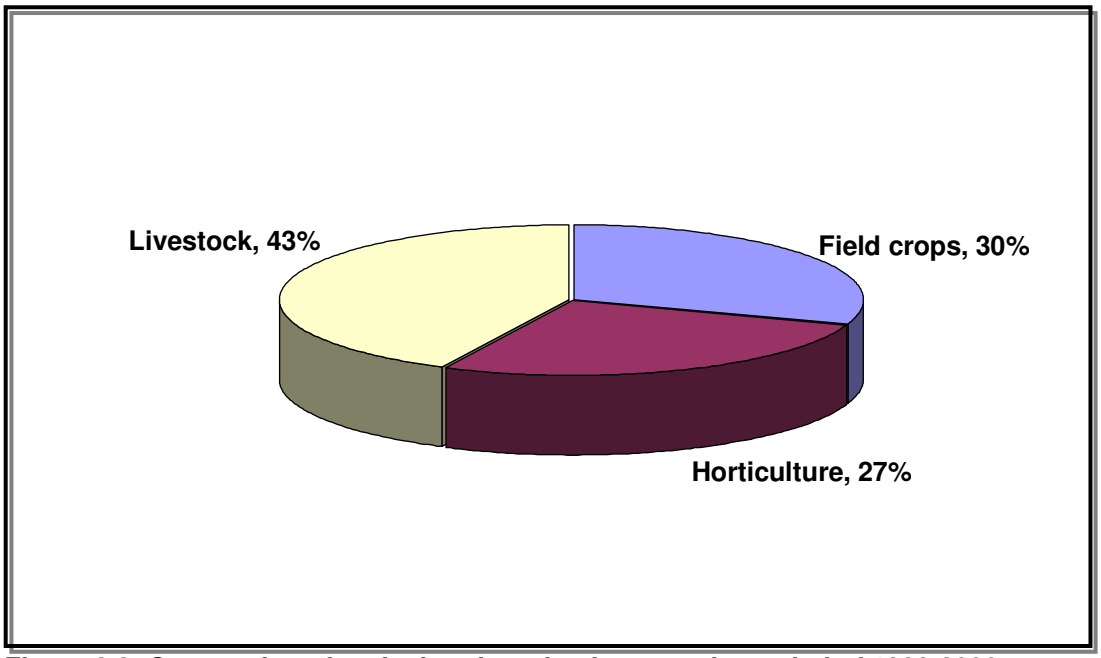

Figure 3.3: Gross value of agricultural production over the period of 1990-2006
Source: (DoA, 2008)

Table 3.2 shows that the South African agricultural sector's trend is moving towards that of being a net-importer with respect to total production; export is on an upward trend compared to total production. This implies there is a huge gap between domestic supply (production) and demand. For example, the percentage of import to total production increased tremendously and, when it is compared to 1980 and 2007, the figure increases four-fold from 6.2% to 24.4% (see Table 3.2). The ratio of total export to total production reduced substantially from 34.2% to 25.5% in the same period. In addition, Table 3.2 shows that the terms of agricultural trade (ratio of exports to imports) have declined substantially. This was partly due to an increase in manufactured food products. It might also have been attributed to South Africa's being

accepted back into the world community, or it could be due to the gradual momentum gained in trade after deregulation of the agricultural industry, which resulted in a freer domestic market.

Table 3.2: Trends in South Africa's agricultural exports, 1980-2004

	1980	1990	2004	2007
Total SA exports (Rm)	19 915.4	60 770.0	253 809.0	463 238
Total agricultural output	5930.30	20198	71264.5	120 155
Total agricultural exports (Rm)	2052.5	4625	15 819.0	30 667
Agricultural exports as % of total exports	10.3	7.6	6.6	6.6
Agricultural exports as % of total agricultural output	34.6	22.9	22.3	25.5
Total SA imports (Rm)	14 381.3	44 141.5	227 918.0	484 837
Agricultural imports (Rm)	369.2	1936	9643.7	29 304
Agricultural imports/total imports (%)	2.6	4.4	4.2	6.04
Agricultural imports as % of total agricultural output	6.2	9.6	13.5	24.4
Agricultural terms of trade (Ag exports/Ag imports)	5.56	2.4	1.6	1.05

Source: DoA(2009)

3.4 CHALLENGES IN THE SOUTH AFRICAN AGRICULTURAL SECTOR

South Africa is characterised by high levels of poverty, especially in rural areas, where approximately 70% of South Africa's poor people reside. Rural small-scale agriculture has not provided sufficient remunerative jobs or self-employment opportunities for the unemployed (Siyabulela, 2005).

There are many reasons for the current state of poverty; most of these are rooted in policies implemented in the past. Natural conditions such as climatic variability, uncoordinated policies and the lack of support by the government to the sector have contributed to the ineffectiveness of commercialising rural agriculture (Siyabulela, 2005).

Since 1990, several processes have taken place to reverse discriminatory legislation and to improve participation in the agricultural sector; at the same time, several other initiatives have been implemented to deregulate and liberalise this sector. Some of these actions had positive results while others had unintended consequences. The main policy shifts in this regard included (DoA, 2006):

- Deregulation of the marketing of agricultural products;

- Changes in the fiscal policy of the agriculture sector, including the abolition of certain tax concessions that favoured the sector;
- A reduction in direct budgetary expenditure;
- Land reform, consisting of the restitution, redistribution and tenure reform programmes;
- Trade policy reform, which included the ratification of farm commodities and a general liberalisation of agricultural trade (including free trade agreements);
- Institutional reform influencing the governance of agriculture; and
- The application of labour legislation to the agricultural sector.

The new Labour Act, the water and land reform legislation, together with the above-mentioned points, led the sector to become skewed in terms of participation. This challenge created a reduction in the number of commercial farmers, which in turn reduced the number of full-time commercial farm employees in South Africa. Many farmers became more vulnerable to international shocks, unstable weather conditions, a worsening debt situation and deteriorating terms of trade (Ramos and Margaret, 2007).

The rapid process of deregulation and liberalisation in the past decade has also exposed farmers' limited capacity to adjust their practices to the new policy and market changes so as to become more competitive in this open economy. Small-farming systems are also failing or finding it difficult to become part of mainstream agriculture (Ramos and Margaret, 2007).

There are positive indications that some farmers are doing well under the current circumstances. It is also evident that there is a good base, a generally positive attitude and willingness among farmers, agribusiness enterprises and government to tackle the challenges (Manduna, 2005).

3.5 TRADE POLICY AND TRADE DEVELOPMENTS IN SOUTH AFRICA

The main developments in terms of trade policies were the replacement of direct controls over imports by tariffs which were set below the rates bound in the WTO, and the elimination of state controls over exports. The average import tariff level was lowered by one-third between 1994 and 1999. South Africa has established a number of preferential trade arrangements with countries inside and outside the SADC region. Even though this trade development introduced greater exposure to external competition for farmers, it created improved access to foreign markets (OECD, 2006).

3.5.1 Trade Policy Prior to the 1990s

Trade policy, or rather trade protection, has played an important role in South Africa's economy. The appeal of economic self-sufficiency that pervaded the developing world during the 1960s and 1970s was heightened in South Africa due to political imperatives. Self-sufficiency was seen as a necessary precautionary response to an 'inimical' external world that could and eventually did cut off supplies to the country (Jonsson and Subramanian, 2001).

During the 1960s and 1970s, South Africa's trade regime was characterised by high tariffs and extensive import controls, including formal import quotas. In response to this perception that growth through import substitution was being exhausted, and by only encouraging manufacturing production and trade, attempts were made to mitigate the anti-export bias of the system. Formal import quotas gave way to import licensing but the focus, however, was on export promotion measures (Jonsson and Subramanian, 2001).

Beginning in 1983, the first systematic attempt was made to eliminate or reduce import licensing that covers 77% of import items. In 1985, South Africa switched from a positive list of permitted imports (i.e., imports not subject to licensing) to a negative list of prohibited imports, which covered about 23% of imports. That shows that more than three-quarters of imports were exempt from licensing (GATT, 1993, in Jonsson and Subramanian, 2001).

However, with the imposition of financial sanctions and the debt standstill in 1985, balance of payments pressures halted and even reversed progress on trade liberalisation. An import surcharge of 10% was introduced in 1985 and subsequently increased to 60% on some items in 1988, and by 1990 there were three rates (10, 15, and 40%, respectively) for the surcharge (GATT, 1993, in Jonsson and Subramanian, 2001).

During the 1980s, a number of export schemes were introduced to alleviate the burden on exporters. In 1990, they were consolidated into one scheme, the Generalised Export Incentive Scheme (GEIS), which provided exporters with a tax-free subsidy related to the value of exports, the degree of processing of the exported product, the extent of local content embodied in exports, and the degree of overvaluation of the exchange rate (Jonsson and Subramanian, 2001).

By 1992, only 15% of tariff lines in the manufacturing sector were subject to import licensing, which had become virtually automatic and hence less restrictive. Agriculture (74% of tariff lines) and five manufacturing sectors, namely food, beverages, rubber, tobacco (about 90%) and clothing (59%), remained subject to licensing (GATT, 1993, in Jonsson and Subramanian, 2001). The tariff regime was highly complex.

By the end of the 1980s, South Africa had the most tariff lines (greater than 13 000), most tariff rates (200 ad valorem equivalent rates), the widest range of tariffs, and the second highest level of dispersion (as measured by the coefficient of variation) among developing countries (see Belli, Finger, and Ballivian, 1993, in Jonsson and Subramanian, 2001). Summarily, South Africa had a highly distorted system of protection.

3.5.2 Trade Policy in the 1990s

The impetus for trade liberalisation started gaining momentum in the early 1990s, and was reflected by a consultative process under the auspices of the tripartite National Economic Forum involving government, labour and organised business. As a result, South Africa adopted a two-pronged approach to trade liberalisation during the 1990s. These included unilateral

trade liberalisation and multilateral trade liberalisation in the context of the Uruguay Round (South African Reserve Bank, 2007).

3.5.3 Unilateral trade liberalisation: 1990-94

Between 1990 and 1994, trade liberalisation largely took the form of eliminating the remaining import licensing procedures that were in place and reducing import tariffs. The average tariff was reduced from 28% to 16%, while the import surcharge was eliminated. Thus, the sum of all charges on imports was reduced from 34% to 16% (Cassim and Van Seventer, 2005).

3.5.4 Unilateral trade liberalisation: 1994-98

In 1994 South Africa announced a schedule of unilateral tariff liberalisation that would expire in 1999 and that went beyond the Uruguay Round commitments. As a result, its average (import-weighted) tariffs in manufacturing declined from 16% in 1994 to 10% in 1998. The current average (import-weighted) tariff is more than 5% below the level committed to by South Africa in the WTO, although the 'water in the tariff' varies considerably between sectors. As a result of these changes, South Africa's trade regime has been considerably liberalised since the early 1990s. Virtually all quantitative restrictions have been eliminated, including those operating through agricultural marketing boards; the tariff regime has been rationalised; the number of product lines have been reduced from over 13 000 in 1990 to about 7900 in 1998, and the number of tariff bands have been reduced from over 200 to 72. In addition, the tariff regime was simplified as the number of lines carrying formula duties (which acted like variable import levies) was reduced from 1900 in 1993 to 28 in 1997, and the number of lines facing specific tariffs was reduced from 500 to 227 (Jonsson and Subramanian, 2001).

3.5.5 Multilateral trade liberalisation: 1995-2002

In the context of the Uruguay Round, South Africa made a tariff offer that would be phased over five years and this took effect on January 1, 1995. This offer was publicly announced in 1994 after extensive consultations with civil society within South Africa. Given the prior progress with liberalising the quantitative restrictions, the offer aimed to (see Table 3.3):

- Reduce the number of tariff lines (from over 13 000) at the six-digit level by 15% in the first year and by 30% or more by 1999;
- Convert all Quantitative Restrictions (QRs) on agricultural imports to bound ad valorem rates; lower all bound agricultural tariffs by 21% on average and reduce export subsidies by 36%;
- Increase the number of bindings on industrial products from 55% to 98%; replace formula duties with tariffs, and reduce the number of tariff rates to six 0, 5, 10, 15, 20, and 30% rates, with the exception of the 'sensitive' industries (textiles, clothing and motor vehicles);
- Liberalise the sensitive industries over an eight-year period; and
- Phase out the General Export Incentive Scheme (GEIS) by 1997 (Jonsson and Subramanian, 2001).

Table 3.3 South Africa: Trade regime, 1990 and 1998 (in percentage, unless otherwise indicated

Tariffs	**1990**	**1998**
Manufacturing		
Maximum tariff	1389	72
Average import-weighted tariff	28	10
Average unweighted tariff	30	14
Number of tariff bands	> 200	72
Standard deviation	43	15
Number of tariff lines[1]	>13 000	7814
Percentage of tariff lines with non–ad valorem duties[1]	28	26
Range of effective protection[2]	189 to 411	204 to 2
Average import-weighted surcharge[3]	6	0
Import surcharge bands	10, 15, and 40	Eliminated
Agriculture		
Average tariff	25	2.2
Average import surcharge	8	0
Export subsidy[4]	17	Eliminated
Export taxes		
Diamonds	15	15
Quantitative restrictions on imports[5]	15	Virtually eliminated
Agriculture	74	Virtually eliminated
Manufacturing	14	Virtually eliminated
Quantitative restrictions on exports; goods[3]	Diamonds	Diamonds
Memorandum items:		
Trade tax revenue as share of total revenue	7.9	4
Import taxes as share of imports	10.8	4.1
Export subsidies as a share of GDP	0.3	0

[1]The figure for 1998 refers to June 1997.
[2]At ISIC three-digit level; excludes import surcharge.
[3]The figure for 1990 refers to 1992.
[4]Actual subsidy disbursements were 2.7 % of exports in 1990/91.
[5]The figure for 1990 refers to 1992. As percent of total tariff lines (other than those maintained for health, security, and environmental reasons).

Source: Jonsson and Subramanian (2001)

3.6 REGIONAL INTEGRATION AND FREE TRADE AGREEMENT

Regional integration is not a new issue in the southern African region, and it dates back to 1910. However, the step was taken to ensure that SACU members pursued a coordinated trade policy approach with regard to third parties (Grant, 2006). A common external tariff did exist. However, in reality members had been negotiating bilateral free trade arrangements. One example of such bilateral agreement is the Trade, Development and Cooperation Agreement (TDCA) concluded between South Africa and the European Union in 1999. The members were forced to adhere to some of the provisions of the agreement, especially concerning the tariff concessions offered by South Africa (Grant, 2006). However, trade agreements were primarily aiming at improving the economic wellbeing of the poor by focussing on the structural transformation of agricultural economies (OECD, 2006).

The South African agricultural sector continues to address the issue of poverty and inequality through its agricultural support programmes for disadvantaged farming communities and by integrating the economy with that of the world community (DoA, 2005).

3.6.1 Southern African Customs Union

The Southern African Customs Union (SACU) is the oldest customs union in the world. It was established in 1910. The members are South Africa, Botswana, Lesotho, Swaziland and Namibia. Essentially, SACU is a customs-free zone with a common external tariff imposed against non-members (Grant, 2006). The members have been characterised by severe divergences in policies, level of development, political systems and administrative capacity. These factors have led to attempts to renegotiate the 1969 agreement (Kirk and Stern, 2003, in Grant, 2006).

The renegotiation agreement was concluded in 2002. This agreement promotes the integrated union into the global economy, facilitates cross-border movement of goods between members and facilitates fair competition (Kirk and Stern, 2003, in Grant, 2006).

3.6.2 SADC Free Trade Agreement

South Africa became a member of the Southern African Development Community (SADC) in 1994. Other members in the SADC are Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Swaziland, Tanzania, Zambia, the Democratic Republic of Congo, the Seychelles and Zimbabwe (ECA, 2004).

The SADC agreement consists of general objectives rather than specific obligations. The key policy objective is to strengthen trade and investment linkages between the members (ECA, 2004).

3.6.3 Trade, Development and Cooperation Agreement (TDCA)

South Africa's trade relations and development cooperation with the EU are governed by the TDCA, which was signed in 1999. The TDCA's ratification is still ongoing and the agreement is being provisionally applied. The main objective of the TDCA is to create a free-trade area between South Africa and the EU over a 12-year period. Both parties open up their markets to each other at a different pace (Economic Commission for Africa (ECA), 2004).

In addition to this agreement, a separate agreement on wines and spirits was signed in January 2002. These agreements, which are also applied provisionally, provide for the reciprocal protection of wine and spirits' names, and cover issues such as processes and product specifications (ECA, 2004).

The TDCA involves various degrees of trade liberalisation, ranging from immediate liberalisation to longer periods of 10 years for the EU and 12 years for SA. On top of the trade provision, the agreement also covers a wide range of other aspects of agreement such as political, economical, social and cultural aspects (ECA, 2004).

South Africa agreed to remove approximately 81% of duties on its imports of agricultural products from the EU, while the EU removed duties on approximately 61% of the EU's total imports of agricultural products from South Africa. If the partial liberalisation quotas and the full liberalisation schedules were included, the latter figure goes up to 72%. Both parties also have

a reserve list of sensitive products that they exclude from liberalisation for the moment. Bananas, sugar, beef, rice, maize, sweet corn, starches, many fruits and vegetables are among the products on the EU reserve list. SA has excluded products such as fresh meats, dairy products, some cereals and sugar products. The reserve lists are subject to future review (ECA, 2004).

For certain products which are to be liberalised, albeit not immediately, some preferential transitional quotas have been introduced with immediate effect (the EU will benefit from such quotas on certain wines; SA will benefit on certain cheeses, cut flowers and wines). In addition, the EU has allowed partial liberalisation for some of the community's other sensitive products, such as citrus fruits, canned fruit, juices, cut flowers and wines, which featured on the original council mandate exclusion list. This form of tariff quotas generally limited to levels of recent imports from SA. In return, SA offered the EU some reciprocal tariff quotas in the cheese as well as the wine sector. These quotas were also based on the levels of recent imports from the EU (DoA, 2006).

3.6.4 The African Growth and Opportunity Act (AGOA)

The African Growth and Opportunity Act (AGOA) is an initiative that was signed into law as part of the United States of America's (USA) Trade and Development Act of 2000, and it aims to promote economic development and expedite the integration of African economies into world trading systems. The USA intended AGOA to provide a means for government-to-government interaction and for the private sector and civil society to work together in order to build trade capacity and expand business links (DoA, 2006).

Through these cooperative efforts, AGOA is said to have expanded duty-free access for more than 6400 African products to US markets, including selected agricultural commodities (DoA, 2006). At present, South Africa's major benefit is that AGOA gives a major boost to the clothing manufacturing industry (DoA, 2006).

The AGOA initiative provides sub-Saharan African countries the opportunity to take advantage of tariff-free export of agricultural produce to the USA. Under AGOA, several African countries

have been trying to access US markets, although few countries have the capacity to satisfy the stringent phytosanitary requirements that the US demands. To help these countries improve their capacity, four trade hubs have been established in African regions since 2001 – namely in Kenya, Senegal, Ghana and Botswana – under the African Global Competitiveness Initiative (AGCI). The objective is to provide technical assistance and infrastructure development in order to promote trade (DoA, 2006).

3.6.5 Challenges in SADC trade integration

SADC countries' ability to exploit market access opportunities which may be obtained through economic integration arrangements are severely limited by supply and marketing constraints. Moreover, insufficient competitiveness in a number of export and production sectors still exists. The Rules of Origin, which encourage import substitution at a regional level, specifically also exacerbate the problems associated with supply constraints within a region (Martine and Trudi, 2004).

The Rules of Origin have been tailored to facilitate trade and to ensure that only products originating within the region have access to the preferential status provided by the FTA (Ashipala and Haimbodi, 2003). SACU countries, in particular South Africa, have largely provided the motivation for the implementation of these rules.

Essentially, these requirements provide a form of intra-regional import substitution or trade diversion, but at the same time introduce a significant barrier to market access within the region, effectively drawing a distinction between SACU markets and non-SACU markets (Martine and Trudi, 2004).

The two-stage transformation might encourage agricultural production as well as agri-processing, especially in Malawi (Mandindi, 2000, in Martine and Trudi, 2004). While it holds promise in supporting the development of supply chains and Intra-Industry Trade (IIT) within SADC, it presents considerable difficulties for most of the SADC members and many have inferred that, given the requirements, this will further limit market access to SACU. Many researchers, for instance, Ashipala and Haimbodi (2003) and Martine and Trudi (2004), argue

that these rules are much more stringent that what was in place before (Ashipala and Haimbodi, 2003). It is commonly argued that if the Rules of Origin are fully implemented, not even SACU could supply the entire demand for inputs in the region (Martine and Trudi, 2004).

In terms of basic conditions affecting market structure, the single greatest obstacle to intra-regional trade is the transaction costs faced by individual firms. Market access is largely obstructed as a result of excessive transaction costs.

The seven most important Non-Tariff Barriers (NTBs) that impede trade in the region are, according to Martine and Trudi (2004):

- Communication problems;
- Customs procedures and charges;
- Transport problems;
- Lack of market information;
- Other border procedures;
- Services: financial, electricity, technical support, and
- Standards and certification/technical restrictions.

Again drawing from the theory of industrial organisation, the nature of the underlying market structure in which industries operate has significant implications for firm-level conduct and performance. Invisible trade barriers greatly increase the cost and risk of doing business, thereby affecting the competitiveness of firms in the global market and, above all, prohibit smaller firms' access to regional markets. These factors are explanatory variables for low intra-regional trade and should be considered in the formulation of industry support policies aimed at providing incentives for productivity enhancement, industrial development, investment and trade expansion (Martine and Trudi, 2004).

3.7 THE SOUTH AFRICAN AGRICULTURAL TRADE FLOW WITHIN AFRICA

Trade relations with African states are based on political and economical common interests. In 2002, around 16% of South Africa's exports destinations were to Africa. South Africa has signed to a number of preferential trade relationships both as regional and bilateral trade agreements (Daya, Ranoto, and Letsoalo, 2006).

The agreements provide deeper economic integration through the development of common policies on industry, investment, agriculture and competition. Its purpose is also to harmonise policies of unfair trade practices. Right after independence in 1994, South Africa became a member of the Southern African Development Community (SADC). In 1994, a key economic objective of the government was to strengthen trade and investment linkages between South Africa and other SADC countries. In 2000, the SADC protocol on trade was implemented. South Africa's trade with SADC countries was estimated to be 16 billion Rand in 1998, which grew to 32 billion Rand in 2002 (Daya *et al*., 2006).

South Africa has long had strong trade relationships with African countries such as Nigeria, Kenya and Ghana. In recent years, these relationships have shown substantial growth in terms of trade flow. For example, South African import/export was estimated to be R2.5 billion and R2.7 billion, respectively, from/to Nigeria in 2003. The trade balance with Kenya seemed relatively equitable: exports and import to/from Kenya amounted to R2.2 billion and R2.1 billion, respectively, in the same period. Exports/import to/from Ghana were smaller than with other African countries (estimated at R1.1 billion and R52 million, respectively). Over the past years, South Africa has consistently had a trade surplus with other African nations (DoA, 2008).

Table 3.4 presents the summary of South Africa's exports in 2006. When export figures in this table are compared to those of 2003, one sees substantial progress with most countries. For example, export to Nigeria, Ghana and Kenya was 48.2%, 54.5% and 45%, respectively. Further, Table 3.4 shows the biggest South African export destination was within SADC countries (accounting for about 27.5% of the total export to Africa).

Table 3.4: South African export destinations in Africa – 2006

Country/ region	R million	Percentage
Africa	53 448	40.50%
SADC	35 892	27.20%
Zambia	7788	5.90%
Zimbabwe	7410	5.60%
Mozambique	6240	4.70%
Angola	4739	3.60%
Nigeria	4001	3.00%
Kenya	3244	2.50%
Tanzania	2765	2.10%
Congo	2553	1.90%
Mauritius	1995	1.50%
Ghana	1737	1.30%

Source: DoA(2008)

The exchange rate has always been influential in terms of South Africa's trade within Africa. For instance, a sharp decline in the local currency at the end of 2001 showed large increases in exports, which saw South Africa's trade balance narrowing down significantly. When the Rand started to strengthen in 2003, this led to a substantial decline in exports during the corresponding period. South Africa's major exports capacity was from primary to secondary commodities (Daya *et al*., 2006). However, South Africa's products have a relative comparative advantage, predominantly for minerals, vehicles and motor parts, base metals, chemicals, plastics as well as food and beverages (Daya *et al*., 2006).

3.8 GLOBAL TRADE FLOWS OF SOUTH AFRICAN AGRICULTURE

The opening of the agricultural sector placed South Africa among the world's leading exporters of agro-food products such as wine, fresh fruit and sugar. Up until to 2005, South Africa witnessed strong agricultural export growth (Figure 3.4). South Africa's agricultural export revenues reached almost 9% of the total value of national exports. Europe was by far the largest destination, absorbing almost one-half of the country's agricultural exports (OECD, 2006). However, in 2007, trade trends showed that agricultural export was declining tremendously and imports were growing (see Figure 3.4). This is due to a multitude of factors. As Coetzee (2008) indicated in a Farmer's Week report, the main reasons why production is declining are as follows:

i) Since 1994, government has restructured/focussed South Africa's commercial agriculture departments to centre on encouraging newly emerging commercial farmers. Little attention has been paid to commercial agriculture's role in providing food to the local population.

ii) Unfair competition from highly subsidised imports has caused local production to drop tremendously, as farmers battled for high input costs and lower prices.

iii) The transferred land to previously disadvantaged people has not been able to produce enough to close the gap between demand and supply.

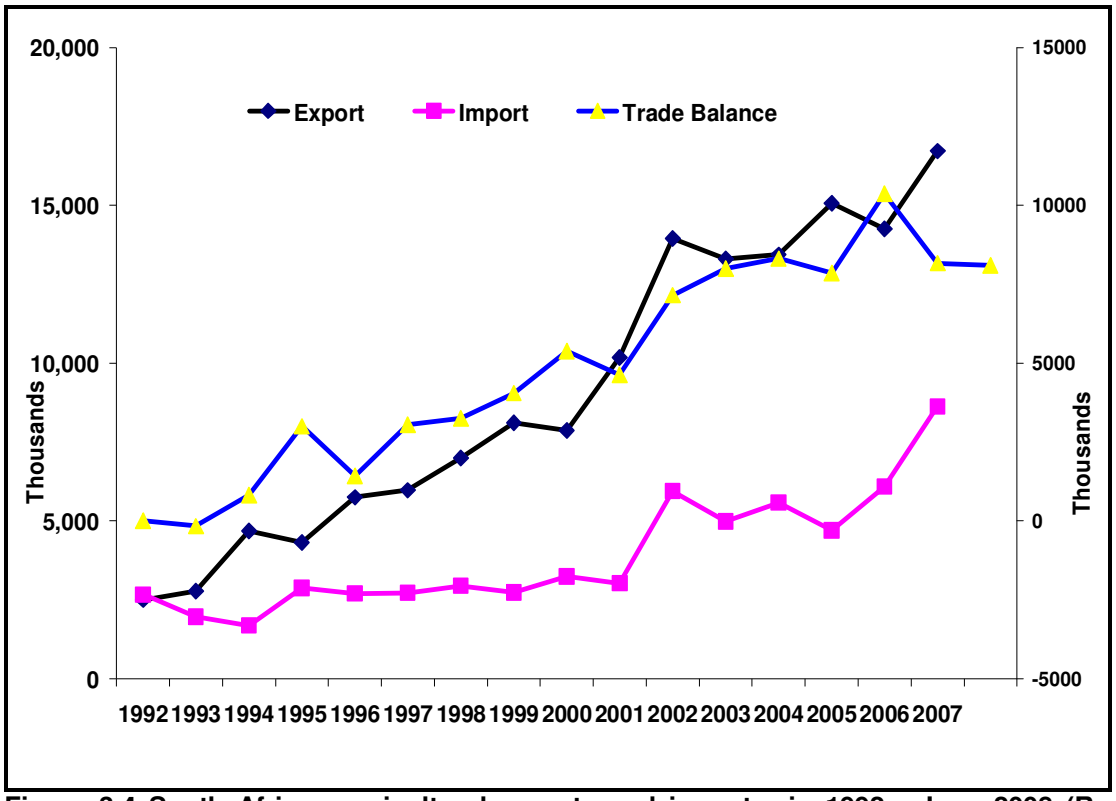

Figure 3.4 South African agricultural exports and imports: in 1992 - June 2008 (Rand thousand)
Source: Department of Trade and Industry (DTI) (2008)

Figure 3.5 shows South Africa's total average agriculture export destination by region. From 2004 to 2007, the EU accounted for 49.6%; the second and third importers were Northern-East Asia and SADC, with 16.4 and 9.4%, respectively. The total export to other regions accounts 16.4%. This may indicate that South African agricultural products exports are competitive in the

EU markets, or could be a result of consumer preferences towards South African products. It may also indicate the ability of the South African agricultural industry to comply with market requirements.

Furthermore, the bilateral free trade arrangements between the SA-EU Trade, Development and Cooperation Agreement (TDCA) could have facilitated the South African agricultural product having preferential access to the market. The SADC integration has created good opportunities to increase export within the region.

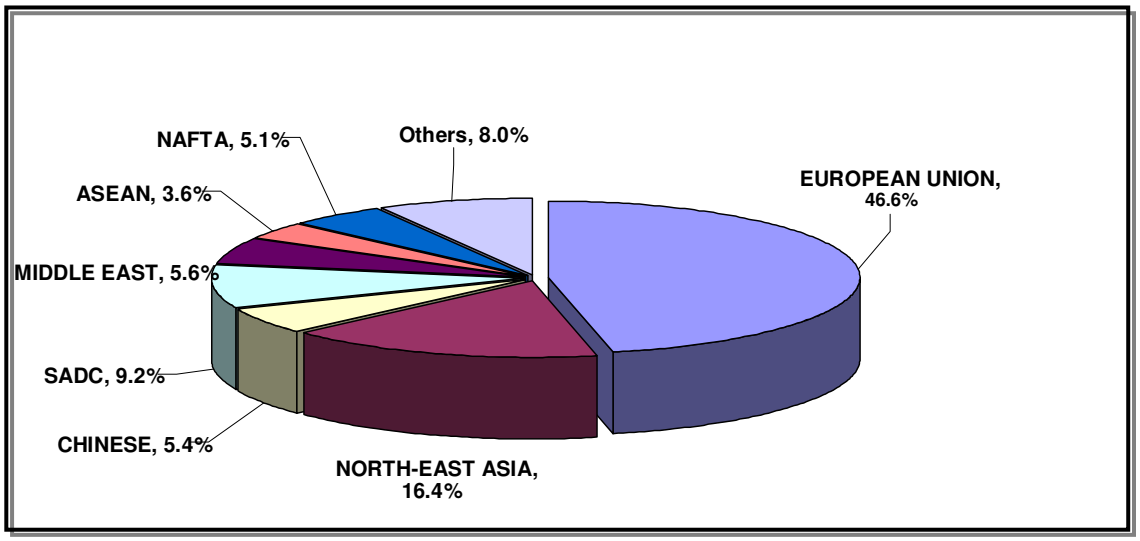

Figure 3.5: South African export origin by region: average from 2004 to 2007
Source: DTI (2008)

In terms of South Africa's import origins (Figure 3.6), the MERCOSUR trading region was the biggest exporter to South Africa, accounting for about 23%; SADC was the second largest exporter at 17%, followed by NAFTA (at 15%); the EU and other regions collectively accounted for 10 and 7%, respectively. This shows that South Africa, with its new import orientation, is looking for the cheapest region to be cost-effective and to close the demand gap.

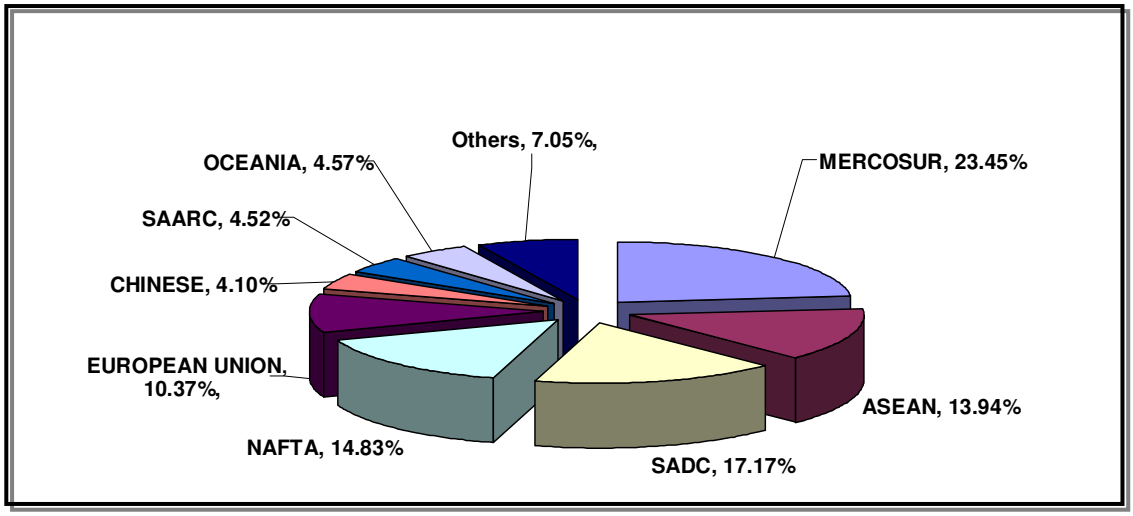

Figure 3.6: South African import origin by region: average from 2004 to 2007
Source: DTI (2008)

3.9 THE SOUTH AFRICAN AGRICULTURAL INTERNATIONAL TRADE PERFORMANCE

South Africa's total agriculture export in 2007 was about R16.7 million. Figure 3.7 shows that the biggest South African export destinations were EU countries, which accounted for 59.2%; Northern-East Asia, the second largest importer from South Africa, accounted for about 16%, and is followed by the Chinese with 7.2%. Imports by other countries together accounted for less than 30%. This may indicate that South African agricultural products exports were competitive in the EU markets. The reasons for this can be:

i) Consumer preferences towards South African products;

ii) The ability of the South African agricultural industry to comply with market requirements; or

iii) The market might be highly profitable.

Furthermore, the bilateral free trade arrangements between the SA-EU Trade, Development and Cooperation Agreement (TDCA) give the South African agricultural product preferential access to the market.

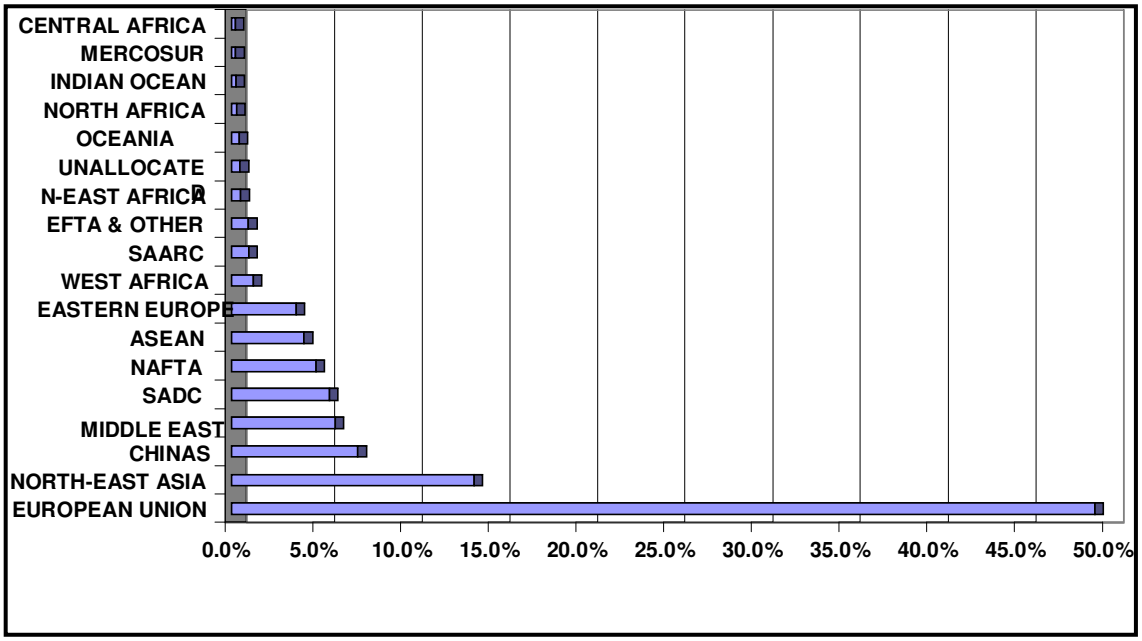

Figure 3.7: Percentage distribution of South African exports of agricultural products by Region in 2007
Source: DTI (2008)

In terms of import origins (Figure 3.8), the MERCOSUR trading region, the leading exporter to South Africa, accounts for 28%; NAFTA is the second largest exporter (20%), and the SADC and ASEAS were in third and fourth place, respectively (accounting for 15% and 13%, respectively). Import from the EU and other countries accounted for less than 10%.

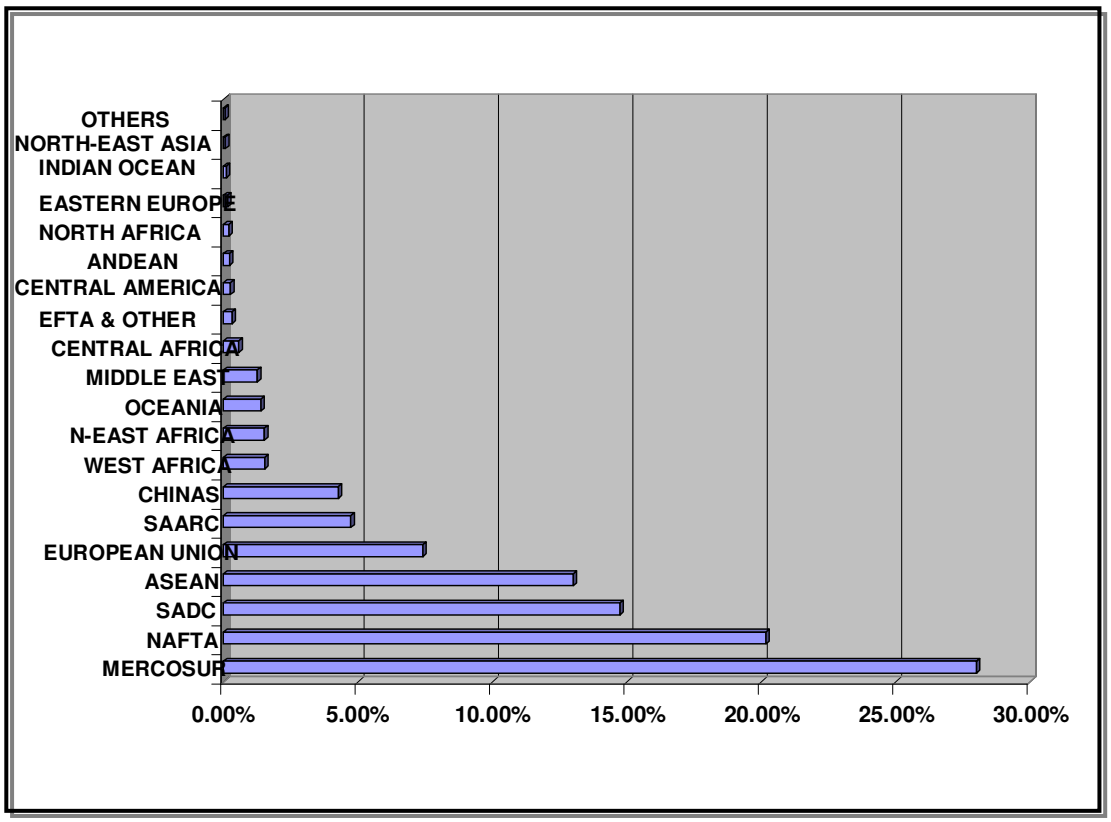

Figure 3.8: Percentage distributions of South African imports of agriculture products by region in 2007
Source: DTI (2008)

Figure 3.9 shows South Africa's export distribution to different countries in 2007. In terms of export destinations, the Netherlands, United Kingdom and Japan were the leading export destinations for South African agricultural products, accounting for 8.7%, 8.2% and 7.6%, respectively.

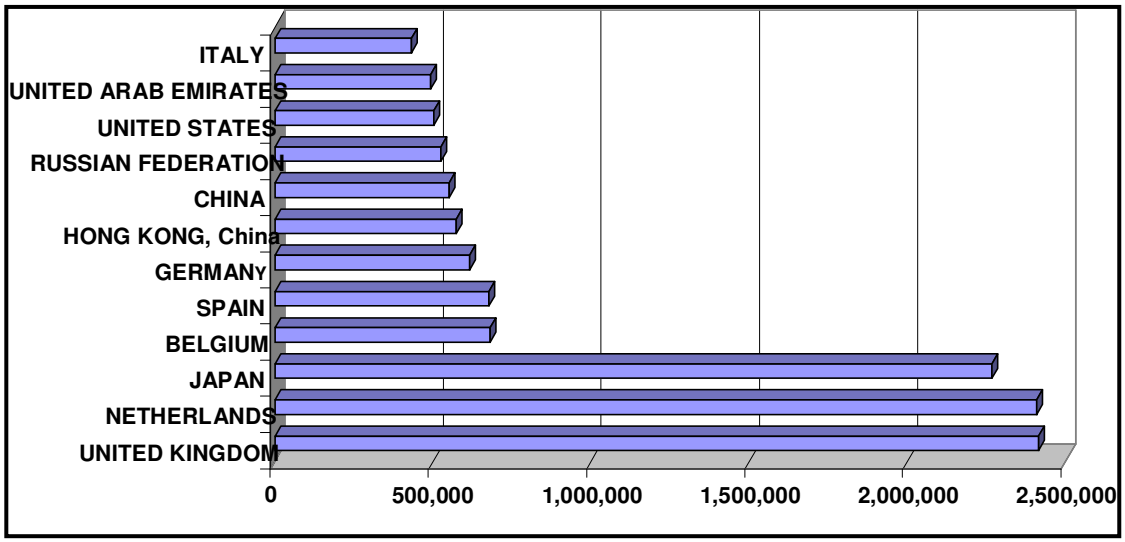

Figure 3.9: Distributions of South African exports of agricultural products (in Rands) by countries in 2007
Source: DTI (2008)

In terms of the import origin to South Africa, Argentina export records shows 40%, Indonesia 9.7% and China 5.9% (see Figure 3.10). This clearly shows that the South African preference shifted to Latin America; this could be the cheapest market for South African agricultural consumers.

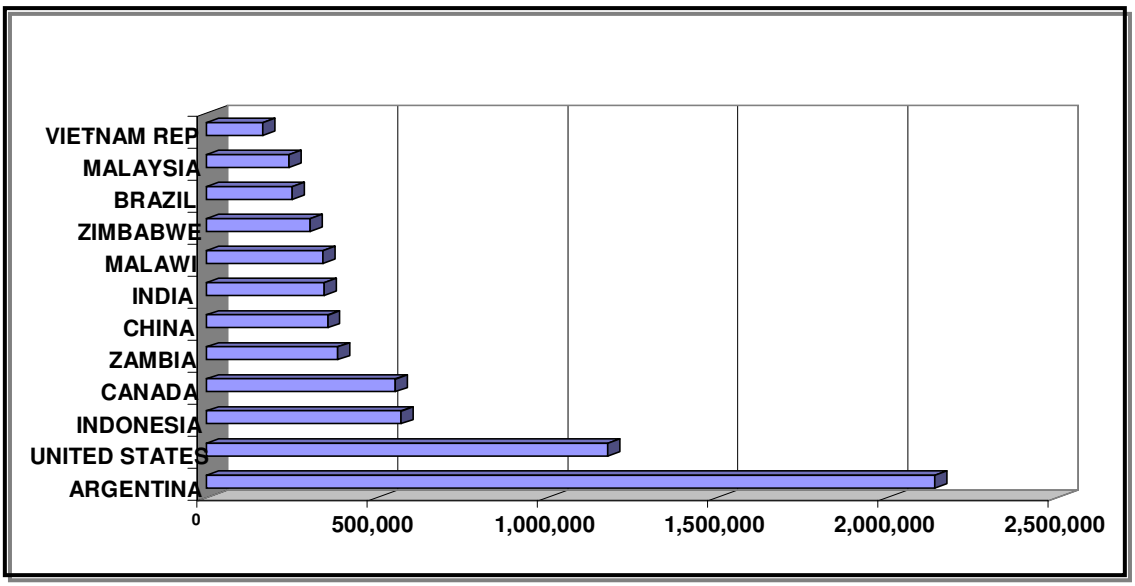

Figure 3.10: Distributions of South African imports of agriculture products (in Rands' 000) by countries in 2007
Source: DTI (2008)

Figure 3.11 shows that South Africa mainly exports crops to trading partners. This implies that there is restriction on fruit and livestock products in the trading regions. For example, the EU has excluded livestock products from the EU-SA-TDCA agreement.

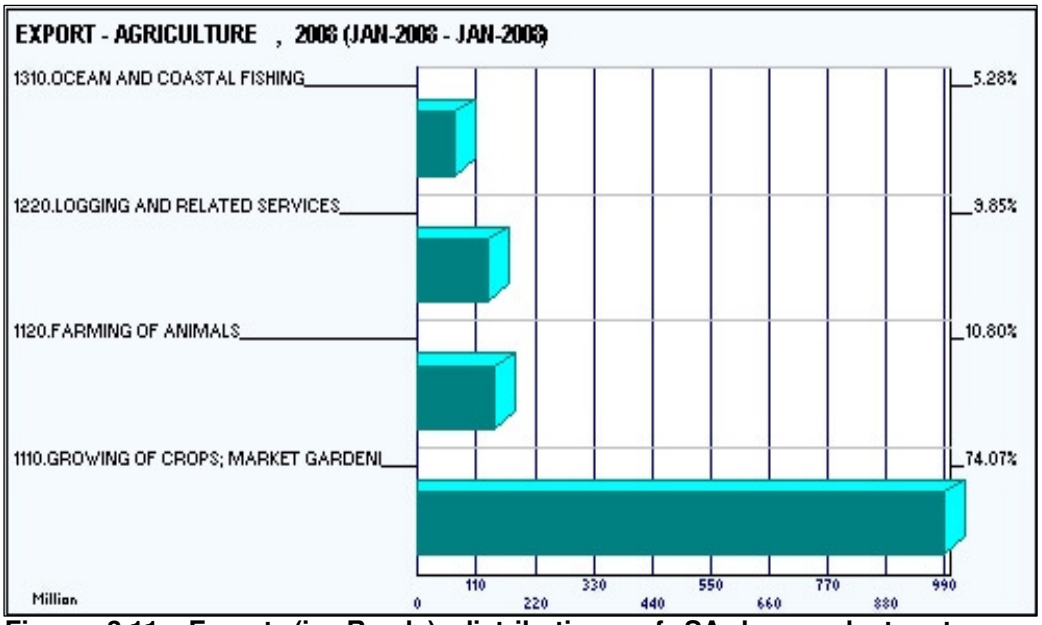

Figure 3.11: Export (in Rands) distributions of SA by product category of agriculture products in January 2008
Source: DTI (2008)

3.10 CONCLUSION

From 1950 to 1987, agricultural output grew on average at the annual rate of 2.5% before it declined by an average annual rate of 2.1% between 1987 and 1995. Between 1997 and 2007, output showed a small growth of about 1% annual average. When comparison is made between 2006 and 2007, one sees a 13% contraction in total agricultural production from the previous year, and that the sector picked up slightly by 0.3% during 2007, contributing only 3.2% to the total GDP. This slow pick-up was mainly due to good weather prospects, persistent high prices and the overall economic upswing (DoA, 2008).

However, the average annual contribution of South African agriculture total GDP and employment has dropped from 7.7% and 1.64million jobs to 3.2% and 0.63million jobs, respectively, from 1970 to 2007 (DoA, 2008). Value of import and export accounts for

133.3million and 431.5million in 1970, in 2007 becomes 29 304million and 30 667million respectively. This shows South Africa becomes a net importer in food item.

Within the above context, several questions arise. Firstly, why is it that the current South African agriculture exports have declined while imports have risen, and what could the main factors be that led to these changes? Secondly, how can agriculture play a role in improving the situation, and what factors influence agriculture to play a more prominent role? The third question pertains to the role of trade and government's open trade policy. The final analysis looks at how trade policy in the agricultural sector is the foundation for achieving government's growth objectives. Further, it is necessary to provide answers to the following questions:

- Have the current open trade regimes followed by South Africa, and in particular in the agricultural sub-sector, culminated in increased economic growth and what was agriculture's role in it?
- Are current policies sufficiently sequenced and linked to provide support to an open trade regime?
- What policy directions should be taken to foster agriculture's role in the economic growth, especially in the case of trade policy?

Therefore, this study tries to assess how the South African agricultural sector benefited from trade liberalisation and how the sector should be handled. It also considers the question of which trading agreement bloc should give more emphasis in order to promote economic growth and poverty reduction.

CHAPTER 4

DEVELOPMENT OF THE INTERNATIONAL TRADE-WIDE MODELLING FRAMEWORK

4.1 INTRODUCTION

This chapter provides a relevant development of the international trade-wide modelling for the South African agricultural economy and relates it to economic growth and trade liberalisation. In this chapter, a detailed methodological development that suits each objective is presented after justifying the econometric modelling and providing a theoretical framework of different methods applicable to this study.

Given the fact that the main objective of this study is to examine the implications of trade liberalisation and economic growth for South African agricultural industries, the development the IIT and the Gini coefficient is discussed in detail. These coefficients assess agriculture's ability to contribute to export earning, international market access and the trade balance. However, it is appropriate to ask how much import liberalisation has contributed to the economic growth. Further, it is important to assess the role of different regional trading bloc agreements, including the impact of a trading partner's distance and the exchange rate in striving for effective trade flows with agricultural products. The development of the gravity model that best states the bilateral trade flows and its impact on the agricultural industry is also discussed. In addition, the development of co-integration modelling and Exact Maximum Likelihood (EML) is presented in detail in this chapter.

4.2 JUSTIFICATION OF THE ECONOMETRIC APPROACH TO TRADE MODELLING

The world's economies and many of its economic markets operate daily and are used to formulate realistic models to represent the economy; these markets also serve as a major challenge facing economists today. Given that the economy is made up of millions of agents that are continuously making decisions, using a continuous time model allows for these interactions to be incorporated and is a more realistic description of the underlying phenomena. The econometric estimation of continuous time models has been a major ongoing development over the last 30 years. The major problem faced in such econometric modelling is that it does not have a continuous time record of observations and most economic data is available only at discrete time periods (annually, monthly or quarterly). In finance, data is more frequently available at a higher frequency. For example, daily and even recent hourly transactions data sets are automatically available. The problem facing an econometric investigator is therefore how to best utilise such data in the estimation of an underlying continuous time system so that the fitted model can then be used in economic forecasting, policy analysis and derivative pricing (Hazell and Norton, 1986, in Jooste, 2001).

The question might, however, rightfully be asked as to whether econometrics should be used as a vehicle to derive answers sometimes quite obvious to observers in the field of economics. In this regard, it should be remembered that mathematical economics is merely an approach to economic analysis. Chiang (1984, in Jooste, 2001) supports this notion by stating that it should not, and does not, differ from the non-mathematical approach to economic analysis in any fundamental way. He goes further by stating that the major difference between 'mathematical economics' and 'literary economics' lies principally in the fact that, in the former, the assumptions and conclusions are stated in mathematical symbols rather than words, and in equations rather than sentences. The main advantages for going beyond the geometric approach of economic modelling lies in the following (Chiang, 1984, in Jooste, 2001):

- The 'language' used in the economic approach is more concise and precise.
- A wealth of economic theorems exist.

- It forces the analyst to explicitly state all assumptions as a prerequisite to the use of the economic theorems.
- It allows the analyst to treat the general N-variable case.

In economic modelling, researchers face a fundamental choice between modelling in continuous and discrete time. This choice raises the important question of why models should be formulated in continuous time rather than in discrete time. There are a number of advantages to modelling in continuous time that are briefly summarised here (Albert and Khalide, 2007):

Firstly, since the economy is continuously operating and the underlying decision processes being modelled involve millions of decisions by economic agents within the recorded data observation interval, realistic models will depend on the continuous passage of time. A continuous system will therefore accommodate the underlying interactions being modelled and captured in the data, whereas traditional discrete time models are inherently less flexible because they restrict the underlying decision-making lag structures by exactly matching the observation interval in the data (daily, monthly, quarterly) so that, at best, an economy's equilibrium and disequilibrium characteristics are being captured at successive points of time. The potential for misspecification therefore seems greater in a discrete time system when the underlying phenomenon is continuous.

Secondly, economic models typically comprise two types of variables. The two variables are: stock variables observed at points in time (for example, the money stock, inventories, fixed capital), and flow variables (for example, consumption, exports, output and imports) observed as aggregations over the unit observation period. Continuous time econometric methods, as applied in this monograph, allow for the correct treatment of these different types of variables in the direct and exact estimation of the models. This solves the temporal aggregation bias that commonly occurs when using discrete time models with flow variables, where, generally, no distinction is given to stock and flow variables.

Thirdly, when economists in government and central banks develop econometric models for short- and long-term economic forecasting, the construction of a quarterly or monthly model is commonplace due to the availability of national accounts data of that frequency. This dependence of the formulation of the model on the observed data frequency is a major disadvantage of discrete time models. For example, constructing a model on monthly data will be different to one based on daily data. In contrast, the specification of a continuous time model in economics and finance is independent of the available data frequency. Related to the previous point, the fourth advantage of continuous time models is in economic and financial forecasting. The use of continuous time models allows one to obtain continuous time paths of the variables that can be used to make forecasts at shorter intervals for the available data used in the estimation of the model. For example, the continuous time path forecasts of agricultural production and gross domestic product in the economy would be useful to government Treasury departments and central banks in their policy setting. In the business sector, companies would find it useful, for instance, to have the continuous time path of retail sales projections for setting future production levels. A discrete time model is less flexible where a quarterly macro-economic model would generate forecasts of gross domestic product at quarterly interval forecasts when needed on a weekly or monthly interval. The forecasts would have to be interpolated.

A fifth advantage of continuous time modelling is concerned with the modelling of dynamic adjustment mechanisms in the economy; continuous systems allow for more realistic specifications of the partial adjustment processes than with a discrete time model. Typically, when formulating partial adjustment (error correction) mechanisms with continuous systems, it allows the dependent variable to adjust continuously in response to deviations from its partial equilibrium level, which may be set to continuously depend on other variables in the model according to some underlying economic theory. These partial adjustment equations usually take the form of first- or second-order differential equations but could, of course, be much more general. The main reason why economic variables adjust gradually, rather than instantaneously, to their partial equilibrium level, is that there are adjustment costs which

depend on the rate of change and, possibly, the acceleration of the adjusting variable. The resulting mechanisms can be formally derived as part of the solution of a dynamic optimisation problem, which takes account of the costs of adjustment, as is done in the present monograph study.

The sixth advantage of continuous time models is their natural application in the development of economic theory and derivative pricing models since the groundbreaking work of Merton (1969, 1971, and 1973) and Black and Scholes (1973, in Albert and Khalide, 2007). Sundaresan (2000, in Albert and Khalide, 2007) provides a major review of these developments, and of continuous time models in economics and their many applications. There are a number of other advantages of continuous time modelling (Brennan and Schwartz, 1980, in Albert and Khalide, 2007).

One of the disadvantages of continuous time modelling is that the estimation of these models has involved the development of complicated and sometimes specialised econometric methods that have in the past largely remained in the province of econometric theorists and finance specialists.

4.3 THEORETICAL FRAMEWORK OF INTRA-INDUSTRY TRADE (IIT) AND GINI COEFFICIENTS

Many developing countries have taken steps toward trade liberalisation and have undergone important policy changes. As a result, trade exports in particular have expanded considerably. With this expansion, Guzin and Haluk (2003) have observed a significant increase in the Intra-Industry Trade (IIT) coefficient in most African economies; essentially, the simultaneous buying and selling of the same or similar commodities among countries leads to higher IIT records. Openness to trade has long been seen as an important element of sound economic policies aimed at alleviating poverty and promoting trade success. There is a preponderance of cross-country evidence that trade liberalisation and openness to trade increases the growth rate of income and output (Hoekman, Michalopoulos, Schiff, and Tarr, 2002:1, in Jooste and Van Schalkwyk, 2006). This is in turn linked directly and indirectly to the people's level of income.

Since the pioneering work done by Grubel and Lloyd in the mid-70s, much empirical work has been undertaken to examine IIT determinants. The cross-country model of intra-industry trade has long been studied to explain the level of sophistication of the trade structure and the level of development of countries (Alan, 2002). Grubel and Lloyd (1971) showed that the bulk of trade in industrial countries was intra-industry trade. They stated that it should be clear that IIT is a result (or the effect) of increased specialisation, not a cause. The underlying determinants of a country's preparedness to compete internationally and to adapt to changing circumstances are fiscal and monetary policy, the factor market, investment, international trade, and restrictions such as tariffs and quotas. It should be noted that trade liberalisation has significant advantages for specialisation. This conclusion remains valid, as shown in recent studies such as that of Globerman and Dean (1990, in Oleh and Peter, 1997). The notion that the degree of specialisation in IIT or that high Gini coefficients correlate with the stage of development has led to a large body of literature and empirical studies (Alan, 2002, and Guzin and Haluk, 2003).

One needs to be cautious when interpreting the IIT as an indicator of preparedness. A high IIT is broadly indicative of a greater flexibility in competing internationally and thus signals better preparedness for trade liberalisation. On the other hand, a reverse causation could be argued, namely that liberalisation, even only vis-à-vis the EU, can stimulate investment and efficiency improvements, which in turn would be reflected in an increased IIT index. The proposition that trade liberalisation generates increased IIT is posited in the literature, though this in fact remains unresolved. Globerman and Dean (1990, in Oleh and Peter, 1997) argue against this proposition by analysing the Canada-US Free Trade Agreement.

Oleh and Peter (1997) present the results of a survey of Canadian firms which concludes that these firms do not plan to specialise further. The study also indicates that there appears to be a 'topping out' or even reversal of increasing IIT levels, suggesting that product specialisation is not an expected outcome of the Free Trade Agreement (FTA) between the US and Canada. Similarly, Steven (2003) examines whether a change in the level of protection has consequences for the IIT level in Australia and New Zealand. He has found no support for this hypothesis. However, one must be cautious about making inferences regarding these studies,

as they analyse the effect of liberalisation or protectionism on IIT for industrialised countries, where the notion of topping out may be more applicable.

The Gini coefficient measures the extent of concentration that is determined by various factors (such as consumer preferences) that result in different trade streams; trade barriers prohibiting or restricting trade between different regions and certain products or product types; trade agreements and trade incentives; infrastructure; political stability or instability in a country, and the ability to pay, which is a function of income (Lubbe, 1992).

The Gini coefficient is defined graphically as a ratio of two surfaces and involves the summation of all vertical deviations between the Lorenz curve and the perfect equality line. The Gini coefficient was developed to measure the degree of concentration (inequality) of a variable in a distribution of its elements. It compares the Lorenz curve of a ranked empirical distribution with the line of perfect equality. This line assumes that each element has the same contribution to the total summation of the values of a variable. The Gini coefficient ranges between 0, where there is no concentration (perfect equality), and 1, representing total concentration (perfect inequality). The closer the coefficient is to 1, the more unequal the distribution (Brian and Jean, 2005).

The purpose of this study is to examine the agricultural position of South Africa in a global comparison of Gini coefficients and IIT, and to draw inferences about trade flexibilities. Ingco and Townsend (1998, in Jooste and Van Schalkwyk, 2006) argue that, had developing countries been at the negotiating table for the right reasons, i.e., to find ways and means to take advantage of the liberalisation process, they would have received different treatment. By resisting liberalisation and the opportunity to anchor domestic reform in an international framework, a region such as sub-Saharan Africa (SSA) has foregone the opportunity to reap substantial gains from the Uruguay Round. This is reinforced by Brian and Jean's (2005) study conducted on the possible impact of the Uruguay Round on developing countries. They indicated that larger gains would have been realised if developing countries chose to participate

wholeheartedly in the world trading system by undertaking (trade) reforms of their own (Jooste and Van Schalkwyk, 2006).

4.3.1 Lorenz curve and Gini coefficient

Suppose that N observations (import/export) in a specific year are dispersed among n importing/exporting countries. That represents the number of observations for each country as $m_k, 1, ..., n.$ Interest lies in studying the concentration or distribution of a feature of each of the N observations across the n members of the importing/exporting country. Let the individual observations be denoted by $Y_{jk,}\, j = 1, ...m_k$, and let X_k denote the value of a summary for the K^{th} country. In terms of this study, N indicates the number of countries importing/exporting from/to South Africa. Y is a binary indicator whether or not there is an import/export from a specific country, and $X_k = \sum_{j=1}^{mk} Y_{jk}$ is the number of import/export trading partners to South Africa in the profile of the K^{th} country (Chaya, Moskowitz, Venkatraman, Elyn Riedel and Colin, 2007).

The Lorenz curve is constructed by ranking the units in terms of the measure of concentration, in this study, in the proportion of import/export from/to a specific country. Let $\tilde{t_k} = X_k / m_k, k = 1, ..., n,$ be the observed proportions, and for notational convenience, let the n units be ranked in ascending order on the basis of $\tilde{t_k}$, . Suppose that t_k = E($\tilde{t_k}$) is the expected value of $\tilde{t_k}$. Let the n experimental units be conceptually re-ordered on the basis of these unknown proportions $\{t_k\}$, and let $\{K^*\}$ denote this re-ordering (Chaya *et al.*, 2007). Further, set

$$L(t) = \frac{\sum_{tk^* \leq_t} m_{k^*} t_{k^*}}{\sum_{k^*=1}^{n} m_{k^*} t_{k^*}} \text{ and}$$

$$G(t) = \frac{\sum_{tk^* \leq_t} m_{k^*}}{N} \text{.....(4.1)}$$

Then the underlying true Lorenz curve is a plot of L(t) versus G(t). It is a plot of the fraction of all import/export by South Africa with the lowest proportion trading country partner in their import/export volume, profiled against the fractions of total import/export by South Africa. (Note that this definition is conditioned, for convenience, on the observed sample sizes in each import/export unit (Chang and Halfon, 1997).

In practice, the Lorenz curve is constructed empirically. That is, the import/export volumes are ranked on the basis of the observed proportions $\tilde{t}_k, k = 1,.....,n.$ In this case, the axes of the 'empirical' Lorenz curve are given by:

$\tilde{L}_k = (\sum_{\tilde{t}_k \leq_t} m_k \tilde{t}_k)/(\sum_{k=1}^{n} m_k \tilde{t}_k)$ and $\tilde{G}_k = N^{-1} \sum_{\tilde{tk} \leq} m_k$

In this formulation, the metric for plotting the curve is the import/export, though only one point is plotted for each unit that is imported or exported. That is, the K^{th} importing/exporting will be plotted at distance m_k / N to the right of the $(k-1)^{th}$ importing/exporting countries (Pham-Gia and Turkkan, 1997).

According to Davidian and Giltinan (1995), the Gini coefficient is a commonly used numerical summary of the Lorenz curve and in applications it frequently accompanies graphical presentation of the curve. A theoretical formula for the Gini coefficient is $(1/2)\int L(t)dG(t)$. It is estimated as:

$$GC = \left| 1 - \sum_{k=1}^{n} (\tilde{G}_k + \tilde{G}_{k-1})(\tilde{L}_k + \tilde{G}_{k-1}) \right| \quad \ldots\ldots(4.2)$$

Where $\tilde{G}_0 = \tilde{L}_0 = 0$. The coefficient is an estimate of the ratio of the area between the Lorenz curve and the 45 degree line to the area below the 45 degree line. The Gini coefficient ranges from zero for perfect equality in a distribution to one for maximum inequality.

In the hypothetical situation there is perfect equality in the distribution so that the proportions of the features are evenly dispersed among the experimental units, $t_k = t_l \; \forall k, l$ and the Lorenz curve falls on the 45 degree line connecting the origin (0.0) of the unit square to the top right corner (1.1). In this case the Gini coefficient will be zero. On the other end of the spectrum, when all of the features are concentrated in a minimum number of import/export volumes from/to South Africa (maximum inequality in the distribution), the Lorenz curve will lie along the horizontal axis before increasing linearly. The corresponding Gini coefficient in this case is one. In practice, the Lorenz curve lies somewhere between these two extremes (Laird and Louis, 1989).

The problem with which we are concerned arises because the quantities used to calculate the empirical Lorenz curve and Gini coefficient must be estimated from the data. Specifically, for each import/export from/to South Africa, it is observed only as an estimate, $\tilde{t}_k$, of the true unobserved measure, t_k, where each of these estimates is based on a limited sample and/or limited time period of study, characterised by m_k. Thus, while the empirical Lorenz curve is estimated as described above, using the $\{t'_k\}$ true curve involves a ranking of the data according to the $\{t_k\}$. The problem is that when $t'_k \neq t_k$, not only will the estimated relative frequencies $\{t'_k\}$ be subject to random error, but their ordering in the construction of $\{\tilde{L}_k\}$ will also be redistributed in such a way as to maximise the apparent concentration.

The Gini coefficient is a measure of statistical dispersion most prominently used as a measure of inequality of income distribution or inequality of wealth distribution. In this study, this model measures the distribution of South African export/import distribution to different destination/origin countries. A higher Gini coefficient means the trading pattern is fairly diversified in terms of export/import to different countries.

4.3.2 The Intra-Industrial Trade (IIT) coefficient

The second analytical tool used is an Intra-Industrial Trade (IIT) coefficient with its key determinants. To determine attributes that contribute to high IIT, an Ordinary Least Square (OLS) econometrical model was applied by looking specifically at the case of South African agriculture, covering data from 1965 to 2007.

This tool is useful for measuring the level of concentration and patterns in trade. As Lubbe (1992) states, in order to evaluate countries' international trade performance, concentration indices may be used as proxies for determining specialisation and the market power of a country. This method explores the South African level of specialisation and/or diversification in agricultural trade.

It is necessary to ask the question: why do countries import and export the products of the same industry at the same time, or import and export the same kinds of goods?

According to Grimwade (2000), "An explanation cannot be found within the framework of classical or neo-classical trade theory. The latter predicts only inter-industry specialisation and trade". However, this is far from the case with respect to the impact of trade liberalisation on market access.

The traditional model of trade was set out by David Ricardo and Heckscher-Ohlin, who both produced models that tried to explain the occurrence of international trade. Both models used the idea of comparative advantage and an explanation of why countries trade. However, many economists claim that these models provide no explanation of intra-industry trade as, under their assumptions, countries with identical factor endowments would not trade and produce goods domestically. Hence, over the past three decades as intra-industry trade has developed,

many economists have looked at other explanations (Krugman & Obstfeld, 1991, cited in Grimwade, 2000).

Finger (1975, cited in Grimwade, 2000) made an attempt to explain IIT, and thought that the occurrence of inter-industry trade was 'unremarkable' as existing classifications place goods of heterogeneous factor endowments in a single industry. However, evidence shows that even when industries are disaggregated to extremely fine levels, IIT still occurs, so this argument can be ignored.

Another model to look at is that of Flavey and Kierzkowski (1987). They produced a model that tried to rid the idea that all products are produced under identical technical conditions. Their model showed that goods are distinguished by their perceived quality on the demand side, and high quality goods are produced under conditions of high capital intensity. However, this model has also been dismissed. It is not clear whether the model is addressing IIT or not and it appears that it does not offer any solutions to the problem.

However, the most comprehensive and widely accepted explanation, at least within economic theory, is that of Paul Krugman's (cited in Grimwade, 2000) new trade theory. Krugman argues that economies specialise to take advantage of increasing returns, and do not follow differences in regional endowments (as contended by neoclassical theory). In particular, trade allows countries to specialise in a limited variety of production and thus reap the advantages of increasing returns (i.e., economies of scale), but without reducing the variety of goods available for consumption (Donald, 1995, cited in Grimwade, 2000).

Yet, Donald (1995, in Grimwade, 2000) believed that both the Heckscher-Ohlin and Ricardian models were still relevant with respect to explaining intra-industry trade. He developed the Heckscher-Ohlin-Ricardo model, which showed that even with constant returns to scale, intra-industry trade could still occur under the traditional setting. The Heckscher-Ohlin-Ricardo model explained that countries of identical factor endowments would still trade due to differences in technology, as this would encourage specialisation and therefore trade, in exactly the same manner that was set out in the Ricardian model.

In trade literature, the amount of intra-industry trade or trade in similar goods is often taken as a measure of the diversity, degree of specialisation and the degree of technical sophistication of a country's industrial sector. This can be used to infer a country's ability to compete in a changing environment (Oleh and Peter, 1997).

Grubel and Lloyd (1971) define the IIT index as follows:

$$IIT = 1 - \frac{/X_{it} - M_{it}/}{X_{it} + M_{it}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4.3)$$

Where:

X_{it} = Exports of industry i in period t

M_{it} = Imports of industry i in period t

The value of 'IIT' lies between 0 and 1; zero indicates a low trade balance, while a value closer to 1 indicates that a sector has a high rate of import/export of the same or similar products.

The key determinant of the IIT model is drawn from the theoretical and empirical literature. The model follows the general modelling of IIT determinants as developed by Oleh and Peter (1997), and is specified for South African trade's aggregate agriculture IIT over the period of 1965 to 2007. The expected signs of the independent variables are shown below:

IITj = f(EXGDPj, TIMBj, EXP_IMPj, RDEBTj, RERj, D1) …………………………………..(4.4)

Table 4.1: Variable identification for determinants of IIT

Variables	Expected sign	Variable definition
EXGDPj	+	Ratio of total export to agricultural GDP
TIMBj	-	Trade imbalance
REXP_IMPj	-	Ratio of total export to total import
RDEBTj	-	Ratio of total agricultural debt to agricultural GDP
RERj	-	Real exchange rate
D1	+	Dummy variable for impact of trade liberalisation in South Africa, trade agreement starting year with SADC, take in the model value of 1 (that is 1998); and before this period, take value of zero in the model

Since IIT is a multidimensional issue, it is important to indicate and justify the model specification, and the expected sign in relation to the index.

- EXGDPj is the effect of export relative to GDP and is an indicator of the growth of the economy and the success of international trade. A higher GDP would most likely affect the IIT coefficient positively (Oleh and Peter, 1997). Therefore, the expected sign would be positive.
- IIT measures the difference between import and export in terms of absolute value (TIMB). It measures the degree of trade imbalance/balance (Verbeke *et al.*, 2000). Including this as a determinant factor in the model possibly shows how the trade trend in the country occurs. The estimation is defined as:

$$TIMBj = /Xj-Mj/ (Xj+Mj)$$

- Where Xj is defined as the total export of country j, and Mj is defined as the total import of country j (Oleh and Peter, 1997). The expected sign should be negative. If there it is imbalanced or positive, trade is balanced.
- EXP_IMP (the ratio of total agricultural commodity export to total commodity import) details how the country is specialised in the sector. A higher EXP_IMP reveals that there are trends of re-export function (which could be processed further or re-exported as it is). Scale effects would likely decrease the coefficient of IIT. Then the expected sign of EXP_IMP would be negative (Alan, 2002).
- Exchange rate and debt were expected to have a negative sign.
- The expected sign for the dummy variable of trade liberalisation is positive (impact of open trade regime/trade liberalisation). It is hypothesised that trade liberalisation and regional integration schemes could have a positive effect on IIT.

The model follows the general modelling of Grubel and Lloyd's (1971) IIT index, as previously defined. In this case, the IIT determinant of Ordinary Least Square (OLS) is refined and estimated in log linear form as follows:

LnIIT = lnEXGPj + lnTIMBj + lnEXP_IMPj + lnRDEBTj +lnRERj + lnD1 + C ………..… (4.5)

Given the fact that the main objective of this study is to examine the implications of trade liberalisation and economic growth for South African agricultural industries, the above-mentioned methodology assesses agriculture's ability to contribute to export earnings. It is appropriate to ask how much import liberalisation has contributed to economic growth, better productivity and the improved performance of agricultural industries. It also aims to assess the role of different regional trading bloc agreements and their trade flows in agricultural products, including the impact of trading partner's distance and the exchange rate. Applying a gravity model will state the bilateral trade flows and their impact on the agricultural industry.

4.4 Standard Gravity Model Formulation

According to Kang (2003), the standard gravity model states that bilateral trade flows are determined by four sets of variables:

i) Variables indicating the total potential demand of the importing country j;

ii) Variables indicating the total potential supply of the exporting country i;

iii) The geographical distance between the countries' capitals (or economic centres); and

iv) Variables aiding or hindering trade between the importing and exporting countries.

As stated in Kang's (2003) study, the standard form of the gravity model is an equation that is linear in logarithmic form, and it explains bilateral trade flows based on the masses of the two economies, the distance between trading countries, and a set of other variables:

$$\ln Xij = \alpha_0 + \alpha_1 \ln Y_i + \alpha_2 \ln Y_j + \alpha_3 \ln L_i + \alpha_4 \ln L_j + \alpha_5 \ln D_{ij}$$
$$\ldots\ldots\ldots\ldots + \alpha_6 \ln A_{ij} + \varepsilon_{ij} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4.6)$$

Where:

- X_{ij} is the value of exports from countries i to j;
- Y_i and Y_j are values of incomes for countries i and j;
- L_i and L_j are the populations of countries i and j;

- D_{ij} is the distance between countries i and j;
- A_{ij} represents countries' infrastructure rating; and
- ε_{ij} is a random error term, usually taken to be normally distributed.

Sanso, Cuairan, and Sanz (1993, in Kang, 2003) note that the purpose of using a gravity model for international trade flows is to determine micro-economic foundations of trading partner countries/regions. In addition, they propose "one of the characteristics of the equation is its general validity, since it is equally applicable to any pair of countries. It is also symmetric because it provides the trade flows in both directions by changing the country i variables for the country j" (Kang, 2003).

An alternative formulation of (4-5) can be constructed by using GDP per capita, instead of population variables. Thus, the specification of another form of the standard gravity model is:

$$\ln Xij = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln y_i + \beta_4 \ln y_j + \beta_5 \ln DS_{ij} + \ldots\ldots\ldots\beta_6 \ln A_{ij} + \varepsilon_{ij} \quad (4.7)$$

Where Y_i and Y_j are the exporter (importer) GDP per capita variables. The second specification of the gravity model could be used when bilateral trade estimates are made for a specific commodity, while the specification form of the above equation (4-6) can be used to estimate aggregate trade flows. Therefore, this study applies the above model. Bergstrand (1989, in Kang, 2003) distinguished aggregate trade flows into industries and goods; this way the coefficient of export's GDP per capita income indicates whether the industry or commodity under study is labour or capital intensive in production. In addition, the coefficient of an importer's GDP per capita indicates that the products are a luxury or necessity in terms of consumption. Consequently, this study uses the second form of the gravity model.

4.4.1 Model Specification: Augmented Gravity Model

In the augmented model, more variables are added to the standard gravity model; these include the real exchange rate, importing GDP and GDP per capita, infrastructure, and dummy variables to take into account the effect of regional trade agreements, specifically with the

SADC and the EU, to make explicit the direction of trade between countries i and j. In this study, cross-sectional data for each year from 2004 to 2007 for both South African agricultural product origin and destination countries was gathered, as well as panel/pooled data during the period of 2004 to 2007. Therefore, equation (4-7) can be expressed in log linear expanded form as follows:

$$\ln Xij = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln y_i + \beta_4 \ln y_j + \beta_5 \ln DS_{ij} + \beta_6 \ln E_{ij}$$
$$\ldots\ldots\ldots + \beta_7 \ln L_j + \beta_8 \ln D1_{ij} + \beta_9 \ln D2_{ij} + \varepsilon_{ij} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.8)$$

Where E_{ij} denotes the real exchange rates and L_j is the GDP of importing/exporting countries. $D1_{ij}$ and $D2_{ij}$ are the dummy variables for the SADC and EU trade agreement. If trading partners have trade agreements with South Africa, then it takes 1; otherwise it is equal to zero.

Table 4.1 shows the expected sign and explanation of variables; it is based on Hellvin and Nilsson (2000).

Table 4.2: Variable identification for gravity model

Variables	Sign	Explanation
Exporter GDP	+	Potential export supply
Importer GDP	+	Economically larger countries import more
Exporter per capita GDP	+/-	A higher output per person indicates a potential for higher exports, but a larger population may both increase or decrease trade
Importer per capita GDP	+/-	A higher output per person indicates a higher import demand, but a larger population may both increase or decrease trade
Distance	-	Transportation costs
Real exchange rates	+/-	An appreciation of the import country's currency promotes exports or hinders imports
SADC countries' trading partners	+	Trade agreements will enhance trade between those countries
EU countries' trading partners	+	Trade agreements will enhance trade between those countries
Infrastructure	+/-	Advanced infrastructure is likely to increase diversification of product and attract investment that potentially closes the demand gap, or increases specialisation in the specific product that increases the extent of importing

Source: Hellvin and Nilsson (2000)

In conclusion, the literature has found ample justification to apply a gravity type equation as it exists in a variety of models for international trade flows. In some respects, this empirical framework may not be the most appropriate one for explaining international trade flows when observing different trade theories. However, the gravity equation can be employed for testing the determinants of trade flows, given its considerable explanatory power and robustness with regard to international trade.

4.4.2 Properties of the Gravity Equations

In this study, the gravity model includes additional variables to examine the value of South African agricultural product trade with each of their trading partners. The value of the South African agricultural product trade is expected to have a positive relationship with the economic masses of the paired countries. In other words, each country's trade potential depends on GDP because the exporting country's GDP can be treated as its production capacity and the importing country's GDP is treated as its purchasing power. A larger GDP in country j is an important component in creating a larger demand for South African exports and also for the supply of South African imports. Therefore, the coefficient of South Africa's GDP is expected to have a positive impact on South African agricultural exports to and imports from its trading partners.

Per capita GDP is also used to reflect the products that have capital or labour intensive production for the exporter and the products that are necessities and luxuries in terms of consumption for the importer. The Linder (1961, in Kang, 2003) hypothesis is based on the assumption that "relative demands change with per capita income". In this context, most econometric studies expect there to be a positive relationship between countries with a high level of per capita GDP. Thus, per capita GDP is expected to have a positive impact on South African agricultural products in terms of both exports and imports.

Distance reflects the costs of trading and has a significant effect on the relative price difference of a trading commodity. Frankel (1997) and Linnemann (1966, in Kang, 2003) presented three different kinds of costs of doing business in relation to distance.

Firstly, there are physical shipping costs, which can be measured by subtracting the pre-export price from costs, insurance and freight (c.i.f.) prices or the ratio of c.i.f. value to free on board (f.o.b.) value. Linnemann called this an objective resistance. Secondly, distance creates an expansion in time, which increases over distance. The cost of time in terms of transportation includes interest rate charges, perishability, and the loss from adapting to changing conditions. Thirdly, there is a degree of cultural unfamiliarity. Linnemann indicated psychic distance or economic horizon costs (Frankel, 1997). Thus distance, as a proxy for natural resistance for trade, can be expected to have a negative impact on South African agricultural trade.

According to Wang, Coyle, Gehlhar and Vollrath (1998), it is expected that there should be a decline in the effects of distance on trade flows over time because of the development of new transportation technologies, which will reduce the cost of distance on trade flows. Distance elasticity is the variation in trade with respect to distance. Thus, a larger distance elasticity implies a greater impact, with the assumption of *ceteris paribus.* However, Wang *et al.*'s (1998) findings show that elasticity of distance has a negative sign. The conclusion is that there is no evidence of a decline in the effect of distance on US exported agricultural products.

In support of the above study, Frankel's (1999) study also shows that there is no statistical evidence for the decreasing effect of distance on trade. Due to the fact that there was relatively greater homogeneity.

The real exchange rates are one of the most crucial components affecting trade flows. An increase in the dollar value of an importing country's currency implies a depreciation of the US dollar, and is expected to have a positive impact on agricultural product exports and a negative impact on imports too (Kang, 2003).

4.4.3 Empirical modelling of gravity model

The study presents several models for the panel data analysis, which differs from a single time-series or cross-section regression because the analysis has a double subscript on its variables. Thus, the general structure of the panel data model can be written as:

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \quad \text{.....(4.9)}$$

The data set for this analysis will consist of multiple observations. In the subscript t = 1, …., T indicates time-series observations and the subscript I = 1, …, N indicates cross-sectional observations units. Here, α is the intercept coefficient, β is the slope of the coefficients to be estimated, X_{it} represents the explanatory variables and ε_{it} is the error term, assuming $E(\varepsilon_{it}) = 0$ and Var $(\varepsilon_{it}) = \delta\varepsilon^2$. Several variations across individual countries or the time effect of this structure can be analysed with a simple shift of regression function, including both the one-way error component and the two-way error component models for fixed and random-effects models, respectively. In this section, the study presents the most important feature of these two models.

4.4.3.1 One-way Error component model

The one-way error component model is most widely used in panel data applications. By pooling time-series and cross-sectional data containing observations on N units of the countries for T years, the standard OLS regression can be regressed from the equation (4-9).

In an OLS regression, α is considered as a constant over time, t, and is specific to the country's cross-sectional unit, i, assuming $E(\varepsilon_{it}) = 0$ and Var $(\varepsilon_{it}) = \delta\varepsilon^2$. The assumptions about the error term are the standard assumptions of OLS regression. If the assumption α is the same across units, OLS will yield consistent and efficient estimates of α and β (Kang, 2003).

Another model assumes that the difference across countries can be captured in the different constant terms for each country; traditionally, there are two ways to estimate the panel data model using these assumptions for individual effects. These are fixed-effects and random-effects models. According to Dascal, Matts and Tzouvelekas (2002), in the former, individual effects are treated as fixed parameters that need to be estimated, whereas in the latter, individual effects are treated as being a sample of random drawings from a population and they become part of the model's terms. In general, most of the empirical applications of panel data have focussed on the one-way error component model for the disturbances, namely that:

$$\varepsilon_{it} = \mu_{1it} + \nu_{it} \quad \text{.....(4.10)}$$

Where, μ_i indicates the country-specific effect and V_{it} indicates the remainder of the disturbance. In the fixed-effects model, the μ_i (country-specific effects) is treated as fixed parameters to be estimated and the remainder disturbances are stochastic, with v_{it} independently and identically distributed (0, $\sigma^2 v$). It is also assumed that X_{it} is independent from v_{it} for all i and t (Dascal *et al.*, 2002).

An equivalent form of the fixed-effect model can be expressed in the following equation by allowing the use of dummy variables, which are based on the assumption that different countries have different intercept terms. This equation form has N θ_{ijt} indicators for each country and does not contain a general intercept α to avoid perfect co-linearity with the set of N indicators, $\theta_{ijt.}$

$$Y_{it} = \alpha_1 \theta_{1it} + \alpha_2 \theta_{2it} + \alpha_3 \theta_{3it} .... \alpha_n \theta_{nit} + \beta X_{it} + \varepsilon_{it} \quad \text{..... (4.11)}$$

Here $Y_{it} = \theta_{1it}$ are country-specific dummy variables for each country and are equal to 1 only when i = j and are otherwise 0. The implication of equation (4-11) is usually called the Least Square with Dummy Variables (LSDV) model and the equation can be estimated by literally creating dummies and using OLS (Kang, 2003).

In other approaches, this argument might be more plausible than the fixed-effects model approach. In country-specific approaches, constant terms are randomly distributed across sectional units. In other words, in the random-effect model, it is assumed that U_i is randomly distributed. This means that country-specific constants are treated as a sample of random drawings from the population, i.e., they are independent random variables, in this case $\mu_{it} \approx (0, \sigma\mu^2)$ and $\nu_{it} \approx (0, \sigma\mu^2)$ (Dascal *et al.*, 2002) where μ_{it} is independent of the ν_{it} and X_{it} is independent of μ_{it} and ν_{it} for all i and t. Country-specific components are denoted as μ_{it} to emphasise that they are treated as a random disturbance with an error ε_{it}, which has a distribution characterised by its mean and variance rather than fixed parameters. The above assumptions imply that the variance-covariance matrix of the composite error term ($\mu_{it} + \nu_{it}$) is

not clearly scalar and that estimation results of OLS are not considered the best estimator. In order to find the most appropriate gravity model, the model could be examined in two ways. One is the restricted form (constant intercept) and the other is the unrestricted form (country-specific effects). In the random-effect model, assumptions were:

Var (ε_{it}) = $\sigma_\mu^2 + \sigma_\nu^2$ for all i and t

Cov $(\varepsilon_{it}, \varepsilon_{js}) = \sigma_\mu^2 + \sigma_\nu^2$ for all i = j, t = s

$= \sigma_\mu^2$ for all i = j, t ≠ s and zero otherwise.

This indicates that the correlation coefficient between ε_{it} and , ε_{js} is

Corr $(\varepsilon_{it}, \varepsilon_{js}) = \rho$ = 1 for all i = j, t = s

$= \sigma_u^2 / \sigma_\mu^2 + \sigma_\nu^2$ f for all i = j, t ≠ s and zero otherwise.

4.4.3.2 Two-way Error components of Model

The one-way error component model can be extended to a two-way error component model by including a time-specific effect. Wang, Coyle, Gehlhar and Vollrath (1998) suggest that, in pooling cross-sectional and time-series data, we have to take into account variations (i) across time, (ii) across export destinations, and (iii) in joint disturbances in both dimensions. Thus, one needs to decompose the error term from the above equation. Thus, the two-way error component disturbance model can be rewritten from equation (4-9) to become:

$$\varepsilon_{it} = \mu_i + \lambda_t + \nu_{it} \quad \text{.....(4.12)}$$

In this context, this decomposed error term approach allows one to implement the two-way effects model with respect to country-specific and time-specific effects. Here, μ_i denotes a country-specific effect, λ_t denotes a time-specific effect, and ν_{it} is a remaining stochastic disturbance term. Such an error structure leads to the use of a two-way error component model. In such models, it is assumed that both the importing country's specific errors and time errors are normally distributed random effects (Wang *et al.*, 1999).

The panel data estimator also permits two-way fixed effects and random effects to have the same reasoning as for the one-way models. The fixed-effect version can be extended to the following format:

$$Y_{it} = \alpha + \mu_i + \lambda_t + \beta X_{it} \nu_{it} \quad \text{..... (4.13)}$$

This model has an overall constant as well as a country-specific effect for each country, and a time-effect for each period. Here, λ_t represents a time-specific effect that is the same for all countries at time t; it is also assumed that

$$\sum \mu_i = \sum \lambda_t = 0 \quad \text{..... (4.14)}$$

Thus, the problem of multi-colinearity – which arises when explanatory variables' individual effects cannot be isolated and the best unbiased linear estimator could be too imprecise to get useful results – is avoided by constraining both the country-specific and time-specific components to sum zero. If μ_i and λ_t are assumed to be fixed parameters to be estimated and the remainder disturbances are stochastic with $\nu_{it} \approx (0, \sigma^2 \nu)$, then (4-12) represents a two-way fixed-effects error component model and X_{it} is assumed to be independent of the ν_{it} for all I and t (Wang *et al.*, 1999).

Dependents on a country's productive capacity trade flow, specifically based on comparative or absolute advantage, have a big influence on the success of international trade. In order to evaluate factors that affect the South African agricultural product, it is important to support the result by assessing disaggregate forms of the data. Therefore, this study will test the long- and short-term relationship of variables that influence Total Factor Productivity (TFP) in nine major South African export agricultural commodities, i.e., sorghum, wheat, dry beans, soyabeans, oats, groundnuts, sugar, maize and beef. Panel data is pooled from 1995 to 2007.

4.5 LONG- AND SHORT-TERM DYNAMIC RELATIONSHIP OF MODELLING

This study follows the general modelling of Jonsson and Subramanian (2001) to test the co-integration relationship between trade liberalisation and Total Factor Productivity (TFP). This

enables the researcher to examine objective 4. Dummy variables have been included to capture the impact of trade agreements. Both cross-sectional and time-series data were applied. For cross-sectional analysis, data was pooled from 1995 to 2007 in respect of nine South African agricultural commodities, namely, sorghum, wheat, dry beans, soyabeans, oats, groundnuts, sugar, maize and beef. Furthermore, the Exact Maximum Likelihood (EML) method was applied to examine the major determinants of economic growth, and their relationship to trade liberalisation (to address objective 5).

4.5.1 Co-integration modelling

According to Matyas and Sevestre (1995), to test long- or short-term dynamic relationships, panel data sets are important. These data sets offer a certain number of advantages over the traditional pure cross-section or pure time-series data sets. There are three main advantages of this data set. Firstly, the data sets generate more reliable parameter estimates, thus assisting researchers to test more sophisticated models. Secondly, panel data reduces multi-colinearity problems and the bias of estimation in the regression. Thirdly, panel data sets make it possible to capture the relevant relationships among variables. They also make it possible to monitor the possibly unobservable individual effects of trading pairs.

4.5.1.1 Cross-section Modelling

This study attempts to examine the empirical relationship between trade and Total Factor Productivity (TFP) in the agricultural sector, and uses both cross-sectional (across nine agricultural commodities) and time-series analysis and applies the Ordinary Least Square (OLS) method. The cross-sectional model is specified as follows:

$$Y_i = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \\ .....\alpha_5 X_5 + \alpha_6 D_1 + \alpha_7 D_2 .....(4.15)$$

Where: Y is defined as the ratio of total production to the area planted (TFP);

X1= is the ratio of total export to production (in volume);

X2= is the ratio of total import to domestic consumption (in volume);

X3= is the ratio of capital formation to agricultural GDP (in current price);

X4= is the Producer Price Index;

X5= is the real exchange rate; and

D1 and D2 are the dummy variables for SADC and EU trade agreements, respectively.

4.5.1.2 Co-integration test: the long-term dynamics

To analyse the long-run dynamic relationship between TFP and openness, it is necessary to test co-integration for time-series data. Johansen (1988) has proposed two statistics which can be used to evaluate the rank of the coefficient matrix, or the number of co-integration relationships. The one used here is the likelihood ratio test of the null hypothesis, which posits that the number of co-integration vectors is r versus the alternative r+1 vector. In this case, the null hypothesis is the number of co-integration vectors, which equals 0. If the test proved that there is a co-integration relationship among the variables, Vector Error Correction Model (VECM) estimation is estimated, otherwise OLS is the best estimator.

$$Y_i = \alpha_0 + \alpha_1 A_1 + \alpha_2 A_2 + \alpha_3 A_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4.16)$$

The data sets of the time-series were examined from the period of 1970–2007; Y_i is the Total Factor Productivity and is calculated as the real agricultural GDP divided by the Consumer Price Index.

The second variable, A_1, represents **Open** and it is defined as the ratio of real imports and real exports to real GDP (this is a proxy for the state of South African trade openness). The use of this variable might be open to criticism and might only measure an outcome, thus may not have policy implications. The preferred estimation strategy is to view and use direct measures of trade policy. However, it is difficult to compute a reliable series of 'trade policy' over the sample period, especially because of the pervasiveness of non-tariff barriers (Jonsson and Subramanian, 2001).

The third variable, A_2, represents **CFC** and it is defined as the total investment in equipment and machinery divided by agricultural GDP. Time-series data for R&D in South Africa is not easily

available. However, following De Long and Summers (1991, in Jonsson and Subramanian, 2001), this study uses the share of investment in equipment and machinery to the total agricultural GDP as the proxy for technology adoption. Insofar as South Africa does not undertake significant amounts of R&D activity in agriculture, the study assumes that the bulk of the R&D is embodied in capital formation, especially that which is imported from abroad. By looking at total investment in machinery and equipment, the specification implicitly aggregates R&D undertaken at home and abroad, and assumes that the two have similar effects on TFP. An alternative approach that could have disentangled the effects of foreign and domestic R&D would have been to use separate measures for domestic and imported capital goods (Jonsson and Subramanian, 2001).

The last variable in this section **DEBT**, A_3, is included to capture the financial crisis in the agricultural industry, and it is defined as the total debt in agriculture relative to agricultural GDP.

4.5.1.3 Vector Error Correction Model (VECM): Econometric dynamic analysis

The VECM model was initially developed by econometricians in the 1980s for macro-economic forecasting (Litterman, 1984; and Sims, 1980, 1982, in Johansen, 1988). In a VECM, each time-series variable is explained by a linear function of its own lagged (past) values and the lagged values of all other variables in the system. Mathematically, the general form of a VECM process of order S for a system of m variables may be represented by

$$Y_t = CX_t + \sum_{s=1}^{s} \beta_t Y_{t-s} + \varepsilon_t \qquad (4.17)$$

where Y_t is an m ´ 1 vector of the time-series, X_t is a vector of deterministic variables, C is a coefficient matrix with r being the number of deterministic variables, S is the number of lags entering each equation,

$$\beta_i = \begin{bmatrix} \beta_{11,i} & \beta_{1m,i} \\ \beta_{m1,i} & \beta_{mm,i} \end{bmatrix} \qquad (4.18)$$

On equation (4-15) (m ´ m) coefficient matrix, and e is an m X 1 vector of disturbance terms, which are often called impulses or innovations in the language of VECM and which have the stochastic properties of zero mean ($E[e_t] = 0$) and the same (non-singular) variance matrix $\sum_e = [e_t e_t]$ for all t. Furthermore, e_t and e_j are uncorrelated when $t \neq j$. Each variable in a VECM is represented by a separate equation. The same set of variables appears on the right-hand side of all equations (Albert and Khalide, 2007).

Enough lags for the variables are included to sufficiently account for the dynamic properties of a possibly infinitely lagged system. The trend for most social and economic time-series is best represented as a random walk with drift, usually only a constant, and a deterministic trend component need not to be included in a VECM model (Lu, 2001, in Albert and Khalide, 2007).

The VECM model superficially resembles the form of simultaneous equations models (SEM), but the VECM approach imposes fewer and weaker restrictions in specifying a model than SEM does (Freeman *et al.*, 1989; Todd, 1984 in Albert and Khalide, 2007). For example, instead of distinguishing (*a priori*) between endogenous and exogenous variables, all variables are regarded as endogenous in a VECM, though obviously deterministic and exogenous variables such as regional dummies and spatial trend terms may be included. The VECM modeller also does not attempt to determine which lagged effects should be included in the model. Each variable is regressed on the lagged values of that variable and on those of all other variables in the system. These features are attractive to geographers because geographical theory often does not justify the strong restrictions regarding structural relationships that appear in many statistical models (Lu, 2001, in Albert and Khalide, 2007).

Several methods have been developed to identify and understand the patterns of cross-linkages and feedback in a VECM (Geweke *et al.*, 1982; Granger, 1969; Sims, 1972, in Albert and Khalide, 2007). The Granger causality test is often used in empirical studies. A variable Y is said to be Granger-caused by another variable, X, if Y can be predicted more efficiently when the information on the past and present X is taken into account than when it is not in addition to all other available information. For example, Gruidl and Pulver (1991, in Albert and Khalide,

2007) used the Granger causality tests to investigate the extent to which net migration leads to lags or occurs simultaneously with employment changes (Lu, 2001, in Albert and Khalide, 2007).

The appropriate lag length for each variable used in Granger causality tests and in VECM models must be determined, and may be done with Sims' modified likelihood ratio test (Sims, 1980), the Akaike's Final Prediction Error (FPE) criterion, or Schwarz's Bayesian Information Criterion (SBIC). The lags should be long enough to capture the dynamics of the system being modelled, but should not consume too many degrees of freedom. In practice, one may need to choose between having a sufficient number of lags and having sufficient degrees of freedom. The equations in a VECM model may be estimated together using the SURE (seemingly unrelated regressions) technique, but, since each equation contains the same number of lagged variables, the OLS method may be used to estimate each equation separately, and the results will be identical to those from SURE. The estimated coefficients of a VECM may be interpreted in the usual regression fashion, but the individual coefficients in the estimated VECM model are not always easy to interpret, especially when their signs alternate. A common practice in VECM modelling is to estimate the so-called impulse response function (IRF; also called innovation accounting) and to examine how the dependent variable responds to a shock administered to one or more equations in the system. Suppose that the error term (i.e., impulse or innovation) in one of the equations increases by an amount equal to one standard deviation – the shock will change the dependent variable in the current and future periods. Since the particular dependent variable also appears on the right-hand side of the other regression equations, the shock will have an impact on all other dependent variables. In practice, the autoregressive representation of the data is further inverted to a moving average representation (MAR). The results may be plotted and used to trace out the dependent variable in a VECM's response to random shocks in any one of the variables for several periods in the future. The importance of a response can also be evaluated by decomposing the forecast error of each variable of a VECM into components due to shocks (innovations) in each variable (Freeman *et al.*, 1989; Greene, 1997, in Albert and Khalide, 2007).

Further, to more specifically measure the determinants and the source of short-term agricultural economic growth, the study estimates agricultural growth regression with its set of explanatory variables postulated as growth determinants. Although this study does not deal directly with the long-run relationship between growth and its determinants, it does indirectly account for it by including cyclical output movements.

4.5.2 Short-term Modelling for Economic growth determinants

Before model specification, it is important to explain the characteristics of Exact Maximum Likelihood (EML). The growing empirical literature on the Exact Maximum Likelihood (EML) estimation highlights the importance of efficiency and consistency via its repeated sampling principle estimation procedures. The advantage of EML is its dependence on the long-term range process, and it is characterised by the highly intensive computational dimension system, as used/defined by Lardic and Mignon (2004).

According to Emmanuel, Sandrine and Val´ Erie (2004), the Exact Maximum Likelihood (EML) procedure is used with no co-integration as a residual-based test of the hypothesis, versus the alternative of fractional co-integration. The pertinence of this method lies in using all information concerning the short- and long-term behaviour of the series since it simultaneously estimates all parameters of the ARFIMA (p, d, q) (Auto-Regressive Fractionally Integrated Moving Average) estimation procedures representation. Moreover, the application allows one to test the null hypothesis of a unit root (d = 1) against the alternative of fractional integration (d < 1).

Following the general modelling of Norman and Raimundo (2002), the study uses Exact Maximum Likelihood to estimate the variation of a growth regression:

$$y_{it} - y_{it-1} = \alpha y_{it-1} + \alpha_C (y_{it-1} - y_{it-1}^T) + \beta X_{it} + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots(4.19)$$

Where y is the log of per capita output, y^T represents the trend component of per capita output, $(y_{it-1} - y_{it-1}^T)$ is the output gap at the start of the period, X is a set of variables postulated as growth determinants (a period-specific effect) and ε represents unobserved

factors or error terms. The expression on the left-hand side of the equation is the growth rate of per capita output in a given period. On the right-hand side, the regression equation includes the level of per capita output at the start of the period (to account for transitional convergence) and a set of explanatory variables measured during the same period. The inclusion of the output gap as an explanatory variable allows one to control for cyclical output movements and thus to differentiate between transitional convergence and cyclical reversion. The variables are defined as follows:

- gGDPc is the percentage change in the agricultural growth $(\ln GDP_t - \ln GDP_{t-1}) / \ln GDP_t$;
- Outputg (output gap) is the difference between the log of actual GDP (log) and potential GDP;
- Adult literacy (Ali) is the ratio of total primary and secondary school enrolment to the population of people between ages 15 and 64;
- RDGDP is the change in the ratio of total agricultural debt to the agricultural GDP (log form);
- Trade is the difference between log export and import to the log agric GDP;
- Govexp is the difference between the current and previous year of government exp (log) divided by GDP (in log);
- CPI is the difference between the actual and potential of CPI (proxy for inflation);
- Cyclical volatility of GDP (Stdoutg) is the standard deviation between actual and potential of the output gap of GDP;
- Real Exchange Rate (RER) is the difference between actual RER (in log) and potential RER (in log);

- Term of trade (TOT), as part of the external factors category, is measured by the ratio of export to total capital formation (in log) in agriculture as a proxy for balance of trade payment; and
- The dummy for trade liberalisation (D1) taken prior year 1998 is zero, otherwise one.

4.6 CONCLUSIONS

There are currently several multi-commodity, multi-regional agricultural trade models in use internationally for measuring the impact of issues related to trade liberalisation and food security. Most of these models have the ability to forecast or estimate the short- to medium-term impact on the food security situation. Applying gravity and co-integration supported with simple mathematical modelling goes beyond the medium-term and gives room to assess different regional trading bloc agreements and South Africa's trade flows in agricultural products.

Although the agriculture industry in South Africa has been researched extensively in terms of its structure, economic behavioural parameters and so on, limited research has been conducted from a combined econometric and mathematical simple calculation (Gini and IIT) perspective, whose results will inevitably assist policy-makers with information regarding different regional trading and agreements preferences.

According to Devarajan and Robinson (2002), there exists a trade-off between using a structural model, which requires a large number of structural parameters to be estimated, and a reduced-form model with fewer parameters. Devarajan and Robinson (2002) further point out that many reduced-form models are so limited in their domains of applicability as to be virtually useless in policy analysis. They further suggest that it is better to have a good structural model capturing the relevant behaviour of economic actors and their links across markets – even if the parameters required are imperfectly estimated – because of the applicability such models have within policy analysis.

The main characteristics of the model are that it is multi-regional and multi-product, deterministic and synthetic in nature. The model is for the exclusive use of modelling changes in trade policy and selected demand and supply shift factors in the markets South African

agricultural products use. The model is not suitable for reaching conclusions about resource usage on farm-level, nor is it suitable for deriving answers regarding market variables over the short-run. Assumptions underlying the model can be summarised as follows: (i) production, processing and consumption take place at the same location in each trading region; (ii) average prices are used for each trading region; (iii) price differences between any two regions (or markets) that trade with each other will merely equal transfer costs; (iv) surplus regions will first meet their own demand before trading, and deficit regions will supply their own demand before importing; (v) homogeneous products are traded; and (vi) conversion and off-take rates are constant over time, which is an assumption adopted from Jooste (2001).

CHAPTER 5

SOUTH AFRICAN AGRICULTURAL INTERNATIONAL MARKET ACCESS AND TRADE BALANCE FOR THE AGRICULTURE SECTOR

5.1 INTRODUCTION

As was indicated in Chapter 4 on trade literature, the amount of intra-industry trade, or trade in similar goods, is often taken as a measure of the diversity, degree of specialisation and the degree of technical sophistication of a country's industrial sector. This can be used to infer a country's ability to compete in a changing environment (Oleh and Peter, 1997). It should be noted that trade liberalisation research findings appear to be controversial among trade researchers, specifically studies on third world countries that lead to different conclusions on the issue of specialisation.

For example, Santos, Paulino and Thirlwall (2004) studied the effect of trade liberalisation on a country's economic growth. This study was conducted in 22 developing countries, and shows that the adoption of trade liberalisation policies stimulated both exports and imports growth. Thus, trade liberalisation is likely to have exerted a net positive effect on income growth over the three decades of their research.

Manchin (2005) concentrated on African, Caribbean and Pacific (ACP) countries, using threshold estimation to test preferential access to the EU. The study found that ACP countries have been unsuccessful in taking advantage of the preferential access status. For instance, the share of world export from ACP countries fell from 3.4% in 1976 to 1.9% in 2000; similarly, the share of EU imports from ACP decreased from 6.7% in 1976 to 3.11% in 2002.

From this trend, the study concluded that these countries need to reconsider their decision to request preferences and to take into account factors of production costs, quality of products, competitiveness, quality of infrastructure, and institutional qualities.

Further, recent studies by Globerman and Dean (1990, in Oleh and Peter, 1997) found a positive result in this regard, namely that the degree of specialisation in IIT or high Gini coefficients correlated with the stage of development, and this has led to a large body of literature and empirical studies (Alan, 2002; Guzin and Haluk, 2003). Therefore, this chapter will look at or revisit the contribution of IIT to the South African agricultural industry, using the model stated in Chapter 4.

This chapter analyses South African agriculture's access to international markets by applying a Gini coefficient and IIT models that were developed in Chapter 4. These two models are discussed using a simple mathematical formula calculation. Further, IIT is supported with an econometric model to examine the key determinant for high IIT. The aim of this chapter is therefore to investigate the impact of trade liberalisation on South African agriculture's ability to contribute to export earning (objective one), and to examine the extent of international market access and trade balance in the agricultural sector (objective two).

5.2 THE VALIDATION PROCEDURE

According to Hazell and Norton (1986), validation of a model encompasses four different issues, namely: a numerical report of a model's fidelity to the historical data set; improvements of the model as a consequence of imperfect validation; a qualitative judgement on how reliable the model is for the stated purposes, and a conclusion regarding the kinds of uses that it should be used for.

The model first solved for the Gini and IIT coefficients, with respect to import and export, so as to examine trade flows across different trading regions and to model measures of the distribution of South African export/import to different destination/origin countries. A high Gini coefficient means that the trading pattern is fairly diversified for export/import to different countries. Calculating the Gini coefficient firstly checks the consistency of observed import and

export fitted to calculate the Lorenz curve, given observed import and export from/to different countries; secondly, it checks the validity of the net import or export by applying IIT with its key determinants.

The Lorenz curve is a graphical tool that is widely used to depict the concentration of a measure in a population, for instance, wealth; in this study it was applied to measure the extent of trade distribution. It is frequently the case that the measure of interest used to rank import/export units when estimating the empirical Lorenz curve and the corresponding Gini coefficient is subject to random error. This error can result in an incorrect ranking of import/export units, which inevitably leads to a curve that exaggerates the degree of concentration in the population. This study explores this bias and discusses several widely available statistical methods that have the potential to reduce or remove the bias in the empirical Lorenz curve. The properties of these methods are examined and compared in a simulation study.

The growing 'internationalisation' of production systems – which increasingly involve vertical trading chains spanning a number of countries, each specialising in a particular stage of production – is an important feature behind the changing nature and increasing scale of world trade. Although there is considerable anecdotal evidence concerning this phenomenon, there is surprisingly little in the way of data at the aggregate level to gauge its overall importance, and measurement problems attach to available macro-data (Grimwade, 2000). Subject to these limitations, this chapter uses IIT to review recent evidence relating to the internationalisation of production over the past decade in the South African agricultural industry, firstly based on intra-industry trade data and then on analysing intra-industry trade data. The broader macro-economic significance of these trends is also considered. Tentative conclusions are that: the impact of some shocks on output (as measured by the value added) may be more dispersed internationally; the speed with which certain shocks are transmitted as well as the volatility of world trade may have increased, and trade may be less sensitive in the short-term to changes in price competitiveness.

In this respect, it is important to note that the model used is synthetic in nature (see Chapter 4). Thus, given that pre-defined transformed variables fitted to OLS and supported with the Gini

index are used to calibrate and find out the best determinants of IIT functions, there is no need for further calibration of observed values. Stated alternatively, the construction of the inverse import and export demand functions is a kind of model calibration, since it ensures that, given unchanged conditions, the original values are repeated.

5.3 RESULT AND DISCUSSION

5.3.1 The impact of trade liberalisation on agriculture's export earning ability: Gini coefficient approach

Table 5.1 and Figure 5.1 show the Gini coefficient calculations and Lorenz curves for South African exports for agricultural commodities to 30 importing countries in 2007. The X-axis reflects the countries that import agricultural products from South Africa, ranked from lowest to highest importer/exporter. The Y-axis shows the cumulative percentages of different countries' imports from South Africa. As indicated in Figure 5.1, the cumulative percentage of exports to 27 countries is less than 5%. This indicates that agricultural export by South Africa is highly concentrated in a few countries. The Gini coefficient of export was calculated as 0.55 (see Table 5.1). This implies that the total South African export is contracted to a few countries.

Table 5.1: Calculation of Gini coefficient for export from South Africa in 2007

Countries	Rank	Export Value	(2i -n-1) Xi
NORWAY	1	51,959	-1,506,811
PORTUGAL	2	74,882	-2,021,814
BULGARIA	3	79,374	-1,984,350
ZAMBIA	4	87,274	-2,007,302
SWITZERLAND	5	102,497	-2,152,437
IRELAND	6	115,494	-2,194,386
THAILAND	7	121,980	-2,073,660
INDIA	8	125,396	-1,880,940
MAURITIUS	9	158,889	-2,065,557
SINGAPORE	10	162,909	-1,791,999
ANGOLA	11	175,519	-1,579,671
ZIMBABWE	12	191,522	-1,340,654
CZECH REPUBLIC	13	199,423	-997,115
MOZAMBIQUE	14	234,915	-704,745
MALAYSIA	15	247,696	-247,696
CANADA	16	254,561	254,561
FRANCE	17	267,689	803,067
SAUDI ARABIA	18	299,399	1,496,995
ITALY	19	431,951	3,023,657
UNITED ARAB EMIRATES	20	493,226	4,439,034
UNITED STATES	21	503,288	5,536,168
RUSSIAN FEDERATION	22	525,227	6,827,951
CHINA	23	550,926	8,263,890
HONG KONG, China	24	572,745	9,736,665
GERMANY	25	616,085	11,705,615
SPAIN	26	677,069	14,218,449
BELGIUM	27	681,181	15,667,163
JAPAN	28	2,268,150	56,703,750
NETHERLANDS	29	2,408,689	65,034,603
UNITED KINGDOM	30	2,414,765	70,028,185
Total		**15,094,680**	**249,190,616**
Mean (μ)		**503,156**	
Gini coefficient			**0.55028353**

Therefore, the Gini coefficient for export from South Africa was calculated using equation (4-1) (refer to Chapter 4):

$$G_i = \sum_{n=1}^{n} (2i - n - 1)X_i) / (n^2 \mu) \quad \text{.....(4.1)}$$

G_i = (249,190,616)/30^2 x 503,156

G_i = 0.55028353

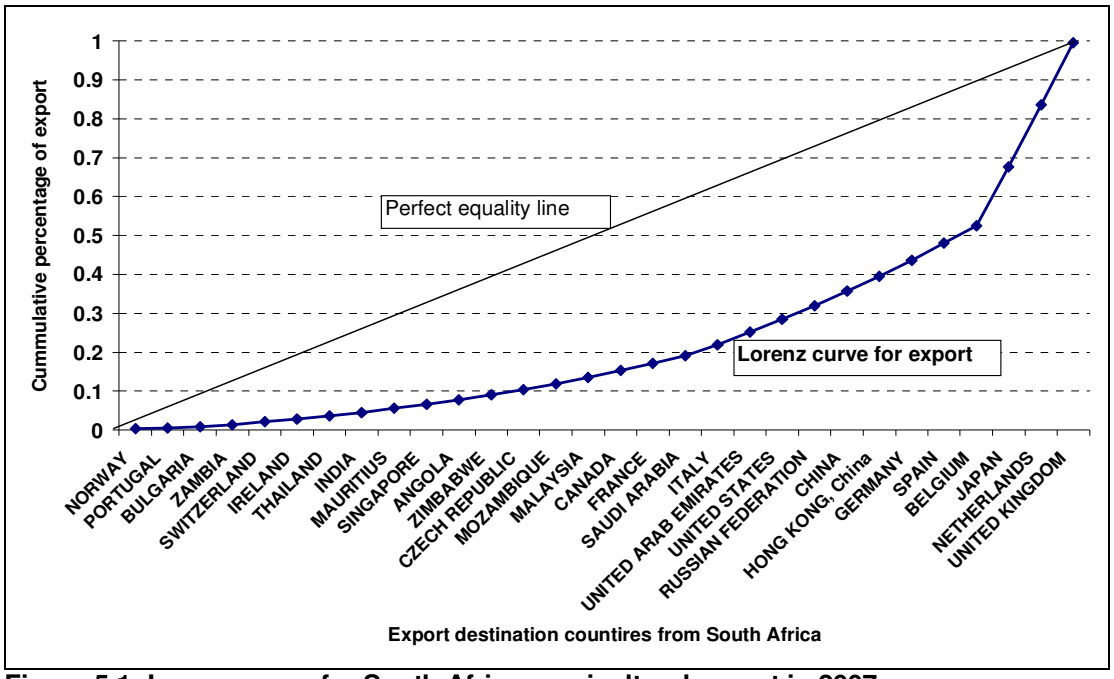

Figure 5.1: Lorenz curve for South African agricultural export in 2007

Table 5.2 and Figure 5.2 represent the Gini calculation table and Lorenz curve for South African import, respectively. This also holds a similar explanation as above; the cumulative percentage of imports from 30 countries is less than 0.55%. This indicates that agricultural import to South Africa is highly concentrated in a few countries. The Gini coefficient of import was calculated as 0.616% (see Table 5.2). This implies that the total South African import from 30 countries amounts to 62%. Furthermore, the calculated Gini coefficient for import is greater than export; this implies that the import capacity of South Africa was diversified a bit to increase trade partner options. This shows that:

i) South African agricultural products are moving towards net import orientations, further implying that the South African import origin is moving towards the cheapest region to be cost-effective. For example (see Chapter 3, Figure 3.10), Argentina's export volume is about R2.14 million, and accounts for 27% of total imports to South Africa in 2007. This might be due to availability and cost-effectiveness.

ii) This result also holds an important implication for the gap between demand and supply in the agricultural sector in South Africa, i.e. South Africa is unable to close the gap of

high demand, and as a result, the industry is moving towards being a net importing industry. This might be due to a multitude of factors such as drought, high external competition and land reform issues. As a result, importation of agricultural products increases the diversity of trading partners.

Table 5.2: Calculation of Gini coefficient for import to South Africa in 2007

Countries	Rank	Export Value	(2i -n-1)Xi
COLOMBIA	1	8,137	-235,973
ITALY	2	25,767	-695,709
PHILIPPINES	3	33,707	-842,675
SINGAPORE	4	34,335	-789,705
ISRAEL	5	36,930	-775,530
TURKEY	6	40,997	-778,943
NEW ZEALAND	7	43,480	-739,160
SRI LANKA	8	44,941	-674,115
FRANCE	9	54,877	-713,401
SPAIN	10	66,827	-735,097
IVORY COAST	11	67,121	-604,089
THAILAND	12	68,709	-480,963
TANZANIA	13	70,429	-352,145
AUSTRALIA	14	77,183	-231,549
NETHERLANDS	15	117,920	-117,920
UNITED KINGDOM	16	131,484	131,484
GERMANY	17	154,369	463,107
MOZAMBIQUE	18	165,249	826,245
VIETNAM REP	19	166,055	1,162,385
MALAYSIA	20	243,692	2,193,228
BRAZIL	21	252,839	2,781,229
ZIMBABWE	22	305,643	3,973,359
MALAWI	23	342,750	5,141,250
INDIA	24	345,872	5,879,824
CHINA	25	356,752	6,778,288
ZAMBIA	26	385,024	8,085,504
CANADA	27	554,737	12,758,951
INDONESIA	28	572,579	14,314,475
UNITED STATES	29	1,178,996	31,832,892
ARGENTINA	30	2,140,767	62,082,243
Total		**8,088,168**	**149,637,490**
Mean (μ)		**269,606**	
Gini coefficient of Import			**0.616692968**

The Gini coefficient for import to South Africa was calculated applying the formula that is given in Chapter 4 (equation 4-1)

$$G_i = \sum_{n=1}^{n} (2i - n - 1)X_i)/(n^2\mu) \quad \text{.....(4-1)}$$

G_i = (149,637,490)/301^2 x 269,606

G_i = 0.616692968

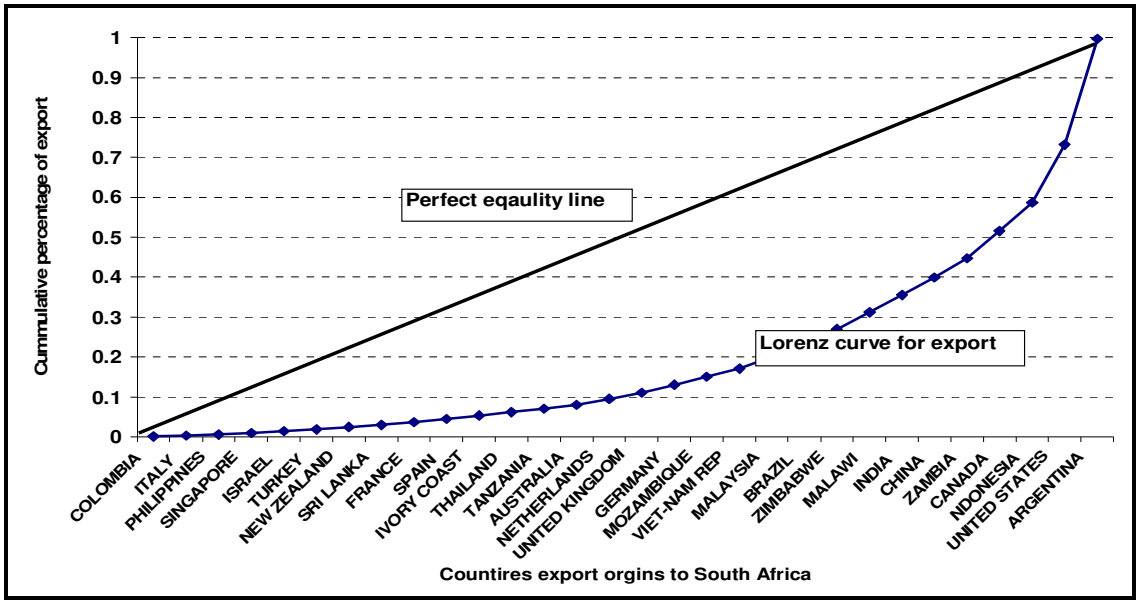

Figure 5.2: Lorenz curve for South Africa agricultural import in 2007

As stated earlier in Chapter 3, among the five top export destinations for South Africa are in the EU and SADC bloc. The trend of concentration appears to have remained the same. The biggest share of exports and imports over the past ten years was in SADC (Assarson, 2005). It can be concluded that the regional trade and bilateral trade agreements created market opportunities for South Africa to increase its export and import share.

As Assarson (2005) indicated in his study, South Africa has comparative advantages for the EU in terms of natural resources, textiles, agricultural products, wine and a labour force. Trade with Africa, America and Asia also constitutes an important part of the South African market. During 1999 and 2007, the total imports and exports increased by 54% and 37%, respectively. In the same period, the EU increased its total imports and exports to South Africa by 29% and 30%, respectively. These figures imply that South Africa has benefited from trade liberalisation and

trade agreements. This may be taken as proof to substantiate that trade creation has been realised.

5.3.2 Extent of international market access and trade balance in the agricultural sector: Intra-Industrial Trade (IIT) analysis

The calculated IIT indices for the agricultural industry are given in Figure 5.3. It is interesting to note that the IIT indices' performance after 1994 fluctuated between 64% and 96%, which is higher than prior to the structural adjustment, which fluctuated between 18% and 77%.

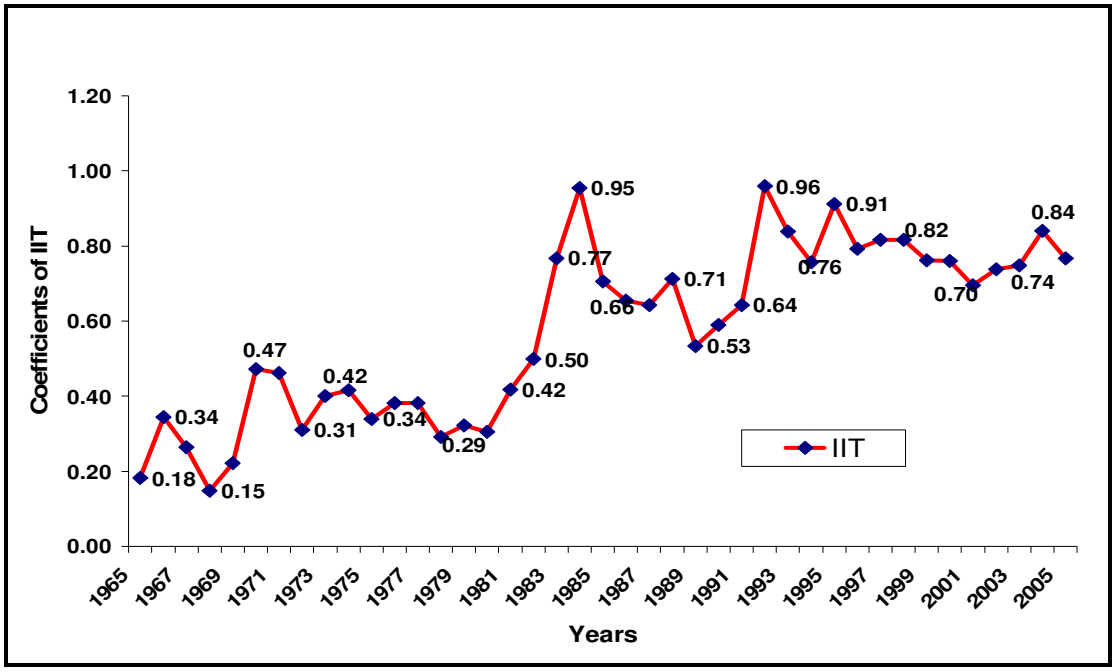

Figure 5.3: IIT coefficient for agricultural industries (from 1965 to 2006)

The high value of the IIT recorded during the period prior to 1985 in Figure 5.3 might be attributed to the fact that the values of imports and exports moved in equal proportion (see Figure 3.4). Since 1994, the value of imports and exports started to rise, resulting in moderate IIT. After 1995 the value of exports increased substantially, while imports increased marginally. From 1998 the value of imports and exports increased proportionally. This increase resulted in higher IIT; this high IIT is a good indicator that South Africa has increased its specialisation and competitiveness. This may be due to:

(i) South Africa's being accepted back into the world community;

(ii) Gradual momentum gained after the deregulation of the agricultural industry, which resulted in a freer domestic market; and

(iii) The process of complying with the Agreement of Agriculture (AoA), which resulted in a greater number of more open markets, both domestically and internationally.

5.3.2.1 Model estimation for determinants of IIT

5.3.2.1.1 Stationarity test (Unit root tests)

Stationarity is defined as a quality of a process in which the statistical parameters (mean and standard deviation) of the process do not change with time (Challis and Kitney, 1991, in Maurice, 2001).

- The most important property of a stationary process is that the Auto-Correlation Function (ACF) depends on lag alone and does not change according to the time at which the function was calculated;
- A time series stationary process has a constant mean and ACF (and therefore variance); and
- A truly stationary (or strongly stationary) process has all its higher-order moments constant, including the variance and mean.

There are two general approaches for testing stationarity: parametric and non-parametric. Literature seems to indicate that parametric approaches are those usually used by researchers working in the time domain (such as economists) when making certain assumptions about the nature of the data. Non-parametric approaches are more commonly used by researchers working in the frequency domain (such as electrical engineers), and who often treat the system as a 'black box' and cannot make any basic assumptions about the nature of the system. Non-parametric tests are not based on the knowledge or assumption that the population is normally distributed (Maurice, 2001). By making no assumptions about the nature of the data, non-parametric tests are more widely applicable than parametric tests, which often require normality in the data. While more widely applicable, the trade-off is that non-parametric tests are also

less powerful than parametric tests. To arrive at the same statistical conclusion with the same confidence level, non-parametric tests require from 5% to 35% more data than parametric tests (Bethea and Rhinehart, 1991, in Maurice, 2001).

Previous studies indicate that time-series data, be it monthly, quarterly or annual, is likely to be non-stationary (see for example Bakucs and Ferto, 2005; and Cho, Kim and Koo, 2004). In this study, the Augmented Dickey-Fuller (ADF) unit root test, with and without a linear trend, is performed to test for the stationarity of the variables considered. The ADF test with a linear trend checks if the variables have a stationary trend. The standard Augmented Dickey-Fuller (ADF) test is performed to assess the degree of integration of the variables (Gervais and Bruno, 2004).

In this study, the Augmented Dickey-Fuller (ADF) unit root test, with and without a linear trend, is performed. The ADF test with a linear trend checks the trend in stationarity of the variables. The results are presented in Table 5.3. Since the ADF test is sensitive with respect to the chosen order of the lag, the starting point was the over-specification ADF test, wherein the order of the lag was relatively larger and corresponds to the highest (absolute value) Akaike Information Criterion (AIC).

From Table 5.3 one sees that the absolute values of the ADF test show that it is statistically lower than the 95% critical value. This suggests that the null hypothesis of the unit root is not rejected and that none of these variables are (trend) stationary at a 5% significance level. Each series was differenced once and the ADF test was performed. The result shows that the unit root null hypothesis is rejected at a 5% significance level (see Table 5.3).

Table 5.3: ADF test results – with and without trend

		In Levels			Differenced Once		
Variables	**Specification**	**Lag**	**Critical Value**	**Test Statistics**	**Lags**	**Critical Value**	**Test Statistics**
IIT	Constant only	2	-2.9446	-2.1795	1	-2.9472	-6.625
	Constant with trend	4	-3.5386	-3.1902	1	-3.5426	-6.4207
EXGDP	Constant only	4	-2.9446	-1.6157	1	-2.9472	-5.9033
	Constant with trend	4	-3.5386	-1.4265	1	-3.5426	-6.0356
TIMB	Constant only	4	-2.9446	-1.7205	1	-2.9472	-6.4992
	Constant with trend	4	-3.5386	-2.7265	1	-3.5426	-6.4071
REXPIMP	Constant only	4	-2.9446	-1.9953	2	-2.9472	-4.4159
	Constant with trend	3	-3.5386	-2.4604	2	-3.5426	-4.3039
RDBTG	Constant only	1	-2.9446	-1.9866	1	-2.9472	-4.7362
	Constant with trend	1	-3.5386	-2.5522	1	-3.5426	-4.6365
RER	Constant only	1	-2.9446	-0.51014	1	-2.9472	-4.4985
	Constant with trend	1	-3.5386	-2.789	1	-3.5426	-4.4448
D1	Constant only	1	-3.5386	-0.44949	1	-2.9472	-4.1833
	Constant with trend	1	-3.5386	-1.6089	1	-3.5426	-4.3263

95% Critical value for the augmented Dickey-Fuller statistic

The results show that all of the tested series were not stationary in (log) levels but were stationary at a 5% significance level after being differenced once, which fulfils a necessary condition for a co-integration test.

5.3.2.1.2 Co-integration test

To test co-integration, Johansen and Juselius (1990) proposed two statistics which can be used to evaluate the rank of the coefficient matrix, or the number of co-integration relationships. The one used here is the likelihood ratio test of the null hypothesis, which posits that the number of co-integration vectors is r versus the alternative r+1 vector. In this case, the number of co-integration vectors equals 0 in the null hypothesis.

Table 5.4 shows that Likelihood Ratio (LR) statistics are below their corresponding coefficients of the critical value. Therefore, the co-integration between the variables' pairs is unlikely. The Johansen tests reject the hypothesis at 5% (1%) significance level LR (see Table 5.5). The result shows clearly that there is no long-term co-integration vector among the variables:

Table 5.4: Co-integration analysis

Test assumption: No deterministic trend in the data				
Series: IIT EXGDP TIMB REXPIMP RDBTG RER D1				
Lags interval: 1 to 1				
	Likelihood	5 Percent	1 Percent	Hypothesised
Eigen Value	Ratio	Critical Value	Critical Value	No. of CE(s)
0.611439	100.7148	109.99	119.80	None
0.527315	63.84783	82.49	90.45	At most 1
0.315780	34.62409	59.46	66.52	At most 2
0.221367	19.82453	39.89	45.58	At most 3
0.154922	10.06612	24.31	29.75	At most 4
0.071994	3.501372	12.53	16.31	At most 5
0.014949	0.587420	3.84	6.51	At most 6
*(**) denotes rejection of the hypothesis at 5% (1%) significance level				
LR rejects any co-integration at 5 % significance level				

Table 5.4 shows that co-integration tests were conducted with the assumption that no deterministic trend in the data had been performed, proving that there is no long-term relationship; the necessary condition to use Ordinary Least Square (OLS) regression was done.

5.3.2.1.3 Estimation of the model

In Table 5.5, results for the determinant of IIT are presented. The overall explanatory power is quite high at 95%. Except for RER (not significant and not reported: see Table 5.5), all other variables were found to be statistically significant at the specified level of significance.

Table 5.5: Log-linear estimates of IIT data, using Ordinary Least Square (data from 1965-2006)

Independent Variable	Estimated Coefficient	"t" – Value
DEXGDPj	0.054	2.52**
DTIMBj	-0.079	15.13*
DREXP_IMPj	-0.880	-80.12*
DRDBETj	-0.056	-2.88*
DRERj	0.005	0.28
DD1j	0.005	0.31***
Intercept	-0.0028	
DW-statistic	2.5	
R^2	0.97	
Adjusted R^2	0.95	

***, **, and *** denote significance at the 1, 5, and 10% levels, respectively**

The hypotheses put forth regarding determinants of IIT were confirmed in all of the results. The positive coefficient of ratio of export to GDP indicates that scale effects dominate proximity effects, resulting in a positive coefficient and significance. The 5% significance level of the

variable implies that the GDP had a strong effect on the level of intra-industry trade. That shows that an increase of 1% in the share of export to GDP leads to the increase of IIT by 0.05% (see Table 5.5).

From Table 5.5 one sees that the net share of South African trade (TIMB) was found to be negative and significant at 1%. This implies that South African agricultural trade is somewhat imbalanced. This further implies that either exports or imports are weighted more, and this results in a decreased IIT index. Similarly, the interpretation can be extended as an explanation for the exports to imports ratio share (REXP_IMP) variable. This suggests that in the period of 1965 to 2007, average exports from South Africa were more than the average imports.

On the other hand, it is interesting to note that the result of debt (DEBT) was found to be negative and significant (at a 1% significance level). This implies that by further increasing debt by 1%, it led to a decline of IIT by 0.05%, which is a good indicator that South African agricultural industries were suffering from the debt crisis that affected international trade performance.

The dummy variable for trade liberalisation was found to be significant at 10% significance level, with a positively estimated coefficient of 0.005 (see Table 5.5). The small estimated coefficient implies that the effect of trade liberalisation may be observable over a longer period of observation.

Generally, the finding of this study indicates that South Africa needs to reinforce and align the bilateral agreement with the regional or even multilateral trade liberalisation agreement.

5.4 CONCLUSION

This chapter investigated the trade performance of South Africa. The analytical tools used to contribute to achieving a higher IIT were the Gini coefficient and the Intra-Industrial Trade coefficient with its economic attributors. This tool is useful for measuring the level of concentration and patterns in trade.

The cumulative percentage of exports/imports to 20 countries was found to be less than 6%. This indicates that agricultural export by South Africa is highly concentrated in a few countries.

The Gini coefficient of exports and imports was calculated as 0.55 and 0.62%, respectively. The main export destinations and origins were the EU and SADC blocs. The trend of concentration appears to have remained the same. This implies that the regional trade and bilateral trade agreements created market opportunities for South Africa to increase its export and import share.

Aggregate agricultural IIT calculations after 1994 are higher than average. During this period, South Africa exported products of approximately the same value as that of imported ones, possibly implying that South African industries are highly advanced. This shows an ability to maintain the capacity of balanced trade. Additionally, trade liberalisation and trade agreements open up market opportunities to increase exportable surpluses, probably as a result of increased specialisation and competitiveness. The higher level of IIT after 1998 reveals South African industries' ability to adjust to a more competitive environment, thus reinforcing the position that a bilateral agreement should be accompanied by regional or even multilateral liberalisation.

The finding of the econometric analysis of IIT determinants provides a magnified effect for the coefficients of export to import ratios and the TIMB (trade balance). These results imply that if South African industries implement measures to increase trade liberalisation and diversify the level of industrial specialisation, the IIT level would remain high, and significant economic gains might be achieved from minimising costs. That doesn't even consider the potential of the EU market, which may be looking for another alternative market option.

The negative and significant (at 1%) level for the debt (DEBT) variable implies that South African agricultural industries suffered from a debt crisis which affected the international trade performance negatively.

CHAPTER 6

REGIONAL TRADING BLOC AGREEMENT'S AND ITS IMPACT ON TRADE FLOWS FOR SOUTH AFRICAN AGRICULTURAL PRODUCTS

6.1 INTRODUCTION

Factors such as globalisation trends, international competition from exporting countries, and environmental issues appear to be more permanent factors influencing the market.

Over the past two decades, international trade in agricultural products has been expanding in terms of volume, value and the number of participating countries (Kang, 2003). In this context, globalisation and agricultural growth become a question of market access. Trade agreements play an important role in ensuring market access between trading partners.

A wave of trade liberalisation over the last decade has positioned many developing countries to increasingly participate in the world markets (Kang, 2003). This new openness has been accompanied by concern that the poor will be adversely affected, and that the distribution of income in developing countries will deteriorate (Grant, 2006). Indeed, it has been suggested that agricultural growth for poverty reduction be emphasised in the next round of World Trade Organisation (WTO) negotiations, sometimes called the 'development round'. The issue of trade and the growth of developing countries have become the focus of many researchers (Van Schalkwyk and Jooste, 2007) and (Hertel & Reimer, 2004).

Over the past decade, as it has been mentioned in Chapter 3, trade policy in South Africa has undergone several changes. This trade development introduced greater exposure to external competition for farmers; it also created improved market access internationally

Trade policy includes multilateral reductions in tariffs and subsidies through the country's WTO commitments, the signing of Free Trade Agreements (FTAs) and more recently, several negotiations around future commitments to liberalisation at both multilateral and regional level. These simultaneous developments have had an important influence on both *de facto* protections in the South African agricultural economy and on welfare improvement (Van Schalkwyk and Jooste, 2007)

This chapter focuses on issues that relate to the liberalisation process; the impact of liberalisation on the South African economy was discussed in Chapter 2. This chapter validates the observations made in the previous chapter.

6.2 The validation procedure for gravity model

The gravity model plays a role in evaluating bilateral trade flows not only for aggregated commodity trade, but also for disaggregated commodity trade between pairs of countries. For instance, Bakucs and Ferto (2005) adapt the traditional gravity model of aggregate trade flows into the single product of the world meat trade flows using a panel data framework. They argue that "the gravity model for a single agricultural commodity can be parameterised more effectively by using time series and cross section data rather than cross section data alone". They also indicate that this pooled time-series and cross-section data greatly "improves the efficiency of the results and permits the use of information available over several years for each pair of trading countries". The modified gravity form can be applied to single commodity trade flows; this model provides an adequate statistical description of the trade flows while retaining the conventional gravity model attributes (Kang, 2003).

Wang, Coyle, Gehlhar and Vollrath (1998) emphasise the role of distance in international trade. Their study is a good example of a gravity model that analysed US exports of agricultural products. They assessed the effect of distance on US agricultural products by using the gravity model, and estimated the elasticity of distance. The elasticity of distance could also be a way of measuring the trade effects of distance, which explains the variation in trade with respect to the variation in distance. Their study concludes that "distance elasticity may remain unchanged or

even increase over time in response to differential rates of growth in different parts of the world". Finally, findings of the study show that there is no significant difference or decrease as an effect of distance in trade, and that the gravity model performed better for disaggregated data.

Another modified gravity model, namely that of Gunawardana and Hewarathna (2000), analysed the determinants of Australia-East Asia trade flows by assessing the impact of the East Asian economic crisis. The study reported on Australia's one-way merchandise exports to and imports from nine East Asian countries from 1979 to 1998. The estimated coefficients were positive. In addition, the paper presented the possibility of a potential trade expansion between Australia and East Asian countries, provided that Australia and East Asian countries can achieve a higher rate of growth in terms of real GDP.

Frankel (1997) shows that regionalisation could be explained by geographical proximity and preferential trade agreements when holding constant for the size of the trading partners and other variables that stimulate or impede bilateral trade. Krugman (1991, in Kang, 2003) formalises the role played by geographical proximity in the regionalisation process. He analysed how proximity could lead to production agglomeration and hence regional bias in trade flows. In this context, a pair of countries with low transportation costs between them will tend to have a higher volume of trade than countries further apart. In addition, other variables have to be taken into consideration when measuring the costs related to doing business at a distance. Linnemann (1966, and Frankel, 1997, in Kang, 2003) identifies shipping costs, time elapsed in transporting goods and cultural unfamiliarity as problematic costs. Moreover, Rauch (1999, in Kang, 2003) shows that differentiated products exhibited stronger geographical proximity effects than homogeneous products.

In its simplest form, the gravity model of bilateral trade used by Tinbergen (1962) and Linnemann (1966, in Kang, 2003) relates trade between country i and country j to the proportion of the product of both countries' GDP (Y_i an Y_j) and to the distance between them (D_{ij}) as a proxy for transaction costs. That is $T_{ij} = A^{Y_i Y_j}\!\!\diagup_{D_{ij}}$ where A is a constant for proportionality.

However, although it has been widely recognised for its empirical success at predicting bilateral

trade, initially it lacked a strong theoretical background. Its recent revival has produced an extensive body of literature and it has been shown that the gravity equation can be derived from both the traditional and the 'new' theory of international trade, as Helpman and Krugman (1985) in Kang (2003) and Helpman (1987, in Kang, 2003) suggest. Eaton and Kortum (1997, in Deardorff, 1998) derived the model from a Ricardian framework, while Deardorff (1998) did so from a Heckscher-Ohlin (H-O) perspective. Indeed, Deardorff (1998) argues that the gravity equation does not prove the validity of one theory or another, but it just confirms a 'fact of life'.

Nevertheless, it seems that the key assumption in all of these models has been perfect product specialisation. Grossman (1998) argues that it is this assumption that generates the empirical success of the equation and the validity associated with specialisation. As an exporting country increases the supply of its products, the importing country will increase its consumption proportionally, thereby increasing the volume of trade between them. Evenett, Simon and Keller (2001) show that there is strong evidence that the volume of trade is determined by the extent of product specialisation. They also argued that the perfect specialisation version of the H-O model is unlikely to explain the success of the gravity equation, while the increasing return to scale model was more likely to be a successful candidate. Furthermore, they found that models with imperfect product specialisation better explained the variations in the volume of trade than the models with perfect product specialisation. Kang (2003) extended this analysis using the Rauch (1999, in Kang, 2003) trade classification. They found strong evidence that suggests that the monopolistic competition models of international trade account for the success of the equation when tested within the differentiated product category.

At this point, this study takes a similar stand to Rauch (1999, in Kang, 2003). This study's trade model follows the Deardorff (1998) theory of modelling that says: "all that the gravity equation, aside from its particular form, is that bilateral trade should be positively related to the two countries' incomes and negatively related to the distance between them".

Based on equations (4-8), this study estimates a gravity equation to test for the Linder hypothesis. Countries with similar levels of per capita income will have similar tastes; they will

produce similar but differentiated products and will trade more among themselves. A negative sign will lend support to this effect.

6.3 Regional trading bloc agreement and its impact on South African agricultural industry: Gravity Model Approach

After the necessary statistical test has been performed, the relationship among the variables was estimated using Ordinary Least Square with cross-section and pooled data. However, the result found there is a heteroscedasticity problem. To remedy this problem, Weighted Least Square (WLS) was applied to a cross-sectional and pooled data set (2004 to 2007) of 30 countries' export/import or destination/origin countries.

6.3.1 Trade liberalisation and trade potential: cross-section evidence from gravity model approach

Table 6.1 shows the impact of GDP, distance, exchange rate, infrastructure and dummy variables on the impact of trade liberalisation. These variables assess the extent of South African agricultural industry trade flows using a gravity model to 30 exporting destinations based on cross-sectional observation from 2004 to 2007. The overall explanatory power for export determinants is quite high – at 99% in all cases. Infrastructure (INFRAS) in 2004 and 2005, and a dummy variable for the EU trade agreement impact in 2005 were found to be not significant and are not reported in Table 6.1. All other variables were found to be statistically significant at the specified level of significance and hold the expected sign.

a. **GDP per capita of importing country:** The higher the per capita income for a country is, the greater the demand for importing. Table 6.1 shows that importing countries' GDP per capita has quite a strong effect. The positive coefficient in years implies an increase in trading partners' per capita income. This will increase South Africa's export capacity to the rest of the world as far as surplus production can be produced and exported. The coefficient of this variable in 2007 was much smaller than in the other years. This implies that the contribution of South African exports to the rest of the world decreased substantially in 2007. Furthermore, it can be interpreted that a 1% increase in per capita income of the trading partner country will only have an impact of increasing

export surplus by 0.58% to the rest of the world, compared to 1.72% the previous year, i.e., 2006 (see Table 6.2).

b. GDP: The effect of GDP or GDP per capita is an indication of the growth of the economy and the success of international trade. A higher GDP would most likely affect the coefficient positively (Oleh and Peter, 1997). The positive and statistically significant coefficients of the importer's GDP for the augmented gravity model are consistent with the theory behind the conventional gravity model, suggesting that the size of the economies should enhance the amount of trade between trading partners. A one percent increase in the importer country's GDP created an increase of between 0.50 and 0.81% from 2004 to 2007. The result reveals that the other country's demand for South African agricultural products is inelastic, and in year 2007 it was significantly smaller than in the other years. This sends a message that the foreign export earnings were declining. Factors such as unfair trade agreements creating high competition, a much higher cost price squeeze problem in 2007, and land reform policies could be among the factors leading to declining productivity.

c. Distance: A country that lies geographically far away from South Africa is expected to attract less export, especially due to transport costs. The coefficients indicate that this is indeed the case. Although the influence of distance is significant for total exports, it might not be an obstacle for some individual sectors, depending on the goods and services produced in the particular sector. Transport costs for goods to the developed world declined substantially over time. For example, the estimated coefficients of 2005 and 2007 were 3.07 and 1.31, respectively. This implies that a one percent change in distance leads to an increase/decrease by the above figure, respectively. This could be a good indicator that distance is a less important factor in determining trade with the globally improved communication and infrastructure.

d. Exchange rate: The magnitude of the coefficient is relatively small. Rapid short-run depreciations will nevertheless, in most instances, result in actual exports overshooting

the potential level. Over the long-run, however, the exchange rate effect becomes less severe compared with the other variables.

e. **Infrastructure:** This variable is drawn from a comprehensive rating of a country's infrastructure and includes various factors, from roads and telecommunications to institutions. A higher rating indicates a better infrastructure. Better infrastructure should lead to higher trade, or it might discourage export to the specific country. With improvements of infrastructure, a country should be able to improve specialisation and production scales. The coefficients indicate that this is indeed the case.

Table 6.1 Gravity Model estimation of export: cross-sectional observation, 2004 to 2007

Variable	2004	2005	2006	2007
GDPcap	1.579378*	1.388964*	1.725288*	0.587267*
	(0.056398)	(0.089009)	(0.178341)	(0.033427)
GDP	0.621513*	0.810635*	0.563046*	0.504345*
	(0.020435)	(0.01954)	(0.042327)	(0.006152)
DISTANCE	-2.45252*	-3.07967*	-1.78765*	-1.31255*
	(-0.13579)	(0.200765)	(0.185502)	(0.027992)
EXCHANGE	0.073183*	0.114596*	0.128525*	0.050929*
	(0.013279)	(0.009174)	(0.036184)	(0.004415)
INFRAS	-0.53715	-0.69945	-3.74636*	-0.44317*
	(0.411333)	(0.575491)	(0.571451)	(0.153881)
D1	-0.67741*	0.199047**	0.134699***	0.184959*
	(0.093495)	(0.089188)	(0.082079)	(0.042885)
D2	1.102415*	0.361512***	1.150649*	-0.1646*
	(0.12155)	(0.458819)	(0.328448)	(0.048421)
C	2.346323	4.436028	1.261472	5.082553
R-squared	0.998	0.999	0.999	0.998
Adjusted R-squared	0.996	0.998	0.998	0.997
Durbin-Watson stat	1.995259	1.582653	1.607789	1.985901
Number of observation	30	30	30	30

*, ** and *** significance level at 1 %, 5 % and 10 %, respectively
Standard error indicated in the parenthesis

The dummy variables for SADC and EU trade liberalisation of the regions appear to be important variables in explaining trade. These variables were found to be significant at 1% in all cases (with the exception of the SADC (D2) dummy variable at 10% in 2005 and the EU

dummy variable at 5% and 10% in 2005 and 2006, respectively) (see Table 6.2). Furthermore, these variables were found to have a positive relationship in all cases (except for the EU (D1) in 2004 and the dummy variable for the SADC (D2) in 2007, which were found to be negative). The negative relationship might imply that trade liberalisation will discourage exports. In other words, trade liberalisation's impact might be captured over a longer future observation. On the other hand, open trade means creating high competition between domestic producers and bigger commercial or international producers, for instance, with the EU's highly subsidised farmers. Comparing the two dummy variables D1 (the EU dummy variable) and D2 (the SADC dummy variable), D2 is more elastic, which implies that the SADC region is an efficient market for South African agricultural industries. This might be due to cheaper transportation costs and similar industrialisation levels in the region, which contribute to higher intra-trade levels in the region and better agricultural growth.

One must, however, caution against making inferences regarding the dummy variable for the EU. The relatively smaller elasticity responsiveness of the EU dummy variable might have resulted from the exclusion of beef, sugar and maize from the agreement, or it might imply that products/commodities that have preferential access to the EU are unable to spill over/explain economic growth.

6.3.2 Trade liberalisation and trade potential: gravity model approach pooled data evidence

Table 6.2 shows the pooled gravity model that explains factors for export destinations to 30 countries from 2004 to 2007. The overall explanatory power for export determinants is quite high at 99%. All variables were found to be statistically significant at one percent significance level. Furthermore, all variables have been found to be the expected sign (except for the dummy variable for the EU (D1)). The negative relationship of export and trade liberalisation could be justifiable and acceptable against a backdrop of the current high world food price crisis, mainly caused by oil prices, unfair trade agreements (i.e., high competition with subsidies for farmers of the EU) and the global financial crisis. These factors could discourage South African export capacity.

The Durbin-Watson statistic indicates 2.06 (see Table 6.2), which implies that there is no auto-correlation problem in the model. Essentially, the estimated regression coefficients have the minimum variance property; the mean square error (MSE) is estimated with exact variance of the error terms, and the computed standard error of the estimated parameter values are the true standard error.

The 'F value' or 'Prob (F-statistic)' used to test if the standard deviations of two populations are equal. The two-tailed version tests against the alternative that the standard deviations are not equal. The one-tailed version only tests in one direction, that is the standard deviation from the first population is either greater than or less than (but not both) the second population standard deviation (Kang, 2003).

The low F-value (0.000) of the model implies that at least some of the regression parameters are non-zero and that the regression equation does have some validity in fitting the data (i.e., the independent variables are not purely random with respect to the dependent variable, except for the alternative hypothesis).

Table 6.2 Gravity Model estimation of export panel data, 2004 to 2007

Variable	Coefficient	Std. Error	t-Statistic
GDPcap_ROW	1.152747	0.027589	41.78235*
GDP	0.622136	0.015877	39.18579*
GDPcap_SA	4.962766	0.567189	8.749763*
GDP_SA	-5.325915	0.529333	-10.06155*
DISTANCE	-1.994226	0.052103	-38.27485*
EXCHANGE	0.048129	0.007484	6.431184*
INFRAST	-0.750345	0.074139	-10.12083*
D1	-0.178369	0.023515	-7.585216*
D2	0.828328	0.040568	20.41841*
C	104.7842	8.973597	11.67694*
Weighted Statistics			
R-squared	0.999999	Mean dependent var	17.392
Adjusted R-squared	0.999998	S.D. dependent var	96.23318
S.E. of regression	0.015822	Akaike info criterion	-5.37512
Sum squared resid	0.027539	Schwarz criterion	-5.14283
Log likelihood	332.507	F-statistic	4.89E+08
Durbin-Watson stat	2.064508	Prob(F-statistic)	0.0000
Number of observations	120		

* shows significance level at 1%

The estimated coefficients for the exporting country's (South Africa) gross income and per person income have the expected signs, which are statistically significant and elastic. However, South Africa's per capita GDP was found to have an inverse relationship to export supply. This might imply that the economy of the country is moving towards other sectors. The gross income indicates that a one percent improvement in national gross income will lead to a 5.32% decrease in export, whereas an increase in the exporting country's (South Africa) per person income encourages export. However, the real income and per capita income of importing countries have been found to be significant and positively related to export capacity. In contrast, the gross income of importing countries was found to be inelastic and per capita income was elastic. For example, a one percent increase in real income or per capita income will lead to a 0.62 and 1.15% increase, respectively. This implies that the South African agricultural product export destinations focus should be on more populated countries. Therefore, policy-makers have to create a conducive export environment to export to more populated countries.

The estimated coefficient of distance for the South African agricultural product is -1.99. This elastic variable implies that if distance between South Africa and the importing country is increased by one percent, then total agricultural product exports will decrease by 1.99%.

As hypothesised, the coefficient of real exchange rates also has a positive effect on the South African agricultural product exports. It is statistically significant at one percent. The dummy variables for the EU and the SADC were found to be significant at one percent; the dummy variable for the EU was found to have a negative coefficient, which implies that South African farmers are facing high international competition, which erodes the profit margin for farmers. On the other hand, the dummy variable for the SADC (D2) has been found to be more significant and positive (with a relatively bigger coefficient (elastic)) than the EU dummy variable, with coefficients of -0.17 and 0.82, respectively. This bears out the same interpretation as the cross-sectional analysis did.

Generally, the GDP per capita for importing countries, the GDP per capita for the exporting country (South Africa), and the distance were found to be elastic. This implies that small

percentage changes on the above-mentioned variables will make a big difference in South Africa's export capacity.

6.4 Conclusions

This chapter evaluated, analysed and classified the significant determinants affecting agricultural exports for both cross-sectional data and panel/pooled data (from 2004 to 2007) using the gravity model. The model estimate was based on the panel data from 30 South African exports destination countries. Consideration was also given to investigating the impact of income, per capita income, distance, exchange rates, and dummy variables to the EU and SADC trading partners in order to analyse the impact of trade agreements on trade volumes.

The model has found that all variables were significant at one percent and carried the expected signs. Only the EU dummy variable had an inverse relationship, implying that the EU trade agreement creates a negative impact on the export capacity of South African farmers. In other words, South African farmers could not compete with the subsidised farmers.

These results have several important policy implications for South Africa. Firstly, trade agreements, whether implemented unilaterally or bilaterally, will enhance potential trade flows between South Africa and other countries or regions. Given that distance to markets is important, South Africa should emphasise the transaction costs. It is also important to protect and advocate productivity growth within the context of fair agreements. Secondly, from an export promotion standpoint, distance in the model results shows that importing countries' per capita income is elastic and significant in determining export. Therefore, it is important for South Africa to maintain trade links and to extend these to high per capita income countries or regions in order to realise export potential.

On the other hand, to avoid exports being vulnerable to future crises in EU regions or countries where the largest proportion of South Africa's export is directed, it is important that South Africa continues to concentrate its export promotion efforts in other regions of the world. Therefore, special attention should be focused on promoting export to new emerging markets in South Asia and Latin America.

The results of this study are, however, subject to certain limitations. Specifically, the model was unable to capture the impact of land reforms. It is clear that the issue of land reform in South Africa affects the current potential of export capacity, but it was beyond the scope of this study.

Therefore, further research is needed to assess the impact of land reform on trade flows between South Africa and different regions. Within this context, it is important to restrict the research to the issue of agricultural investment confidence.

Ward and Ntombifuthi (2008) studied the impact of land reform on improving the livelihoods of the rural South Africans around the Mole-mole Municipality (Limpopo Province). They show that land reform was only marginally (and in many cases not even) improving livelihoods in rural South Africa. Only four out of 39 projects were identified as sustainable. Many did not extensively benefit the rural people. The large majority of the beneficiaries, 4527 out of 4691 (96.5%), did not benefit at all from the land reform projects. This is due to a lack of institutional structures, transparent and participative procedures, a lack of enhanced collective action and empowerment (access to marketing channels etc.), and a lack of government support etc.

CHAPTER 7

ECONOMIC GROWTH AND LINKAGE TO TOTAL FACTOR PRODUCTIVITY OF THE SOUTH AFRICAN AGRICULTURAL INDUSTRY

7.1 INTRODUCTION

The positive relationship between agricultural growth and overall economic growth is empirically well established (Kieran and Karl, 2007). Evidence consistently shows that agricultural growth is highly effective in reducing poverty. Gallup *et al.* (1997, in DFID, 2005) show that every 1% increase in per capita agricultural output leads to a 1.61% increase in the income of the poor. However, developing countries are still ineffective in reducing poverty (Romea and Marcelle, 1998).

This chapter analyses the determinants and the sources of agricultural economic growth by applying the Exact Maximum Likelihood (EML) method (4.19). The chapter further examines the Total Factor Productivity relationship to economic growth using Ordinary Least Square, after testing for co-integration relationships among the variables using equation (4.16).

The study is timeous from a policy perspective, as trade liberalisation constitutes a crucial policy element in the government's efforts to boost the underlying supply capacity of the economy in light of the variation in trade policy orientation and the different degrees of trade openness in South Africa.

7.2 DETERMINANTS OF AGRICULTURAL ECONOMIC GROWTH FOR SOUTH AFRICAN AGRICULTURAL INDUSTRY

7.2.1 Stationarity test (Unit root tests)

Previous studies indicate that time-series data, be it monthly, quarterly or annual, is likely to be non-stationary (for example, see Saghaian, Reed and Merchant, 2002; Cho, Kim and Koo, 2004). In this study, the Augmented Dickey-Fuller (ADF) unit root test, with and without a linear trend, is performed to test for the stationarity of the variables considered. The ADF test with a linear trend checks if the variables have a stationary trend.

Following the above technique, the standard practice of unit root tests tested both the level and first difference of each data series. The results are presented in Table 7.1.

The Augmented Dickey-Fuller (ADF) unit root test, with and without a linear trend, was performed in this study. Since the ADF test is sensitive to the order of the lags chosen, the starting point was the over-specification ADF test, where the order of the lags was relatively larger and corresponded to the highest (absolute value) Akaike Information Criterion (AIC).

From Table 7.1 one sees that the absolute values of the ADF test of levels shows that it is statistically higher than the 95% critical value in the first six variables (Table 7.1), suggesting that the null hypothesis of the unit root is rejected. In the latter five variables (Table 7.1), the test shows that it is statistically lower than the 95% critical value. This suggests that the null hypothesis of the (latter five variables) unit root is not rejected and that none of these five variables are (trend) stationary at a 5% significance level. Each series was differenced and the ADF test was performed. The results of the latter five variables show that all of the tested series are not stationary in (log) levels, but are stationary at a 5% significance level after being differenced once.

Table 7.1 ADF test results – with and without trend

		In Levels		Differenced Once			
	Specification	**Lags**	**Critical Value**	**Test Statistics**	**Lags**	**Critical Value**	**Test Statistics**
gGDPc	Constant only	1	-2.9627	-4.8977			
	Constant with trend	3	-3.5671	-4.3943			
OUTgap	Constant only	1	-2.9627	-4.6851			
	Constant with trend	3	-3.5671	-4.3115			
ALI	Constant only	1	-2.9627	-3.8355			
	Constant with trend	1	-3.5671	-3.9226			
RDGDP	Constant only	1	-2.9627	-4.0596			
	Constant with trend	1	-3.5671	-4.0148			
TOT	Constant only	1	-2.9627	-3.3655			
	Constant with trend	1	-3.5671	-3.8933			
STDoutg	Constant only	4	-2.9665	-4.0595			
	Constant with trend	4	-3.5731	-4.5129			
Trade	Constant only	1	-2.9627	-1.6291	1	-2.9665	-5.4635
	Constant with trend	1	-3.5671	-3.1152	1	-3.5731	-5.3674
GOVexp	Constant only	1	-2.9627	-1.5782	1	-2.9665	-4.0154
	Constant with trend	1	-3.5671	-1.7595	1	-3.5731	-3.8851
CPI	Constant only	3	-2.9627	0.020273	2	-2.9665	-5.345
	Constant with trend	3	-3.5671	-1.7779	2	-3.5731	-5.9485
RER	Constant only	3	-2.9627	-1.191	1	-2.9665	-4.1011
	Constant with trend	3	-3.5671	-3.0287	1	-3.5731	-4.0219
D1	Constant only	1	-2.9627	-0.5039	1	-2.9665	-3.8079
	Constant with trend	1	-3.5671	-1.7478	1	-3.5731	-3.9001

95% Critical value for the augmented Dickey-Fuller statistic

7.2.2 Model estimation for determinants of economic growth

On the basis of the results obtained from Table 7.2, the technique described in the methodology was applied (equation 4-19). The overall explanatory power is at 87%. Except for CPI, RER and D1 (which were not significant at the specified significance level and which are not reported in Table 7.2), all other variables were found to be statistically significant at the specified significance level.

Table 7.2: Maximum Likelihood Estimation (MLE), determinants of agricultural GDP growth, data from 1971-2007

Independent Variable	Estimated Coefficient	T-ratio [Prob]
Cyclical reversion		
OUTGAP	-0.28	-3.38*
Structural policies and institutions		
Education (ALI)	0.47	2.93*
Financial depth (RDGDP)	-0.56	-5.96*
Trade openness (TRADE)	1.21	2.87*
Government support (GOVEXP)	1.03	1.78***
Stabilisation policies		
Lack of price stability (CPI)	0.17	0.41
Cyclical volatility		
Standard deviation of output gap (STDOUG)	0.33	2.20**
Real Exchange overvaluation (RER)	0.087	1.36
External factors		
Term of trade (TOT)	-0.035	-3.46*
Trade liberalisation (D)	0.020	0.45
Intercept	0.55	
R^2	0.91	
Adjusted R^2	0.87	
Durbin-Watson stat	1.63	

*, ** and *** denote significance at the 1, 5, and 10 % level, respectively

It was found that the cyclical reversion, as one of the determinants and sources of agricultural growth, was negative and significant at the indicated significance level (see Table 7.2). This implies that the agricultural economy follows a reverting trend process to close the output gap. However, the cyclical reversion effect was not sizeable; according to the points estimate, if the initial output was, say 5 % of the estimated potential output, the economy would be expected to grow by about 1.4 % in the following year, which is very small.

Results related to structural policies and institutions indicators of growth were presented in Table 7.2. The variables related to this category are: Education (ALI), financial depth (RDGDP), trade openness (TRADE) and government support (GOVEXP). All variables (except for RDGDP) were found to be positively related to growth and statistically significant at the specified significance level. This implies that the agricultural sector is aligned with improved education, financial depth and trade openness. For example, a 10 % increase in secondary

school enrolment has seen a growth of 0.49 % in agriculture. An increase of 10 % in the current debt leads to a 6 % decline in agricultural growth (see Table 7.2). This might be due the occurrence of continuous drought or it might be lack of experience in new emerging famers . Therefore, the results show that the burden of debt crisis was a critical problem in the South African agricultural sector. The study was found to be consistent with a vast body of empirical literature on endogenous growth, including Norman and Raimundo's (2002) findings on the role of education, trade, and government burden, Dollar and Kraay's (2004) study of the role of trade openness, and Levine *et al.*'s (2000) findings on the role of financial depth.

Table 7.2 shows that the TRADE model estimation (as a proxy for openness) was found to be statistically significant at 1 %. This implies that agricultural industries were able to increase specialisation and adapt to a competitive environment (see Table 7.2). The study also shows that government support to agriculture is vital: a 10 % increase in government expenditure increased economic growth by 10.2 %.

Stabilisation policies (inflation is represented by CPI), as a determinant of economic growth, were reportedly insignificant (see Table 7.2). However, the research review shows that economic growth generally increases when government is able to carry out policies conducive to macro-economic stability, even when financial and external crises are present (Fischer, 1993).

The standard deviation of the output gap (STDOUG) was found to be positive and significant, whereas the real exchange rate was reportedly insignificant (see Table 7.2). This reveals that there was an important connection between the business cycle and agricultural economic growth. The standard deviation of the output gap reflects that there was a lack of output stability in the sector. This might be due to the volatile nature of the agricultural sector, which was characterised by droughts and other related agricultural risks.

The last category of this study was external factors (see Table 7.2), i.e., the terms of trade, which was found to be statistically significant and negatively related to growth. This implies that there were imbalanced terms of trade which slowed down the agricultural economy's growth

rate. The dummy variable for trade liberalisation (D1) was found to be too insignificant to be reported, and this might be due to the short period of observation of trade liberalisation (namely, after 1998 only). That period was unable to capture the effect on the model, or this might imply that there were some complications related to trade arrangements that needed revision and consideration to reap better benefits from the trade agreement.

7.3 THE IMPACT OF TRADE LIBERALISATION ON SOUTH AFRICAN AGRICULTURAL PRODUCTIVITY

7.3.1 Cross-sectional evidence

The method explained in the methodology section (equation 4-15) in Chapter 4 was applied. Results are reported regarding the impact of trade liberalisation on the Total Factor Productivity (with other key determinants), across nine different agricultural commodities. The data observation was pooled from the period of 1995 to 2007.

The cross sectional model is specified as follows:

TFP = f(export_share, import_share, CFC, PP, RER, SADC and EU)

Where: TFP is defined as the ratio of total production to the area planted;

Export share is the ratio of total export to production (in volume);

Import share is the ratio of total import to domestic consumption (in volume);

CFC is the ratio of capital formation to agricultural GDP (in current price);

PPI is producer price index;

RER is the real exchange rate and;

SADC and EU represent the dummy variable for SADC and EU trade agreements respectively.

The overall explanatory power is at 77 %. Except for PPI (which was not significant and not reported: see Table 7.3), all other variables were found to be statistically significant at the specified level of significance.

Table 7.3: Determinants of TFP (pooled results: 1995-2007), Ordinary Least Square (OLS)

Dependent Variable	TFP	
Independent Variable	**Estimated Coefficient**	**T-ratio**
Export share	0.045	2.9***
Import share	-0.035	-4.6*
CFC	0.04	2.3**
PPI	0.032	0.44
RER	-0.012	-6.12*
SADC	0.045	1.13**
EU	0.013	2.9***
C	4.2	
R-seq	0.77	
Adj R-seq	0.65	
Number of observations	99	

*, ** and *** denote significance at the 1, 5, and 10 % level, respectively

Table 7.3 shows that export share was found to be positive and significant at 10 %. This implies that export is directly linked to productivity that is higher than the export share performance, and might encourage high investment growth and capital accumulation that leads to better factor productivity growth, and subsequently, to economic growth.

Import share was found to be negative and statistically significant at the specified level (see Table 7.3). This might indicate that there is high external competition and pressure on domestic agricultural industries to keep costs low, which restricts the economy of scale advantage. Generally – and taking these two key determinants into account – the effect of openness was not a significant contributor to economic growth. For example, further increasing export shares by 10 % led to TFP improvement by only 0.45 %; similarly, a 10 % increase in import shares led to a 0.35 % decline of TFP, meaning that the net effect was only 0.10 %, which is very small in relation to the population growth. However, this implies that the agricultural sector needs support from all stakeholders for it to better contribute to economic growth, and continuous research is also important within the era of globalisation.

Empirical studies on international trade show that export shares growth is a good indicator to measure stimulation of production across the economy via technological spill-overs and other

externalities. On the other hand, exports might create externalities for the following reasons: (i) exposure to international markets calls for increased efficiency, and provides incentives for product and process innovation; (ii) increases in specialisation facilitate economies of scale, and (iii) larger exports will contribute to the stock of knowledge and human capital accumulation in the economy (Goldar and Kumari, 2003). Thus, generally speaking, the analysis of the South African agricultural industries in Table 7.3 showed a small net benefit from exports and imports share growth.

The third key determinant of TFP in this section is the Producer Price Index (PPI). It was found to be positive but not significant enough to report (see Table 7.3). The fourth key determinant of TFP is the ratio of capital formation to GDP (CFC); it was found to be positive and significant (at 5 % significance level). This implies that TFP has increased as a result of capital formation.

Goldar and Kumari (2003) show in their study that trade liberalisation gives industries better access to imported inputs, technology adoption and stable exchange rates. The export-oriented trade policy also provides an opportunity to learn better management practices. However, the direct impact of the real exchange rate (RER) on this study (see Table 7.3) was found to be negative and statistically significant in influencing TFP. This implies that the external competition might create pressure on domestic agricultural industries to keep costs low, which restricts the economy of scale advantage; the Rand market devaluation also contributed to a decline in the agricultural sector's contribution to the economy.

The dummy variables for SADC and EU trade liberalisation of the regions appeared to be important variables in explaining TFP. The dummy variable for the SADC and EU was found to be significant at 5 and 10 %, respectively (see Table 7.3). The result shows that the SADC agreement has a magnified effect in explaining the TFP. The estimated coefficients of the two were found to be 0.045 and 0.013, respectively. This implies that further increasing trade by 10 % to SADC or EU regions led to a respective 0.45 % and 0.13 % TFP improvement, which is a good indication that, in the era of trade liberalisation, the SADC regions are efficient markets for South African agricultural industries. This might be due to cheaper transportation costs; also,

the same industrialisation level in the region may have contributed to higher intra-trade in the region.

One must, however, be cautious about making inferences regarding the dummy variable for the EU. The relatively smaller elasticity responsiveness of the EU dummy variable might have resulted due to the exclusion of beef, sugar and maize from the agreement, or might imply that products/commodities that have preferential access to the EU are unable to influence TFP.

7.4 TIME-SERIES EVIDENCE

7.4.1 Stationarity test (unit root tests)

The Augmented Dickey-Fuller (ADF) unit root test, with and without a linear trend, is performed. The ADF test with a linear trend checks for the stationarity trend of the variables. The results are presented in Table 7.4. Since the ADF test is sensitive to the order of the lags chosen, the starting point was the over-specification ADF test, wherein the order of the lags was relatively larger and corresponded to the highest (absolute value) Akaike Information Criterion (AIC).

Table 7.4 shows that the absolute values of the ADF test of levels are statistically lower than the 95 % critical value. This suggests that the null hypothesis of the unit root is not rejected and that none of these variables are (trend) stationary at a 5 % significance level. Each series was differenced and the ADF test was performed. The results show that the unit root null hypothesis is rejected at a 5 % significance level (see Table 7.4).

Table 7.4: ADF test results – with and without trend

		In Levels			Differenced		
Variable	**Specification**	**Lags**	**Critical Value**	**Test Statistics**	**Lags**	**Critical Value**	**Test Statistics**
lnTFP	Constant only	2	-2.9591	-2.4038	1	-2.9627	-5.4294
	Constant and trend	2	-3.5948	-3.5615	1	-3.5671	-5.325
lnOpen	Constant only	4	-2.9591	-1.8097	4	-2.9627	-5.7812
	Constant and trend	4	-3.5615	-1.7976	4	-3.5671	-5.7802
lnDebt	Constant only	1	-2.9591	-2.0519	1	-2.9627	-4.0596
	Constant and trend	1	-3.5615	-2.9352	1	-3.5671	-4.0148
lnCFC	Constant only	1	-2.9591	-1.5124	2	-2.9627	-4.4552
	Constant and trend	2	3.7196	-2.6095	2	-3.5671	-4.3715

95 % Critical value for the augmented Dickey-Fuller statistic

The results show that all of the tested series are not stationary in (log) levels, but are at 5 % significance level after being differenced once. All of the series are therefore assumed to be integrated with order one, thereby fulfilling a necessary condition for a co-integration test.

7.4.2 Co-integration test

Johansen (1990) has proposed two statistics which can be used to evaluate the ranking of the coefficient matrix, or the number of co-integration relationships. The one used here is the likelihood ratio test of the null hypothesis, i.e., that the number of co-integration vectors is r versus the alternative r+1 vector. In this case, the number of co-integration vectors equals 0 in the null hypothesis.

Table 7.5 shows that Likelihood Ratio (LR) statistics are below their corresponding coefficients of the critical value, thus co-integration between the variable pairs is unlikely. The Johansen tests reject the hypothesis at 5 % (1 %) significance level LR (see Table 7.5). The results clearly show that there is no long-term co-integrating vector among the TFP, Open, CFC and DEBT variables.

Table 7.5: Co-integration analysis of TFP, OPEN, CFC and DEBT

Test assumption: No deterministic trend in the data					
Series: TFP OPEN CFC DEBT					
Lags interval: 1 to 1					
		Likelihood	5 Percent	1 Percent	Hypothesised
Rank	Eigen Value	Ratio	Critical Value	Critical Value	No. of CE(s)
R= 0	0.523564	38.26830	39.89	45.58	None
R<= 1	0.211567	13.05993	24.31	29.75	At most 1
R<= 2	0.106587	4.977856	12.53	16.31	At most 2
R<=3	0.033140	1.145842	3.84	6.51	At most 3
*(**) denotes rejection of the hypothesis at 5 % (1 %) significance level					
LR rejects any co-integration at 5 % significance level					

Table 7.5 shows that co-integration tests were conducted with the assumption that no deterministic trend in the data had been performed, proving that there is no long-term relationship; the necessary condition to use Ordinary Least Square (OLS) regression was done.

7.4.3 Time-series model estimation

Applying equation (4-16), Table 7.6 reports the results of the relationship between TFP and trade liberalisation. The overall explanatory power is at 74 %. All variables were found to be statistically significant at the specified level of significance.

Table 7.6: Relationship between TFP and trade liberalisation – Log Ordinary Least Square (from 1970 to 2007)

Independent Variable	Estimated Coefficient	T-ratio
DOPEN	0.034733	1.93**
DCFC	0.0919	1.38***
DDEBT	-0.328	-8.54*
C	-0.0135	
R^2	0.74	
Adjusted R^2	0.71	
Durbin-Watson stat	1.55	
No. observation	35	

*, ** and ***denote significant at the 1, 5 and 10 % levels, respectively

Table 7.6 indicates that all three variables are individually non-stationary; the coefficients of the estimated variables have the expected signs: TFP was positively related to OPEN and CFC, whereas DEBT related negatively.

The time-series evidence goes in the same direction as the cross-sectional results: there is a robust relationship between TFP, the degree of openness (measured as imports plus exports over GDP), and the share of machinery and equipment investment (measured capital formation relative to GDP). In addition, annual growth in TFP is positive and significantly related to contemporaneous changes in openness and investment in equipment and machinery. Debt was found to be inversely related to TFP; this implies that increasing debt further causes temporary deviations in TFP to reduce. The quantitative effects seem to be quite large: the estimated coefficients indicate that a 10 % increase in debt is associated with an approximate 3 % decline in TFP. Similarly, a 10 % increase in the share of machinery and equipment investment and openness is associated with a respective 0.9 and 0.3 % increase in TFP.

7.5 . CONCLUSION

The determinants and sources of agricultural economic growth that can be adjusted were analysed by putting them into five main categories: cyclical reversion, structural policies and institutions, stabilisation policies, cyclical volatility and external conditions.

The structural policies and institutions category variables were found to be statistically significant at the specified significance level (except for RDGDP); all variables were found to be positively related to the growth. This implies that the South African agricultural growth was achieved via improved education, financial depth and trade openness. However, the negative relationship of RDGDP implies that the sector is suffering from debt crisis. Therefore, farmers need to follow an effective debt management system to achieve the required growth rate. This study was also found to be consistent with a vast body of empirical literature on endogenous growth, including Norman and Raimundo's (2002) findings on the role of education, trade, and government burden, Dollar and Kraay's (2004) study on the role of trade openness, and Levine *et al.'s* (2000) findings on the role of financial depth.

Within the cyclical reversion and cyclical volatility categories, the standard deviation output gap was found to be statistically significant and related positively. This implies that the agricultural economy follows a reverting trend process to close the output gap, and shows that there was an important connection between business cycle factors and agricultural economic growth.

The external factor category was statistically significant and negatively related to economic growth. This reveals that there were imbalances in trade that slowed down the agricultural economic growth rate.

Furthermore, this study has tested the relationship between economic growth and TFP using a cross-section approach across nine agricultural commodities for the period of 1995-2007 (when South Africa witnessed major trade reform), and an aggregate time-series approach (covering the period of 1970-2007). The results obtained in this paper indicate that trade liberalisation has contributed to augmenting South Africa's growth potential.

Cross-section analysis (paragraph 7.3.1) showed that all variables (except for the Producer Price Index (PPI)) were found to be statistically significant at indicated significance levels. The OLS result confirms that TFP was negatively influenced by import share and the real exchange rate. This implies that, generally, the agricultural sector needs support from all stakeholders for it to better contribute to economic growth.

The variables export share and CFC were found to be positive and significant at 10 and 5 % significance levels, respectively. As Goldar and Kumari (2003) indicate in their study, trade liberalisation increases efficiency, allows specialisation, innovation, capital formation, and the accumulation of knowledge and human capital in the agricultural economy. Thus, the rate of export growth will cause economy-wide productivity gains.

The dummy variables for the SADC and EU regions appeared to be important variables in explaining TFP. The variables were found to be significant at 5 and 10 % significance levels, respectively. The SADC agreement has been found to have a magnified effect in explaining TFP as opposed to the EU agreement. This implies that the SADC region is an efficient market for South African agricultural industries. This might be due to cheaper transportation costs and the similar industrialisation level capacity of the region. This implies that South Africa has to strengthen the trading linkage to the SADC region to reap better benefits.

The time-series analysis (paragraph 7.4.3) results regarding the joint importance of the openness and the technology variable draw attention to two key and complementary channels of influence in the economy's productivity. While Research & Development (R&D) – as embodied in investment in machinery and equipment – augments productivity, it also appears to be important when it comes to providing an open or liberal environment in which the gains from R&D can be maximised. A policy corollary of this finding could be that emphasis on increasing an economy's access to foreign capital goods by selectively liberalising imports of capital goods might be insufficient to harness the benefits from technology absorption. By the same token, the results suggest that openness needs to be complemented by appropriate avenues for the creation and absorption of technology. The burden of debt needs to be revised in such a way as to improve productivity. Moreover, this also implies that South African farmers/agricultural

industries need support from all stakeholders for better contribution of the sector, and continuous research is important.

While the study's results in this paper are encouraging, there remains considerable scope for refining and deepening the research with regard to the effect of land reform on the TFP.

CHAPTER 8

CONCLUSIONS, RECOMMENDATIONS AND POLICY IMPLICATIONS

8.1 INTRODUCTION

Over the past decade, major changes in the agricultural business environment have taken place. These changes have affected agriculturalists and others directly or indirectly involved in agriculture. With the introduction of free trade, subsequent fluctuations in prices brought about a whole new dimension of risk. South Africa's agriculturalists were not always prepared to manage the resulting external competition (Taljaard, 2007).

In the 1960s and 1970s, African countries were very sceptical about the virtues of free trade. Since the late 1980s, they have shown more interest in multilateral trade as well as negotiations. This reflects the combined effect of three factors: dissatisfaction with the slow pace of regional integration; the belief that trade (if well managed) could play a critical role in confronting the development challenges facing the continent, and the widespread view that multilateral trade could promote as well as spur regional integration efforts. By increasing competition, multilateral trade liberalisation could force African governments to intensify regional integration efforts so as to reduce transactions costs through the development of regional infrastructure (Economic Commission for Africa (ECA), 2004).

During the last decade, trade policy in South Africa has undergone several changes. These include multilateral reductions in tariffs and subsidies through the country's World Trade Organisation (WTO) commitments, the signing of Free Trade Agreements (FTAs) and more recently, negotiations around future commitments to liberalisation both at the multilateral level as well as the regional level. These simultaneous developments have had an important

influence on both *de facto* protections in the South African economy, as well as on welfare improvement (OECD, 2006).

South Africa has undertaken several major economic reforms, and among these, import liberalisation was a principal component. This reform, along with complementary changes in industrial policy and technology, was aimed at making South African industries more efficient as well as updating technology and competitiveness (Jonsson and Subramanian, 2001).

However, from 1970 to 2007 the South African annual average contribution of agriculture to total GDP and employment dropped by 0.09% and 0.22%, respectively. To aggravate matters, the South African economy is characterised by high levels of poverty, especially in the rural areas, where approximately 70 % of poor people reside. Moreover, almost all of the productive and social activities of rural towns and services are dependent on primary agriculture and related activities (DoA, 2008). This makes it complicated to reach government objectives.

Therefore, the overall objective of the study is to examine the impact of trade liberalisation and different Free Trade Agreements (FTAs) on the ability of agriculture to contribute to agricultural economic growth. More specifically, it examines the empirical relationship between trade liberalisation, international trade flow in the agricultural industry and total factor productivity (TFP) in light of South Africa's effort to integrate its economy with the rest of the world's.

8.2 CONCLUSIONS AND RECOMMENDATIONS

This study investigated the international trade performance of South Africa's agriculture. The analytical tools used were the Gini coefficient and the Intra-Industrial Trade coefficient, with its economic attributors that contribute to achieving a higher IIT. This tool is useful for measuring the level of concentration and patterns in trade.

Moreover, the paper evaluated, analysed and classified the significant determinants affecting agricultural exports for both cross-sectional data and panel/pooled data from 2004 to 2007 using the gravity model. The model estimate was based on the panel data of 30 South African export destination countries; consideration was also given to investigating the impact of income,

per capita income, distance, exchange rates, and dummy variables for EU and SADC trading partners when analysing the impact trade agreements have on trade volumes.

The determinants and sources of agricultural economic growths were also analysed by categorising the variables into five main categories: cyclical reversion, structural policies and institutions, stabilisation policies, cyclical volatility and external conditions.

The cumulative percentage of exports/imports to 30 countries is less than 6 % and 5 %, respectively. This indicates that agricultural export by South Africa is highly concentrated in a few countries. The Gini coefficient of exports and imports was calculated as 0.55 and 0.62, respectively. The main export destinations and origins were the EU and the SADC. The trend of concentration appears to have remained the same. This implies that the regional trade and bilateral trade agreements created market opportunities to the specific market.

In aggregate terms, agricultural IIT calculations after 1994 were higher than average during this period, particularly for South African exported products, which had approximately the same value as that of imported ones (this shows an ability to maintain the capacity of balanced trade), possibly implying that South African industries are highly advanced. Additionally, trade liberalisation and trade agreements opened up market opportunities to increase exportable surpluses, and probably resulted due to increased specialisation and competitiveness. The higher level of IIT after 1998 reveals South African industries' ability to adjust to a more competitive environment, thus reinforcing the position that a bilateral agreement should be accompanied by regional or even multilateral liberalisation.

The finding of the econometric analysis of IIT determinants magnified the effect of the coefficients of export to import ratios and the TIMB (trade balance). These results imply that if South African industries implement measures to increase trade liberalisation and diversify the level of industrial specialisation, the IIT level would remain high, and significant economic gain might be achieved by minimising costs.

The negative and significant level (at 1 %) of the debt (DEBT) variable implies that South African agricultural industries suffered from a debt crisis which negatively affected the

international trade performance. This is a good indicator that South African industries need to reconsider how to decrease the level of debt.

The model found that all variables were significant at one percent and carried the expected sign. Only the EU dummy variable had an inverse relationship, implying that the EU trade agreement creates a negative impact on export capacity for South African farmers. In other words, South African farmers were not able to compete with the subsidised farmers.

Considering the components of the structural policies and institutions category, variables were found to be statistically significant at the specified significance level, with the exception of RDGDP; all variables were found to be positively related to the growth. This implies that the South African agricultural growth was achieved via improved education, financial depth and trade openness. However, the negative relationship of RDGDP implies that the sector is suffering from debt crisis. Therefore, farmers need to follow an effective debt management system to achieve the required growth rate. This study was also found to be consistent with a vast amount of empirical literature on endogenous growth, including Norman and Raimundo's (2002) findings regarding the role of education, trade and government burden, Dollar's (2004) findings on the role of trade openness, and Levine *et al.*'s (2000) views on the role of financial depth.

Within the cyclical reversion and cyclical volatility categories, the standard deviation output gap was found to be statistically significant and related positively. This implies that the agricultural economy follows a reverting trend process to close the output gap, and shows there was an important connection between business cycle factors and agricultural economic growth.

The external factor category was statistically significant and negatively related to economic growth. This reveals that there were imbalances in trade that slowed down the agricultural economic growth rate.

Furthermore, this study tested the relationship of economic growth to TFP using a cross-section approach covering nine agricultural commodities for the period of 1995-2007 (when South Africa witnessed major trade reform), and an aggregate time-series approach (covering the

period of 1970-2007). The results obtained in this study indicate that trade liberalisation has contributed to augmenting South Africa's growth potential.

From cross-section analyses (paragraph 7.3), it was shown that all variables (except for the Producer Price Index (PPI)) were found to be statistically significant at the indicated significance level. The OLS result confirms that TFP was negatively affected by import share and the real exchange rate. This implies that, generally speaking, the agricultural sector needs support from all stakeholders for it to better contribute to economic growth.

The variables export share and CFC were found to be positive and significant (at 10 and 5 % significance level, respectively). As Goldar and Kumari (2003) indicate in their study, trade liberalisation increases efficiency, enables specialisation, innovation, capital formation, and the accumulation of knowledge and human capital in the agricultural economy. Thus, the rate of export growth will cause economy-wide productivity gains.

The dummy variables for the SADC and the EU region appeared to be important variables in explaining TFP, and they were found to be significant at 5 and 10 % significance level, respectively. The SADC agreement has been found to have a magnified effect in explaining TFP as opposed to the EU agreement. This implies that the SADC region is an efficient market for South African agricultural industries. This might be due to cheaper transportation costs and similar industrialisation capacity in the region. This implies that South Africa has to strengthen the trading linkage to the SADC region to reap better benefits.

The time-series analysis (paragraph 7.4) results regarding the joint importance of the openness and the technology variable draw attention to two key and complementary channels of influence on the economy's productivity. While R&D, as embodied by investment in machinery and equipment, augments productivity, it also appears to be important in providing an open or liberal environment in which the gains from R&D can be maximised. A policy corollary of this finding could be that emphasis on increasing an economy's access to foreign capital goods by selectively liberalising imports of capital goods might be insufficient to harness the benefits from technology absorption. By the same token, the results suggest that openness needs to be complemented by appropriate avenues for the creation and absorption of technology.

Moreover, this also implies that South African farmers/agricultural industries need support from all stakeholders for them to make a better contribution to the sector.

While the results of this study are encouraging, there remains considerable scope for refining and deepening the research regarding the effect that land reform has on total factor productivity.

8.3 POLICY IMPLICATIONS

These results have several important policy implications for South Africa. Firstly, trade agreements, whether implemented unilaterally or bilaterally, will enhance potential trade flows between South Africa and other countries or regions. Given that distance to markets is important, South Africa should emphasise the transaction costs. It is also important to protect and advocate productivity growth within the context of fair agreement. Secondly, from an export promotion standpoint, distance in the model's results showed that importing countries' per capita income is elastic and significant in determining export. Therefore, it is important for South Africa to maintain trade links and extend these to high per capita income countries or regions in order to realise export potential.

On the other hand, to avoid the vulnerability of exports and potential crises in EU regions or countries where the largest proportion of South Africa's export is directed, it is important that South Africa continues to concentrate its export promotion efforts in other regions of the world. Therefore, special attention should be focused on promoting export to new emerging markets in South Asia and Latin America.

The results of this study have, however, certain limitations. Specifically, the model was unable to capture the impact of land reform. It is clear that the issue of land reform in South Africa affects the current potential of export capacity, but was beyond the scope of this study.

Therefore, further research is needed to assess the impact of land reform on trade flows between South Africa and various global regions. Within this context, it is important to ensure that the research encompasses investors' confidence in agriculture.

Further, effective regional integration with in Africa can provides benefits in terms of economies of scale and the creation of huge internal markets that facilitates competition and efficiency of

production. Deeper integration could also enable South Africa and Africa to increase investment in capital goods allowing for further processing of raw materials within the region before exporting. In this way production is diversified and African producers can move up the value chain. An initial step may be able to promote the production of semi-processed products for export is very important.

Integration efforts need to address issues of infrastructure, trade finance, marketing, training and other factors for production or countries risk remaining in a position of either not being able to supply or not being able to supply competitively (Manduna, 2005).

A coordinated regional and continental wide approach to infrastructure financing, institutional harmonisation and policy coordination needs to be pursued to ensure that the benefits and opportunities accruing form preferential access that can optimised.

Addressing the challenges to trade in Africa requires a comprehensive approach that focuses on a range of issues that supplement preferential access arrangements and facilitate greater competitiveness of African economies. Investment in upgrading infrastructure, developing human capital and transferring technologies and expertise are critical in ensuring diversification of production and greater opportunities for trade.

As Daya et al (2006) mentioned improving the transport infrastructure on the continent is critical to enhancing trade. Furthermore, UNCTAD (1999) suggests that the transport sector is critical in creating a dynamic investment export nexus in Africa. This is particularly important in an agricultural trade context where transport costs constitute a large component of the final cost of goods. In

South Africa's developed commercial farming sector along with marketing and processing abilities places the country in a unique position in Africa in terms of human capital and expertise. These resources provide a valuable opportunity for South African farmers, producers, processors and managers to export their skills to African economies.

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