UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

The impact of deregulation on competitiveness and market integration: The case of South Africa's potato exports

by

Hezron Anaya Chogo

Submitted in partial fulfilment of the requirements for the degree
MSc. (Agric): Agricultural Economics

Department of Agricultural Economics, Extension & Rural Development
Faculty of Natural and Agricultural Sciences
University of Pretoria

December 2009

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

DECLARATION

I declare that the dissertation that I hereby submit for the Masters degree in Agricultural Economics at the University of Pretoria has not previously been submitted by me or any other person for degree purposes at any other university.

Signature: Chogo H.A Date: 14th December 2009

ACKNOWLEDGEMENTS

Above all, I wish to thank the Almighty God for having seen me through this long and challenging journey. I also owe my gratitude to all the people who made this dissertation possible. My deepest gratitude is to my academic advisor, Dr. Ferdinand Meyer for giving me the freedom to explore ideas on my own and at the same time the guidance to recover when my steps faltered. Dr. Meyer taught me how to question thoughts and express ideas. Furthermore, his financial support helped me overcome financial setbacks and finish this dissertation.

I am also thankful for all the support from the Department of Agricultural Economics and its staff. Prof. Johann Kirsten was always there to listen and give guidance on the technical and financial aspects during my study. I also appreciate the support from the BFAP team. Thanks to P.G. Strauss for allocating me a computer. Thomas Funke gave me some insightful ideas on research work. Kirsten Thompson is one of the best teachers that I have had in my life. She introduced me to cointegration techniques and her teachings inspired me to work on the analysis section of this dissertation. I am also grateful to her for encouraging the use of correct grammar and referencing.

Further gratitude goes to the university library staff, members of Potatoes South Africa, Mauritius AMB and the SADC secretariat who were ever timely in providing required information and research material.

Lastly, this would not have been possible without the love, support and care of beloved friends and family. They helped me overcome many hitches and stay sane through the difficult years. I greatly value the friendship of Ntsako Makondo, Peter Beine, Komen Kibii and Itumeleng Moloi. Many thanks to my family for giving me the opportunity to study and for all the sacrifices and prayers. I deeply appreciate their belief in me. Mrs Tafroza, you are the best mum in the world and this one is for you.

Hezron Anaya Chogo
Pretoria, South Africa
April, 2009

ABSTRACT

Impact of deregulation on competitiveness and market integration: The case of South Africa's potato exports

by

Hezron Anaya Chogo

Degree: MSc. (Agric): Agricultural Economics
Department: Agricultural Economics, Extension and Rural Development
Study Leader: Dr. Ferdinand Meyer

This study relates market reforms to agricultural trade performance, in particular the export performance of South Africa's potato industry. The market reform considered here is the deregulation of South Africa's potato market. Changes in producer prices and volumes of exports and imports are the most important outflows of deregulation that the study focuses upon. In the first part, this study provides an overview of deregulation in the potato industry. The objective of this study is to analyse the impact of deregulation on the competitiveness and the level of integration of the South African potato industry in relation to potato markets in the SADC region.

Competitiveness is perhaps the most fundamental idea in economics. Agricultural industries often fight to protect or increase their market share both domestically and internationally. The method used here to measure competitiveness is the Revealed Trade Advantage (RTA), a measure based on the share of a country's net trade in a specific commodity relative to its total international trade. The impacts are investigated individually for the three sub-categories of potatoes: fresh/table, processed and seed. Comparisons are made between South Africa and selected countries in the Southern African region.

Basic trend analysis illustrates that domestic potato production has increased significantly over the past decade. Exports as a percentage share of production have increased consistently from the late nineties to reach 8% of domestic production by

2003. However, from 2004 onwards exports have decreased as the domestic informal market for fresh potatoes expanded at a tremendous pace. The results of the Real Trade Advantage (RTA) analysis reveal that South Africa's potato (fresh) exports are the most competitive in the SADC region. Yet, the competitiveness of the potato supply chain in South Africa was found to be marginal as far as regional competitiveness is concerned. Thus, the potato supply chain exhibits a negative trend in competitiveness when moving from the primary to the processed product.

Another approach to gain a better understanding of the possible impact of deregulation on agricultural markets is to analyse the extent to which domestic commodity markets respond to changes in international prices. Hence, the level of price transmission between local and foreign markets can be analysed. The analysis consists of a set of econometric applications. Annual producer prices of various trading nations are analyzed by testing mostly for the existence of long run equilibrium between the price series of the various nations and the dynamics of the relation between the prices and their causality.

The results of the price transmission analyses show that the South African potato market is not well integrated with other regional potato markets, despite some trade occurring. This can partly be explained by the fact that over the past decade on average only 6 percent of all potatoes in the local market were exported into the region. Further more one has to take the tradability of the good into consideration when analysing the level of price transmission and, therefore, the level of integration of markets, In other words; can the good be traded or not? Potatoes (fresh) are perishable and bulky and therefore not easy to transport. Export trade in fresh potatoes involves high transport and transaction costs which complicate the process of price transmission across markets. Even in the exceptional cases (Mozambique and Mauritius) where market integration was detected, price transmission was found to occur from South Africa to these countries and not *vice versa.* Hence, from the empirical evidence of this study it seems as if domestic prices are determined by domestic supply and demand dynamics and regional exports do not influence the formation of prices in the domestic market. Although the liberalization of the South African potato market has led to the lowering of tariffs and non-tariff trade barriers,

only weak evidence was found that there is some level of market integration between South Africa and its main trading partners in the SADC region.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

GLOSSARY OF ABBREVIATIONS AND SYMBOLS

%	Percent
ADF	Augmented Dickey-Fuller
BFAP	Bureau of Food and Agricultural Policy
ECM	Error Correction Model
FAO	Food and Agriculture Organisation (of the United Nations)
FTA	Free Trade Area
GDP	Gross Domestic Product
Ha	Hectare; equal to 10,000 square metres; 2.471 acre
Kg	Kilogram
Ktonne	Kilo-tonne (1000 metric tonnes)
LC	Local currency
(N)FPM	(National) Fresh Produce Market
NTB	Non-Tariff Barrier
OECD	Organisation for Economic Development and Co-operation
Potatoes SA	Potatoes South Africa
PPECB	Perishable Products Export Control Board
PPP	Purchasing Power Parity
R	South African Rand
R & D	Research and Development
RMP	Relative Import Penetration Index
RTA	Relative Trade Advantage Index
RXA	Relative Export Advantage Index
SADC	Southern African Development Community
Tonne	Metric tonne
US $	United States Dollar
WTO	World Trade Organisation
X - M	Net trade (exports - imports)

CHAPTER 1
INTRODUCTION

1.1 Background

Historically, the South African agricultural sector was heavily regulated and significantly influenced by the existence of many statutory boards. South Africa's agricultural policy changed emphatically in the 1980s, although some of the policy shifts were initially quite gradual (Vink & Kirsten, 2000). Isolation from the world markets, accompanied by the increased isolation of the country in social, cultural, political and intellectual spheres during the 1980s, meant that the deregulation steps that took place were aimed at the domestic market (Kirsten & Vink, 2003). Foreign trade largely consisted of managing imports and exports in order to manipulate domestic prices. Such trade was associated with substantial distortions and externally it was seen that removal of the boards would facilitate the freeing up of trade to and from South Africa (Scrimgeour & Sheppard, 1998)

Several changes took place following the beginning of the democratisation process in 1994. Among the agricultural policy initiatives that took place subsequent to this time were institutional restructuring in the public sector, the promulgation of the Marketing of Agricultural Products Act and reforms to trade policy (Kirsten & Vink, 2003). During 1996, the South African Government passed legislation to abolish the existing boards as part of a major reform in agriculture (Kirsten & Vink, 2003). The internal market reforms were completed in 1997. It should be noted that the reforms were part of a wider set of reforms (e.g. trade liberalisation). The reforms impacted a diverse set of boards; and in a large part involved the removal of a legislative framework

developed in the 1930s. One of the aims of these reforms was to enhance the international competitiveness of the agricultural sector (Kirsten & Vink, 2003).

The Marketing of Agricultural Products Act of 1996 changed the way in which agricultural marketing policy was managed in South Africa, not least by opening the sector to world market influences (Kirsten & Vink, 2003). The Act set up the National Agricultural Marketing Council (NAMC), whose immediate task was to dismantle the existing Control Boards, and subsequently to manage and monitor state intervention in the sector. The boards had been responsible not only for export marketing of agricultural products but also the domestic supply of such products. The review of the boards did not concentrate on the perceived advantages of single selling agencies, with respect to international market power, but rather concentrated on the internal effects of the boards in terms of the negative local market, distribution channel and production effects. (Scrimgeour & Sheppard, 1998)

The potato industry was not excluded from the reforms. In 1993, assets were transferred from the Potato Board to an industry Trust, Potatoes South Africa. This was a step towards deregulation of the industry. Deregulation is the process by which governments remove, reduce, or simplify restrictions on an industry with the intent of encouraging the efficient operation of markets. The rationale for deregulation is often that fewer and simpler regulations lead to a raised level of competitiveness, therefore higher productivity, more efficiency and lower prices overall (Collier, 1998). This should then also lead to increased competitiveness in export markets and as a consequence higher level of exports (Du Toit & Ortmann, 2009). Naturally, export competitiveness is also enhanced by the liberalization of markets. This study

examines how deregulation has affected export competitiveness and market integration within the SADC region. It is interesting to note, however, that some sources argue that the original problems that deregulation and market liberalization sought to solve did not simply go away, and that new problems were created by the transition itself. For example, the FAO (2003) reports that some governments contend that agricultural market liberalisation has contributed to the crisis facing small farm households across the continent, that private sector response and international trade has been too slow and too weak to spur development, and that the state ought to get back into direct distribution of strategic inputs and/or commodities and restrict regional and international trade.

The potato[1] is regarded as the most important tuber crop world wide with a vital role in the global food system. It is the fourth major food crop after maize, wheat and rice in the world and contributes to the food and energy needs of more than a billion people worldwide (GPC, 2008). Potato is grown in nearly 150 countries (CIP, 2008).

South Africa has approximately 50 000 ha under potatoes and produces on average 1.8 million tonnes of potatoes per year (Potatoes SA, 2007). Since the industry was deregulated, marketing of potatoes is done through a free market system: the produce can be sold at any place, any time and at any price. During 2005, 59% of all table potatoes were distributed through fresh produce markets to a number of end markets (NAMC, 2007). These end markets were in the formal and informal sectors. The remaining 41% represented export, processing and direct sales from producers to wholesalers, retailers, processors, some informal traders and consumers. Price

[1] (*Solanum tuberosum*)

determination takes place by negotiation between producers and market agents, wholesalers, retailers or individual consumers.

The objective of this study is to determine whether the potato sector in South Africa has benefited from any increased market opportunities due to deregulation and trade liberalisation. Competitiveness is one indicator that can show to what extent the increased openness in trade markets has been exploited. A number of recent studies have analysed the ability of industries to gain from increased market opportunities. Louw and Emongor (2004) observe that the Southern Africa Development Community (SADC) still faces many constraints in making sure the poorest have access to the opportunities that open markets can deliver. Yumkela *et al* (in FAO, 2003) argue that there is a strong correlation between export expansion and economic growth but the challenge is whether small farmers in Africa can compete effectively in international trade.

Potato marketing is exceptionally complex as it is affected by many factors related to physical production, supply and demand. Such factors affect price determination. The potato supply chain is often long and protracted, involving a large number of market intermediaries (Lele, 1981). Supermarkets and exporters on one hand have strict regulations which some producers, mainly small-scale, find difficult to meet. Instances where producers are exploited by market intermediaries due to insufficient information are not uncommon. Lack of sufficient information leads to bargaining inefficiency thus lower producer prices. This is worsened by the fact that fresh potatoes have only a limited shelf-life hence producers are forced to accept the prevailing market price at the time of harvest (Batt, 2003).

Oxfam (2000) therefore questions whether small-scale farmers can compete in a liberalised environment and whether there is a need to retain some level of protection. It therefore follows that under deregulation and liberalization, competitiveness becomes increasingly important as only those with the competitive edge can exploit the available opportunities. Without being competitive, the potential benefits of reforms are not transmitted to producers.Other than competitiveness, it is also essential to analyse the extent of market integration following reforms. Markets are integrated when trade occurs between them and the difference in the prices equals the transaction costs to move the goods between these markets in the long run (Meyer, 2006). In general, producer marketing decisions are based on market price information, and poorly integrated markets may convey inaccurate price information, leading to inefficient product movements (Goodwin & Schroeder, 1991). Furthermore, the extent of market integration also has consequences for designing successful agricultural price stabilisation policies. Therefore, in the wake of extensive economic reform and market liberalisation in South Africa, market integration studies are needed to evaluate policy. Market integration in this study will concentrate on the SADC region because South Africa enjoys a strategic advantage over competitors from other continents, given the close geographical connection between the countries and also due to the fact that SADC trade protocol accords South Africa preferential market access to the region (DoA, 2006).

1.2 Research Problem

With market and trade reforms, the fundamental nature of agro-business competition is changing, thus intensifying the pressures for the potato industry to remain

competitive. Following deregulation and changes in other external forces[2], producers, market intermediaries, processors and exporters are required to rapidly rethink and retool their strategies.

NAMC (2002) argue that while price information generated by the National Fresh Produce Markets (NFPMs) is a valuable resource to the industry, this information is not packaged in a user friendly format to enable producers to make informed decisions. Such data is in many cases misinterpreted and therefore, could be misleading. Some of the information supplied by the market authorities is also incorrect. In addition, the price information generated by NFPMs may be growing less relevant as these markets become residual markets in a system dominated by direct sales and informal cross-border trade (DoA, 2003). Direct sales have increased over the past decade; borne out by the increase in the number of chain stores most of which buy potatoes directly from producers.

While potato farmers ordinarily transact with those traders who offer the best price, Batt (2003) observes that there is some doubt as to what benefit the farmer will derive from selling to an alternative trader. Deregulation and trade liberalisation could improve the opportunity to sell to the international market, but how accessible are these markets and would producers get better prices? Whilst there have been some studies analysing country or commodity-specific price transmission from border to producer for other food crops, far less attention has been paid to the potato industry and to the ways in which the structure of the markets is changing; or to what this means for different categories of potato producers and traders within the region. For

[2] External forces include changes in demographics, technology, and globalization.

instance, Ihle and von Cramon (2009) analysed country and border effects in the transmission of maize prices.

In this respect, a key issue appears relevant for research: the functionality of markets used by different groups of potato producers in terms of their market access and international competitiveness. The inefficiencies in pricing mechanisms also raise questions on how well the markets are integrated. Market access here relates to the ability of producers to sell their produce to the market that awards them the highest returns. Market integration relates to how well changes in prices in one market, for example in neighbouring countries, are reflected as changes in domestic markets. Competitiveness relates to the ability to gain and maintain market share in a global environment. To achieve this, the following research issues need to be addressed:

Questions relating to market access and competitiveness

- Do farmers and potato dealers have more or less choice of market outlets[3] following deregulation?
- Has access to the regional potato market improved or deteriorated as a result of the market reforms?
- How do various potato products compete on the international market?
- What is the best way of promoting competitiveness in a deregulated industry?

Questions relating to market integration

- Is the producer price for potatoes transmitted across the region?
- Are there policies that impede intra-regional trade?

[3]Potato market outlets are both direct and non-direct. Direct markets involve producer interaction with consumers on a one-on-one basis, and include pick-your-own operations, roadside stands and farmers' markets. Non-direct markets involve producer interaction with market intermediaries, and include terminal market firms, shipping point firms, processors, grower cooperatives, brokers and retail outlets.

- Are there any mechanisms to offset the effect of price fluctuations and manage commodity price risk?
- Have all market participants benefited from reforms or does it vary with the kind of product (fresh, seed or processed)?

1.3 Objectives

1.3.1 Broad objective

The broad objective of this study is to determine the competitiveness of South Africa's potato exports and analyse the extent of market integration in the Southern African region following the deregulation of the potato market.

1.3.2 Specific objectives

Based on the broad objective, the specific objectives are to:

1. Evaluate the impact of deregulation on production of fresh, processed and seed potatoes.
2. Estimate the rate of growth in exports and imports between South Africa and other SADC countries over the past two decades.
3. Determine how competitive South Africa's potato exports are vis-à-vis other SADC countries.
4. Analyse the integration of potato prices between South Africa and its SADC trading partners.

1.4 Hypotheses

Based on the objectives of this study, the following hypotheses shall be tested:

1. Deregulation of the potato industry has resulted in higher production.

2. The growth in net trade for fresh products is higher than that for processed products.
3. South Africa's potato industry is the most competitive in the region.
4. Potato producer prices are not evenly transmitted across the SADC region.

1.5 Scope of the study

The South African potato industry consists of three sub-industries, namely: table/fresh potatoes, processed potatoes and seed potatoes. This study examines each of the three categories with respect to international trade. However, this study puts greater emphasis on fresh and processed potato trade due to data limitations for seed potatoes. Key aspects analysed are competitiveness and market integration as influenced by deregulation. Competitiveness of South Africa's potato industry is compared to that of selected SADC counterparts and the world's top producers and exporters of potatoes in order to ascertain the country's competitive position. A testing framework is applied to potato markets of selected SADC countries to determine the extent of price transmission and market integration. Data used is time-series, while the analyses utilize both descriptive and econometric tools.

1.6 Outline of the chapters

This dissertation is organised into seven chapters. Chapter 1 provides background information on the study. Chapter 2 discusses the structure and organisation of South Africa's potato industry prior to and after deregulation. Chapter 3 describes the international market in which South Africa's potato industry operates, with special attention being given to SADC member countries. Chapter 4 provides a comprehensive literature review on market reforms, competitiveness and market integration, as well as the methodologies that have been applied to such analysis in

previous studies. Chapter 5 analyses the international competitiveness of South Africa's potato industry while chapter 6 analyses market integration. The last chapter (Chapter 7) provides a summary, conclusions and recommendations based on the results and analyses.

CHAPTER 2

THE SOUTH AFRICAN POTATO INDUSTRY

2.1 Introduction

This chapter analyses the structure and economy of the South African potato industry. The major features of the three potato sub-industries are discussed: fresh, processed and seed potatoes. But first, it is important to understand how agricultural policy has evolved leading to deregulation of the agricultural sector in general and the potato sub-sector in particular, what the expectations were and how the market environment has changed.

2.2 Deregulation of South African agriculture

2.2.1 Historical perspective

In the 1970s, the South African economy was characterised by a number of negative features. The most important in terms of their impact on agriculture, were the rise in the inflation rate from the early 1970s (Moll, 1993) and increasing concentration in the agro-industrial complex, resulting from the policy of industrialisation through import substitution (Kassier Report, 1992). By the beginning of the 1980s, these influences, together with a range of farm-specific policies, had created an agricultural sector that needed to be reformed. During this period, there was tight control over the marketing of agricultural products under the consolidated Marketing Act of 1968.

Sandrey (2007) observes that in the period around 1980, South African farm policy changed emphatically though gradually. Kirsten and Vink (2003) demonstrate that the process started outside the sector itself with the following changes taking place:

- First, starting in the late 1970s, the financial sector was extensively liberalised. This affected the external value of the currency and interest cost of farm borrowing.
- Second, many of the existing controls over the movement of labour in South Africa were lifted by the mid 1980s leading to urban influx by locals and increased immigration from most parts of Southern Africa.
- Third was considerable microeconomic deregulation, also starting in late 1970s and early 1980s and leading to a significant increase in activity in the informal sector. Most visible was the informal marketing of farm products in urban areas.
- Around 1987, there was extensive reduction in agricultural subsidies notably the maize sub-sector. This reduction in subsidies led to a degree of decentralization within the marketing process, thus state policy succeeded in putting pressure on farmers to become more competitive.

The main effect of these steps was to decrease the scope for micro-management in most of the sub-sectors in agriculture (Kassier Report, 1992). During this period, deregulation was characterised by change within an existing institutional structure, as the main role players in the sector remained in place despite the general relaxation in state intervention (Sandrey & Vink, 2006).

Sandrey and Vink (2006) observe that following the 1994 elections this changed, although in agriculture some direct policy changes had to wait until 1996 after the withdrawal of the National Party from the Government of National Unity. The most important policy initiatives since then include land reform, institutional restructuring

in the public sector, promulgation of the Marketing of Agricultural Products Act of 1996, trade policy and labour market reforms. Their purpose was to correct the injustices of past policy and to enhance the international competitiveness of the sector.

The result was that state supports were stripped from the sector from 1994 to the end of the 1990s. This happened across various sub-sectors including the potato sub-sector. Trade policies were also deregulated as border tariffs were reduced and export subsidies eliminated. Other major reforms impacting upon agriculture during the late 1990s and early 2000s were the abolishment of the marketing boards, changes of labour policy and land reform initiatives (Kirsten & Vink, 2003).

The Marketing of Agricultural Products Act of 1996 substantially reduced state intervention in the market (Sandrey & Vink, 2006). By 1997, marketing boards ceased to exist and their assets were transferred to new industry Trusts whose role was to handle common-property aspects such as the administration of statutory levies. For the potato industry, assets valued at R 22 million were transferred in 1993 to Potatoes South Africa[4], the industry Trust (Government Gazette, 2004).

These comprehensive policy reforms have had various consequences on agriculture which can be broadly categorized as:

- Changes in production
- Change in factor productivity

[4] Potatoes South Africa is an industry-related organisation supporting the potato producers within regional context in South Africa to continuously perform optimally.

- Shift in trade patterns

This study is interested in the latter and competitiveness. From a general perspective, Sandrey and Vink (2006) report that major shifts can be identified from trade data: growth in agricultural exports, exports of processed agricultural products have increased faster than exports of unprocessed agricultural products and that agricultural imports have grown faster than agricultural exports. But, it remains to be seen whether this is true for the potato industry.

2.2.2 Deregulation of the Potato Industry

In 1951, there was an intervention in the potato industry. Potatoes were marketed under a surplus removal scheme which implied that the Potato Board did not directly control production and marketing (Kassier Report, 1992). Measures used by the Potato Board to counter periodic surpluses according to the Kassier Report (1992) included: a stabilization scheme, exports, banning of the marketing of certain classes, a redistribution scheme, storage scheme, price support and provision of timely information. The Potato Board could only take action against surpluses and resultant low prices after occurrence and the intervention had to be quick (Kassier Report, 1992). This resulted in limited intervention from the Potato Board with market forces determining product prices. The Kassier Report (1992) expressed satisfaction with the growth of the industry at the time and acknowledged the good work of the Board in facilitating the marketing process without unnecessary controls and intervention. However, the Committee recommended that most of the Board's functions could be performed without statutory controls. Thus, the surplus removal scheme was terminated in 1993. Assets were transferred to the industry Trust, Potatoes South Africa. However, this did not constitute full deregulation.

Potatoes SA services are funded by a levy (13 cents for table potatoes and 4.4 cents for seed potatoes) included in the price of each 10 kg pocket of potatoes sold (Black, 2008). Under the deregulated regime, government interference in the potato market is minimal, although the NFPMs are owned by municipalities and controlled by by-laws. This is as opposed to a self-regulating (private) regime where the government does not interfere in the market to any extent and the regulated regime where the government has more control of the market (Scrimgeour & Sheppard, 1998).

Deregulation meant that all rules and regulations which restricted the exercise of entrepreneurship were reviewed and scrapped. This freed producers from the red tape of government bureaucracy thus stimulating innovation and investment into the industry (DoA, 2003). Deregulation therefore means that:

- Domestic markets are free and there are no restrictions on potato production
- Imports of fresh, processed and seed potatoes are free to enter South Africa
- Potato growers have increased ability to develop export markets

In respect to the above, Potatoes South Africa plays a crucial role in developing and expanding the potato market, maintenance of free market principles as well as provision of strategic industry-related information. This is enabled through the various forums for Greenhouse, Exporters, Processing, Packaging, Laboratory Services and Seed potatoes as well as the committees for Seed potatoes, Emerging Farmer Development, National Potato Research and Marketing (Black, 2008).

In 2007, Potatoes South Africa requested the introduction and promulgation of the following statutory measures in the potatoes industry: “Section 15 of the MAP Act:

Levies relating to potatoes" (NAMC, 2007). The levy was meant to finance research, the gathering, processing, analysing and compiling of industry related information, including market statistics, and the dissemination thereof, as well as creating market access for emerging farmers (small and medium scale), including development projects related to the potato marketing chain and the development of foreign markets (NAMC, 2007).

Other institutions which play some role in the potato industry include the National Agricultural Marketing Council (NAMC) and the National Department of Agriculture (DoA). Market intervention by NAMC is minimal (MAP Act, 1996), hence statutory measures can only be implemented if such measures will directly and substantially advance one or more of the objectives of NAMC. In this way, NAMC strives to promote the existence of a more diverse and competitive agricultural sector. To enforce this, the 1996 Marketing of Agricultural Products Act was enacted with the aim to:

- increase market access for all market participants,
- promote efficient marketing of agricultural products,
- optimize export earnings of agricultural products

Although some progress has been made, the potato industry is yet to fully meet the above objectives. As part of its efforts, in March 2007 DoA established the web-based Agricultural Marketing Information System (AMIS). As much as this may seem a breakthrough in provision of market information, AMIS only provides information about the produce that trades on the market floor. Direct sales and informal trade both locally and to export markets are still unaccounted for, hence farmers continue to receive incomplete signals of the actual market conditions.

2.3 Structure of the potato industry

For purposes of this study, the potato industry is divided into three sub-industries: fresh/table, processed and seed potato sub-industries. In 2007, South Africa was the third largest potato grower in Africa after Egypt and Malawi, and the second biggest producer in sub-Saharan Africa (FAOSTAT, 2008). About 88% of the potatoes are produced for consumption (table or processed) and 12% for regeneration (seed). Potatoes SA (2005) estimates that there are 1700 independent potato producers (including approximately 400 seed growers) who produce the total South African crop of seed and table potatoes. The South African potato-processing industry has grown tremendously over the past few years.

2.3.1 Fresh/table potatoes

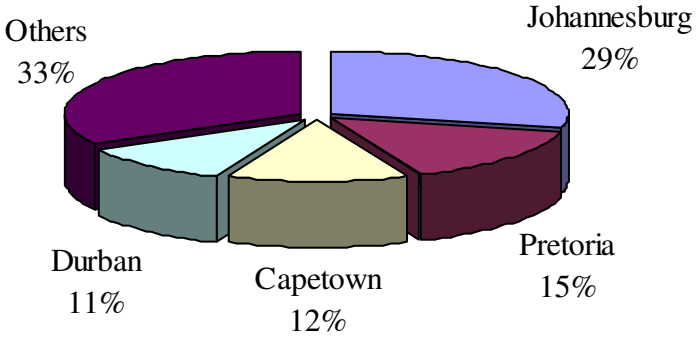
These are potatoes grown for human consumption. The production and distribution of fresh potatoes in South Africa is characterised by duality, where a sophisticated and developed economy exists alongside a developing economy (DoA, 2003). Fresh potatoes are produced by a small number of relatively large, established commercial farmers on the one hand, and a multitude of fragmented, small-scale farmers on the other. About 40% of the country's potato crop is grown in the high-lying areas of the Free State and Mpumalanga (Potatoes SA, 2005). Other important production areas include Limpopo, Eastern Cape, Western Cape, Northern Cape and Kwa-Zulu Natal. About two-thirds of the country's total potato crop is produced under irrigation (NAMC & Commark Trust, 2007).

Fresh potatoes are marketed to a formal sector consisting of a relatively small number of large traders and an informal sector consisting of a relatively large number of small

traders. The distribution is done through fresh produce markets[5], export channels and direct sales to wholesalers, retailers, hawkers, processors, institutional buyers and consumers (NAMC, 2002). Direct channels are an important and main channel used by small-scale producers. Informal trade also plays a significant role in South Africa, largely due to a history of township living. Shebeens, spaza shops and street hawkers generate large volumes of product sales on a national scale. However, direct channels can only do a fraction of the job. The bulk of fresh potatoes moves through more complicated semi-direct and indirect channels (NAMC, 2002).

There are 22 fresh produce markets around the country (Black, 2008). As can be seen in Figure 2.1, the Johannesburg market had the biggest potato turnover (29% market share) compared to the other fresh produce markets in 2005. The Pretoria, Cape Town and Durban markets followed with 15%, 12% and 11% of the potato market share respectively (Potatoes SA, 2007). The Johannesburg, Pretoria, Cape Town and Durban markets account for approximately 67% of the national potato market turnover.

Figure 2.1: Potato sales on the major fresh produce markets (2005)



[5] Fresh Produce Markets include National Fresh Produce Markets which are owned by local government and controlled by means of by-laws as well as privately owned markets not controlled in terms of by-laws.

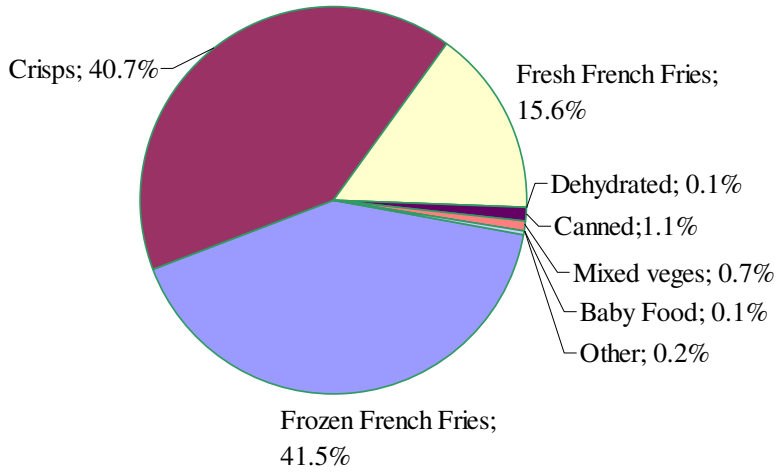
2.3.2 Processing Industry

Processing forms a significant part of the potato industry. The potato processing industry in South Africa has seen tremendous growth in the three main disciplines, namely frozen fries, fresh fries and crisps. This is an increase in production of processed potatoes at the expense of fresh potatoes. Between 1991 and 1995 for example, the growth was more than 100% (Potatoes SA, 2007). An estimated 20% of South Africa's total table potato production, equating to 30 628 091 pockets each weighing 10 kg, was processed during 2005 (Potatoes SA, 2005). Potatoes SA (2007) attributes the fast growth of the processing industry to changes in economic circumstances, expansion in the fast-food industry, a higher average income of the population, the rapid rate of urbanisation and the influx of international processing companies. Recent years have also seen an increase in imports of processed potato products to meet the high domestic demand. A higher proportion of fresh potatoes move directly from farms to processors while the rest go via FPMs to the processors.

2.3.2.1 Market share of various processed potato products

Figure 2.2 summarizes the different processed potato products and the percentage they comprise of total potato processing in South Africa. A large part of the discussion for the various processed products, a) to e) that follows, is based on Potatoes SA (2007). It is clear that the most important of these processed products are crisps, frozen fries and fresh fries, which jointly account for over 97% of all processed potato products.

Figure 2.2: Market share of different processed potato products (2005)



Source: Potatoes SA (2007)

a) French fries (Fresh)

Potatoes SA (2007) reports that the manufacturing of fresh French fries has decreased over the last couple of years. The decrease in production is the result of a decrease in the number of companies involved in the industry and the strong increase in frozen French fries production that has taken a large portion of the market. The main manufacturers of French fries (fresh) as listed by Potatoes SA (2007) are Dimpho Fresh Foods, Errol Veg, Mannic Chips, Rooipoort Fresh Products and Super Chip.

b) French fries (Frozen)

Frozen French fries represent 42% of the total processed potato products in South Africa (Potatoes SA, 2007). There has been an increase in the manufacturing of this product over the last couple of years. This growth is mainly due to today's fast paced life-style leading to an increase in fast food consumption and also the result of expansion in the existing facilities. The main manufacturers of frozen French fries are Lamberts Bay Canning Company, McCains and Mine Corp. Services (Potatoes SA, 2007).

c) Crisps

Processing of crisps has grown steadily over the past decade. The steady growth over the past five years in production is the result of an expansion in existing factories and an increase in the number of companies involved in the industry. Crisps represent 40% of the total processed potato products in South Africa. The main crisps manufactures in South Africa as listed by Potatoes SA (2007) are Dowmont Foods, Frimax, Kavalier Foods, L & C Messaris, Willards, Poco Foods and Simba Quix.

d) Canned potatoes

Only limited quantities of potatoes are canned in South Africa. The canned food is mainly in the form of mixed vegetables where potatoes can contribute up to 20% of the mixture (Potatoes SA, 2007). Skinned baby potatoes are also available on the market in cans. Canned potatoes represent only 1.1% of the total volume of potatoes for processing. The main canned food manufacturers are Langeberg Koop and Gants Foods (Potatoes SA, 2007).

e) Others

Other processed potato products include mixed vegetables, baby food and dehydrated potatoes, among others. Mixed vegetables represented 0.7% of the total processing industry in South Africa in 2005. Dehydrated potatoes and baby food comprise a very small proportion (less than 0.5%) of processed potato products. The main mixed vegetable manufactures in South Africa are Dimpho Fresh Food, Golden Harvest and McCains (Potatoes SA, 2007).

2.3.3 Seed potatoes

Seed potato production comprises approximately 12% to 14% of the total potato production in South Africa (Potatoes SA, 2007). The South African potato industry

has a sophisticated seed potato industry which plays a vital role in the growth of the table potato and processing industries. The potato is susceptible to several transmissible diseases hence successful potato production is to a large extent dependent on the quality of the planting material. Nucleus seed schemes supply the potato industry with healthy planting material. Planting material is multiplied according to certain requirements, a process controlled by certification. Potatoes SA (2007) points out that only laboratories registered with DoA and accredited by Potatoes SA are allowed to conduct laboratory tests on seed tubers with regard to certain bacterial diseases and viruses before certification is confirmed.

Certified seed potatoes are produced by approximately 200 registered seed potato growers under the supervision and administration of Potato Certification Service (Potatoes SA, 2007). Approximately 10 000 hectares are registered annually for seed production while the certified yield per hectare has increased constantly over the past few years (Potatoes SA, 2007).

Seed potatoes are usually certified in 25 kg Hessian[6] bags. Certification in other units is done in consultation with the Potato Certification Service which also provides seed growers with detailed information with regard to yields, occurrence of diseases and laboratory test results. The Seed Potato Traders Forum of South Africa attends to matters regarding the healthy trade of seed potatoes.

Importation of conventional seed potatoes is not allowed into South Africa due to the high risk of importing tuber-borne diseases (Potatoes SA, 2007). However, *in vitro* material and mini-tubers from approved institutions are imported to establish new varieties in the country.

[6]A strong coarse cloth, made of a mixture of hemp and jute, employed for the packing of bales.

2.4 Conclusion

This chapter has provided an overview of the potato industry in South Africa. It begun by looking at the historical perspective of deregulation and finally discusses the potato situation following deregulation. It is clear that there has tremendous growth in the industry and that Potatoes SA has played a key role in this growth. Production of fresh potatoes is characterized by duality (large commercial farmers and small-scale farmers), just as is the distribution consisting of both formal and informal channels. The main formal channel of distribution is through the Fresh Produce Markets (FPMs) while exports are facilitated by the Potato Exporters Forum. Crisps and Frozen French fries are the dominant processed products in the South African market. South Africa produces most of its potato seed locally thus contributing to the growth of the fresh and processed potato industries.

It seems apparent that deregulation of the potato market subsequently affected potato production and trade. However, the magnitude, structure, direction and recipients of these effects might not be obvious. It gets even more complex when one considers the various categories of potatoes i.e. table, processed and seed.

However, deregulation of the potato market coincided with other major occurrences. Most importantly for the agricultural sector was technological advancement. For example, a shift from dry-land to irrigated farming is reported to have resulted in an increase in potato production. However, one may argue that deregulation created a conducive environment for innovation and investment thus adoption of new technologies. Other factors such as population increase and the general rise in living standards are known to have contributed to the rise in demand thus triggering increase

in production. Globalisation and continued liberalisation of global markets also seem to have favoured the deregulation of the potato market since foreign markets opened up for international trade. The following chapter thus looks at the functionality of the international potato market and in particular the SADC regional market in the wake of a deregulated market in South Africa.

CHAPTER 3
THE INTERNATIONAL POTATO MARKET

3.1 Introduction

This chapter gives an overview of the international environment in which the South African potato industry operates. It begins by looking at the world potato market, major producers, exporters and competitors on the international market. The latter part of this chapter uncovers the SADC regional potato market, the closest market to South Africa and the significance of the SADC trade protocol to potato trade.

3.2 World potato market

Potatoes are an important food crop throughout the world and have been cultivated for a long time. Having originated in the Andean mountains of South America, they were first cultivated as a crop on that very continent for subsistence and religious purposes (CIP, 2008). The development of commercial production and international trade in potatoes however has been driven largely by the consumption habits of mainly urban dwellers in the developed and developing world (IYP, 2008).

The world potato sector is undergoing major changes. Until the early 1990s, most potatoes were grown and consumed in Europe, North America and countries of the former Soviet Union (IYP, 2008). Since then, there has been a dramatic increase in potato production and demand in Asia, Africa and Latin America, where output rose from less than 30 million tonnes in the early 1960s to almost 120 million tonnes by the mid-1990s (IYP, 2008). Approximately 19.5 million hectares of potatoes are being planted worldwide every year with a total production of 314.4 million tonnes reported in 2006 (FAOSTAT, 2008). Africa plants more than 6% of the world's potatoes.

China was the largest potato producer in 2005, and almost a third of the world's potatoes are harvested in China and India as seen in Table 3.1 below.

Table 3.1: Major potato producers in the world

Major Producers	1992/94(av.)	2003/05(av.)
Russian Federation	13%	11%
European Union (EU)	29%	20%
USA	7%	6%
India	6%	8%
China	15%	22%
Others*	30%	33%

Others* include Ukraine, Belarus, Canada, Iran, Turkey, Bangladesh, Peru, Brazil

Source: IYP, 2008

FAOSTAT (2008) shows that in 2005, for the first time, the developing world's potato production (162 million tonnes) exceeded that of the developed world (156 million tonnes). In the same year, the developing countries' share represented 52 percent of the global potato output (IYP, 2008). This is a remarkable achievement, considering that just 20 years ago the developing countries' share in global production was little more than 20 percent (IYP, 2008).

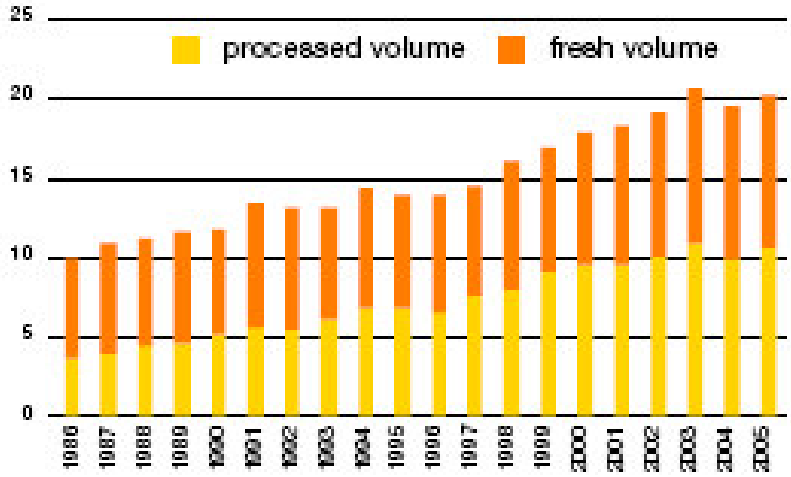
Potatoes arrived late in Africa, around the turn of the 20th century (Horton, 1987). In recent decades, production in Africa has been in continual expansion, rising from 2 million tonnes in 1960 to a record 16.5 million tonnes in 2006 (IYP, 2008). Potatoes are grown under a wide range of conditions, from irrigated commercial farms in Egypt and South Africa to intensively cultivated tropical highland zones of Eastern and Central Africa, where it is mainly a small farmer crop (CIP, 2008; IYP, 2008). In

2006, the top producers in Africa were Egypt, Algeria, South Africa, Malawi, Morocco, Rwanda, Nigeria and Kenya respectively (IYP, 2008).

Fresh potato consumption, once the mainstay of world potato utilization, is decreasing in many countries, especially in developed regions (IYP, 2008). Currently, more potatoes are processed to meet rising demand from the fast food, snack and convenience food industries (Scott, 2002; FAO, 2007; IYP, 2008). The major drivers behind this development include growing urban populations, rising incomes and the diversification of diets and lifestyles that leave less time for preparing the fresh product for consumption (IYP, 2008).

Figure 3.1 compares trade volumes between fresh and processed potatoes globally. Unlike during the 80's, imports and exports of processed potato products have increased and now dominate world potato trade.

Figure 3.1: Global potato trade volume in million tonnes (1986-2005)

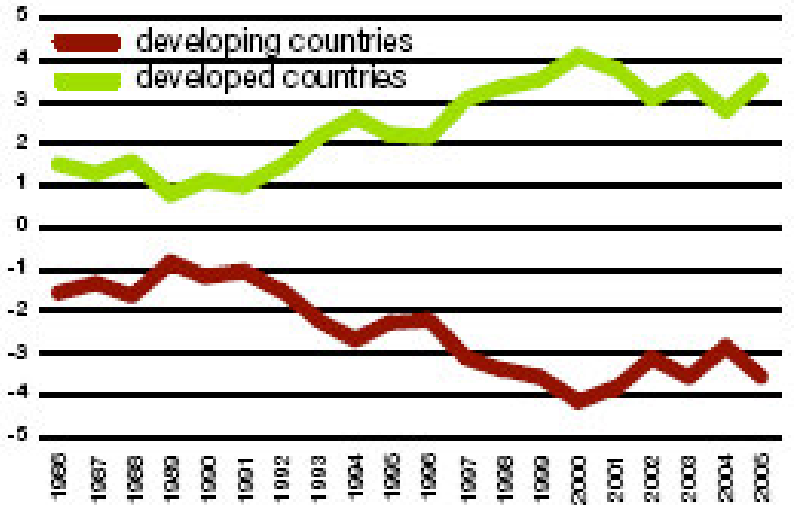


Source: IYP, 2008

Potatoes are commonly regarded as a bulky, perishable commodity with high transport costs and limited export potential, confined mostly to cross-border transactions. These constraints have not hampered the international potato trade,

which has doubled in volume and risen almost fourfold in value since the mid-1980s (IYP, 2008). This growth is due to unprecedented international demand for processed products, particularly frozen and dehydrated potato products. To date, IYP (2008) reports that developing countries have not been beneficiaries of this trade expansion. As a group, they have emerged as leading net importers of potatoes but not net exporters. Figure 3.2 shows that the net trade position of developing countries continues to deteriorate.

Figure 3.2: Potato net trade (exports-imports) in tuber equivalent, 1986-2005 million tonnes



Source: IYP, 2008

International trade in potatoes and potato products still remains thin relative to production, as only around 6 percent of output is traded (CIP, 2008; IYP, 2008). High transport costs, including the cost of refrigeration, are major obstacles to a wider international marketplace. A survey by Workman (2007) revealed that the Netherlands is the world leader in potato exports and imports, reflecting its strategic importance as a European Union distribution hub for vegetables. The top ten potato exporters by weight and top ten importers based on potato import expenditure in 2004 are listed in Table 3.2.

Table 3.2: Top ten potato exporters and importers

	Top 10 exporters		Top 10 importers	
	Country	Weight ('000 ton)	Country	Import value (million US $)
1	Netherlands	1700	Spain	236.9
2	France	1400	Netherlands	204.9
3	Germany	1300	Belgium	190
4	Belgium	972.8	Germany	189.4
5	Canada	428.1	United Kingdom	186
6	Israel	394.4	Italy	176.4
7	Spain	232.5	France	125.8
8	USA	220.7	USA	84.4
9	United Kingdom	217.4	Portugal	64.1
10	Italy	183.3	Greece	56

Source: Workman, 2007

3.2.1 Trade policies

IYP (2008) reports that in general, *ad valorem* tariffs, sanitary and phytosanitary measures, as well as technical barriers to trade are used to protect domestic potato markets. Import tariffs on potatoes and potato products are applied by most countries. The binding rates agreed under the aegis of the World Trade Organisation (WTO) vary considerably.

Table 3.3 provides a summary of WTO bound tariff rates for fresh and processed potato products. The trade-weighted average tariff weights each tariff by the share of total imports in that import category. The standard way of calculating this tariff rate is to divide total tariff revenue by the total value of imports.

Table 3.3: WTO bound potato tariff rates

	WTO Bound Tariff (%)	
Product	Trade Weighted Average	Maximum
Fresh potatoes (inc. seed)	29	378
Frozen potatoes	16	414
Potato flour*	38	446
Potato starch	109	550

* includes flour, meal, flakes, granules and pellets

Source: IYP, 2008

IYP notes that importing countries have the option under the WTO bound tariff levels of protecting their processing industries by levying higher duties on processed products than on raw material as evidenced in Table 3.3. Potato starch faces the highest tariff rates compared to the other potato products.

3.3 Regional trading blocs

An increasing number of countries are coming together to forge stronger trading links among themselves (FAO, 2003). The countries that benefit most are those with the capacity to respond to the new opportunities conditioned by the domestic reforms carried out prior to regional free trade areas (FTAs). COMESA (2001) predicted that the volume of trade among countries who are members of regional FTAs would increase significantly, but was less sure on whether this trade expansion would be extended to the rest of the world.

Under regional trade liberalisation programmes, the core policy changes involve: eliminating barriers to free trade e.g., import licences; eliminating tariff and non-tariff barriers; avoiding recourse to import bans and export prohibitions and eliminating

import levies and export taxes (FAO, 2003). Trading blocs thus tend to allow for free movement of factors of agricultural production, agricultural commodities and services. Increased regional integration in trade and investment leads to an expansion in the agricultural sectors of exporting countries and an overall improvement in the region's competitiveness (FAO, 2003).

Valdés and Leresche (1993) point out that specific policies are needed to promote trade among a group of countries if the potential for trade exists. Koester (1993) asserts that even if individual countries have a strong interest in reforming their policies, internal trade policy reform is made more effective if carried out simultaneously by neighbouring countries. In this respect, deregulation is seen to have been well timed just after South Africa had been admitted into SADC. Furthermore, Finger (1975) suggests that potential for trade exists if price ratios in the pre-trade situation differ, if the set of products on the market differs, or economies of scale in production exist. In short, the scope of trade expansion often depends on the dissimilarities of the countries in the pre-trade situation. These dissimilarities were clear prior to and even after deregulation but it's yet to be seen how far trade expansion has occurred in the potato industry.

3.4 SADC

The Southern African Development Coordination Conference (SADCC), which evolved into the Southern African Development Community (SADC), has been in existence since 1980. At inception, it aimed to coordinate regional development projects in order to lessen economic dependence on the then apartheid South Africa. The transformation of the organisation from a Coordination Conference into a

Development Community took place in 1992 (SADC, 2008). The current fourteen member states are Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe (SADC, 2008). SADC headquarters are in Gaborone, Botswana. South Africa was admitted into the community in 1994. Since then, border measures have been significantly relaxed (OECD, 2006) and the agricultural sector has intensified regional trade.

The Member States are at different stages of development, but predominantly underdeveloped. Social and economic growth and development across the region is heterogeneous, with some countries attaining high growth rates and others achieving very low growth rate (SADC, 2008). See *appendix 1*. Seven SADC countries are classified as least-developed countries: Angola, DRC, Lesotho, Malawi, Mozambique, Tanzania and Zambia. South Africa has the most prominent economy in the region, accounting for about 71% of the total Gross Domestic Product (GDP) of SADC (ESRF, 2003). South Africa therefore plays an important role in the region with its geographical location and size of its economy, particularly for trade and transport. Despite a relatively small market size, SADC region can still reap significant static and dynamic gains from regional integration, provided supply side constraints are adequately addressed (SADC, 2008).

In 2005, the combined GDP for SADC was approximately US $ 330.1 billion. South Africa, the region's most developed economy, had GDP of US $ 239.4 billion (SADC, 2008). In 2005, GDP growth rates in SADC ranged from -10.3 percent (Zimbabwe) to

15.9 percent (Angola), while the weighted average GDP growth rate was 5.7 percent in the region (SADC, 2008).

The structure of production of SADC countries is characteristic of a developing region where large shares of GDP originate in primary sectors of production *viz*: agriculture and mining, whose total contribution is on average over 50% of total GDP. The agricultural sector in South Africa contributes 3.2% to the GDP, whereas it contributes 34% in the case of Malawi, 22% in Mozambique and 44.8% in Tanzania (Louw *et al*, 2004). The agricultural sector in South Africa can provide sufficient food for its population, unlike the other SADC countries. The shortfalls are met through trade within and outside the region. The agricultural sector largely contributes to the total exports in all these countries.

The SADC Trade Protocol, which came into force in 2000, is a keystone of the SADC programme for regional trade, market integration and industrial development (SADC, 2007). The SADC Trade Protocol strives to promote intra-SADC trade, among others by means of intra-SADC tariff liberalisation. When Member States started to implement the protocol in September 2000, almost 47% of all goods traded in SADC were traded at zero tariffs (SADC, 2007).

DPRU (2001) and SADC (2004) demonstrate that there has been significant increase in intra-regional trade in SADC. In 1997, the level of intra-regional trade was estimated at about 22% of total trade and increased to about 25% by 2003 (SADC, 2004). SADC (2007) reports that major strides have been made in facilitating trade in the region particularly in tackling issues of:

- Harmonisation of customs documentation, rules and procedures;

- Simplifying transit procedures and regulations;
- Removal of core non-tariff barriers such as export and import licenses;
- Harmonisation of standards, quality, accreditation and metrology

There is outstanding progress on the harmonization of sanitary and phytosanitary measures, which are critical for trade in agricultural products. This is especially crucial for seed and processed potatoes as they are subject to phytosanitary requirements and quality standards. A Perishable Products Export Control Board (PPECB) certificate is needed for potato exports from South Africa.

3.5 Potato production in SADC countries

3.5.1 Table Potato Production

Most SADC countries grow potatoes. However, there is considerable variation in the quantities produced, area planted/harvested and the yields. Table 3.4 illustrates potato production by the SADC countries based on FAOSTAT (2008).

Table 3.4: Potato production by SADC countries in 2006

Countries	Quantity (ton)	Area harvested (ha)	Yield (ton/ha)
Angola	307,296	123,958	2.5
DRC	93,140	20,013	4.7
Lesotho	98,773	5,887	16.8
Malawi	1,800,000	150,000	12.0
Mauritius	11,310	475	23.8
Mozambique	82,095	6,217	13.2
South Africa	1,862,856	53,000	35.1
Swaziland	5,984	2,970	2.0
Tanzania	250,661	37,091	6.8
Zambia	14,035	973	14.4
Zimbabwe	34,329	2,168	15.8

Source: FAOSTAT, 2008

3.5.1.1 South Africa's production

Table 3.4 shows that in 2006, South Africa produced more potatoes than any other country within SADC. Potato output in South Africa has grown strongly over the past two decades, from 1.2 million tonnes in 1990 to a record 1.9 million tonnes in 2006 (FAOSTAT, 2008) representing a 58% increase. In the same period, the potato farming area actually declined, from 63 000 ha to 53 000 ha (FAOSTAT, 2008).

The correlation matrix in Table 3.5 shows that there is a negative relationship between area planted and volumes harvested in the case of South Africa. The reason for this is that yields have improved over time, resulting in higher levels of production despite a declining trend in the area under production. Interesting to note is that for the rest of the SADC countries, this is not the case with area planted and production being positively correlated.

Table 3.5: Correlation matrix

	Volume	Area	Yield
Volume	1.00	-0.36	0.96
Area harvested	-0.36	1.00	-0.60
Yield	0.96	-0.60	1.00

Potatoes in South Africa are increasingly produced under irrigation (NAMC & Commark Trust, 2007) with yields averaging around 35 tonnes per hectare in 2006 (FAOSTAT, 2008). This is a significant increase compared to the yield average of 20 ton/ha in 1993 (FAOSTAT, 2008).

3.5.1.2 Production by the rest of SADC

Malawi

Table 3.4 shows that Malawi was the second highest potato producer (after South Africa) in the region in 2006. However, in 2007, Malawi became the regions highest producer and Sub-Saharan Africa's second biggest potato producer, with a harvest of 2.2 million tonnes (IYP, 2008). This volume was planted on an area of about 150,000 ha compared to South Africa's 50,000 ha, thus South Africa's yield per hectare was almost three times that of Malawi. This emphasizes technology as a major constraint to production in Malawi.

Mauritius

Potato is a controlled product in Mauritius, under the Agricultural Marketing Board (AMB). Production averages 15,000 tonnes per annum on an area of about 500 ha (FAOSTAT, 2008)

Zimbabwe

At present, just over 2100 ha of potatoes are planted annually producing on average 34,000 tonnes (FAOSTAT, 2008).

Angola

Most of Angola's farmers are still producing at a subsistence level of agriculture (USAID, 2008). Although Angola has the second highest area cultivated by potatoes within SADC, the country has one of the lowest potato yield levels in the region averaging only 2.5 ton/ha in 2006 (FAOSTAT, 2008).

Tanzania

As evidenced by Table 3.4, Tanzania produces on average 250 000 tonnes of potatoes per annum, cultivated on an area of about 37 000 ha. The yields are still low at 6.8 ton/ha in 2006.

Zambia

Potato production in Zambia is still very low with an area of only 973 ha cultivated in 2006 producing about 14 000 ton. However, the country is the fifth best producer in the region in terms of yield (14.4 ton/ha) in 2006.

Lesotho

Given the small size of the country, Lesotho can be viewed as a good performer in potato production within the region, with close to 5 900 ha under the crop in 2006. The resultant volume was 98 773 ton while the average yield in the same year was 16.8 ton/ha (FAOSTAT, 2008).

Swaziland

Swaziland produces the least amount of potatoes compared to the other SADC countries in Table 3.4. The yield is equally very low, averaging only 2.0 ton/ha in 2006 (FAOSTAT, 2008).

DRC

DRC is the largest country within SADC with a land area double the size of South Africa as illustrated in Appendix 1, Table A1.1. However, on average only 20 000 ha are cultivated under potatoes compared to South Africa's 53 000 ha. Table 3.4 also shows a low yield of 4.7 ton/ha was attained in 2006 (FAOSTAT, 2008).

Mozambique

Table 3.4 shows that Mozambique produces about 82 000 ton of potato per annum, cultivated on an area of 6200 ha with an average yield of 13 ton/ha (FAOSTAT, 2008)

3.5.2 Processed potato production in SADC

As already seen in the previous chapter, South Africa boasts of a vibrant potato processing industry thanks largely to the country's high urban population (IYP, 2008). The processing sub-industry utilizes some 250 000 tonnes of potatoes per year, mainly for frozen French fries and crisps (IYP, 2008). The potato processing industries in other SADC countries are still developing.

3.5.3 Seed potato production in SADC

Seed potatoes are usually the most expensive input to potato cultivation, accounting for 30 to 50 percent of production costs (IYP, 2008). In most SADC countries with the exception of South Africa, no formal seed supply system exists. Farmers have therefore devised their own *ad hoc* method for selecting seed tubers: they sell the largest potatoes for cash, eat the medium-sized ones at home, and keep the smallest as future planting material (IYP, 2008). Unlike most other SADC countries, South Africa has a formal seed supply system. Table 3.6 shows the land area utilized for seed potato production and the respective yield for South Africa between 1999 and 2007.

Table 3.6: South Africa's seed potato production (1999–2007)

Season	Registered plantings (Ha)	Certified yield (25 kg bags)
1999/2000	9637.89	5162691
2000/2001	9505.16	4977970
2001/2002	8398.81	4230954
2002/2003	9059.6	4062661
2003/2004	9421.97	5257398
2004/2005	9447.61	5364990
2005/2006	10177.85	5304457
2006/2007	10310.95	5390292

Source: Potatoes SA, 2007

The area under registered seed potato plantings has increased from 9600 ha planted in the 1999/2000 season to over 10300 ha in the 2006/2007 season. However, the yield has only improved marginally over the same period. The average yield for certified seed potato in South Africa is 13 000 kg per ha (Potatoes SA, 2007).

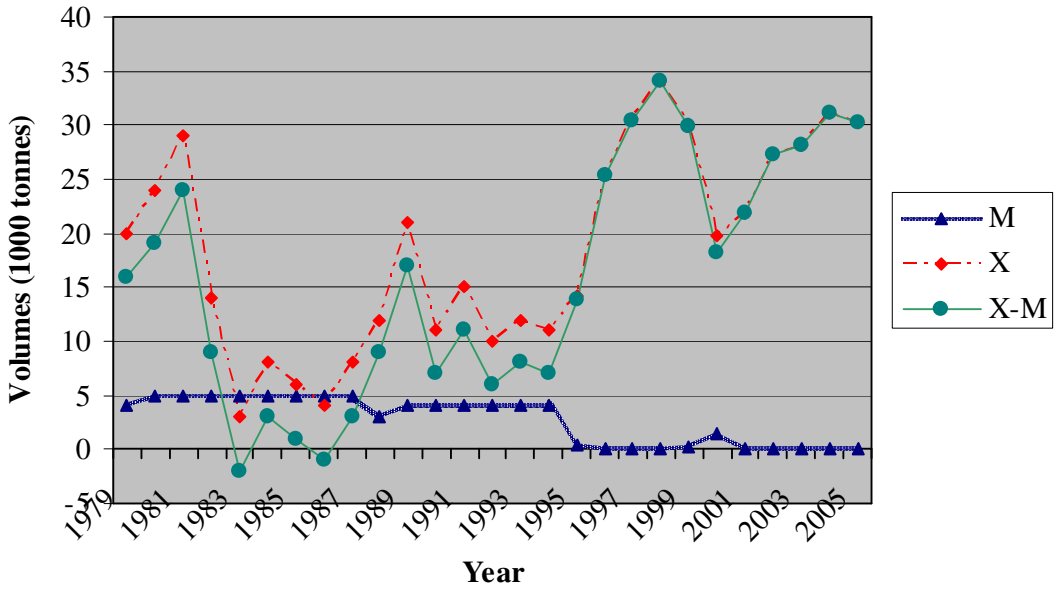
3.6 SADC regional potato trade

Generally, there have been some improvements in terms of growth rates of intra-SADC agricultural trade; though it's not known to what extent trade in potatoes has contributed to this growth. Internationally, South Africa exports by far more potatoes than it imports as demonstrated in Figure 3.3.

Exporters therefore deliver a specialized service to the South African potato industry. The South Africa Potato Exporters Forum was established by Potatoes South Africa in conjunction with exporters to facilitate *inter alia* discussions between exporters, service providers and producers (Potatoes SA, 2005). As mentioned previously, South Africa produces most of the potatoes in the region. An estimated 11.07 million 10 kg pockets of table potatoes, representing 7% of total production, were exported during 2005 (Potatoes SA, 2005). Although these exports end up in various countries around

the world, the SADC market remains the biggest and most important given that potatoes (fresh) are bulky and highly perishable.

Figure 3.3: South Africa's net trade in potatoes (1980-2005)



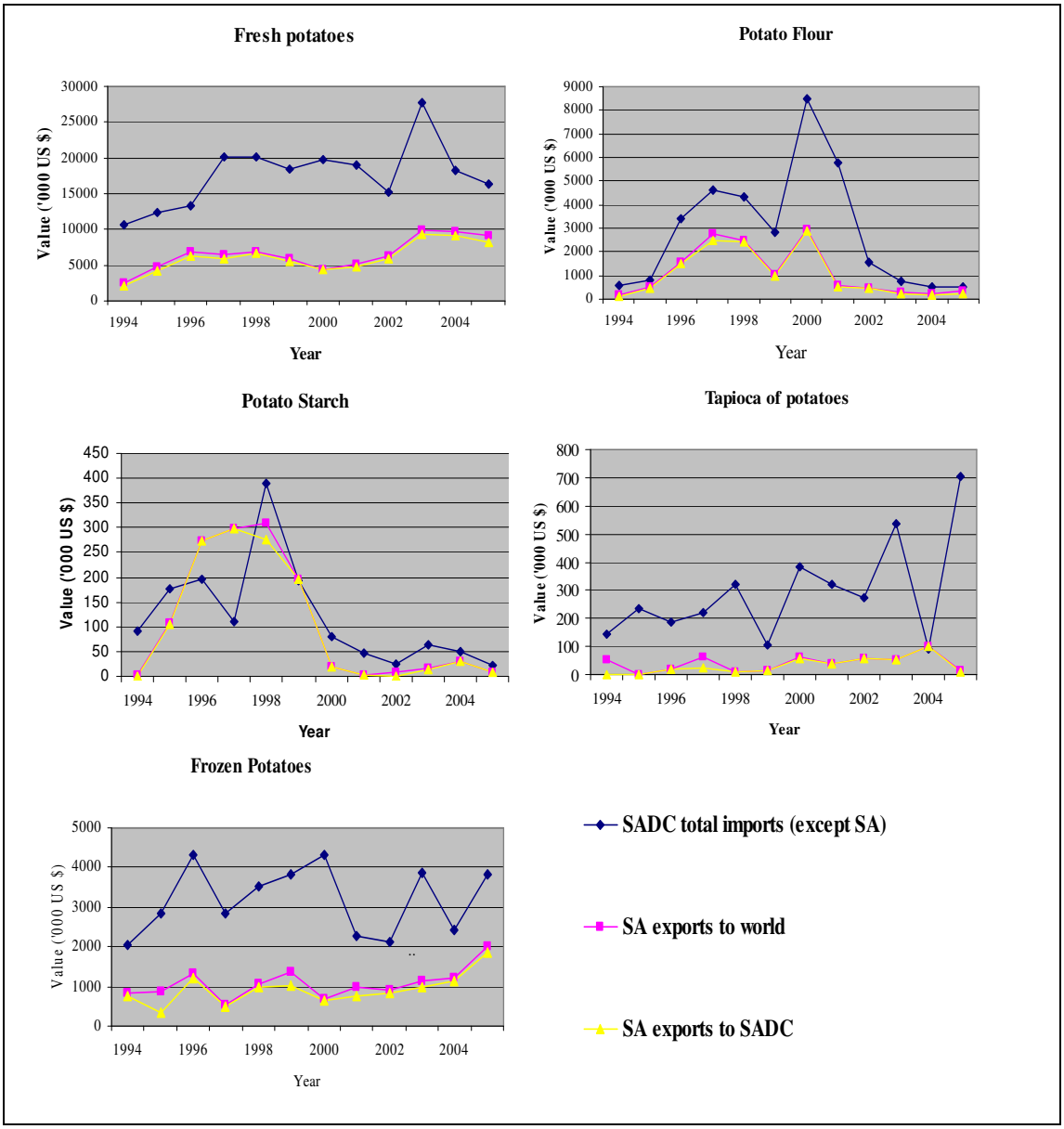
Source: BFAP database, 2007

South Africa's potato exports go to SADC countries such as Angola, Mauritius, Mozambique, Zambia and Botswana (Potatoes SA, 2007). Most of the produce is utilised for food and for processing into products such as crisps, mixed vegetables, fresh and frozen French fries. Countries such as Botswana and Namibia do not commercially produce potatoes. Most of the potatoes consumed in these countries are imported from South Africa and other neighbouring countries such as Zimbabwe. As reported by Louw *et al* (2004), most SADC countries are not self-sufficient in potato production; they rely on imports.

Informal cross-border potato trade also represents a fraction of South Africa's exports. However, since these transactions are not documented, actual prices and volumes traded are difficult to determine. The informal trade, in which women are the main

actors, is viewed as having the potential to transform the lives of many people in the region, if the necessary facilitation mechanisms are put in place. The SADC secretariat is carrying out an assessment of the extent of this trade in the region. Figure 3.4 below shows the breakdown of formal exports between South Africa and SADC countries.

Figure 3.4: South Africa's potato trade with SADC compared to trade with the rest of the world



Source: FAOSTAT, 2008

The graphs in Figure 3.4 show that although the import demand for potatoes in SADC countries follows a similar trend as South Africa's potato exports into the region, there remains a gap. This implies that SADC countries also import potato products from countries other than South Africa. The graphs also show that there is hardly any gap between South Africa's exports to the world and South Africa's exports to SADC. This implies that most of South Africa's potato exports go to SADC countries. There has been an increase over time in exports of fresh and frozen potatoes while exports of potato flour and starch declined between 2000 and 2005.

3.7 Conclusion

Many developing countries have recently become much more integrated into international potato trade. This phenomenon is partly the result of the worldwide trend toward lower tariffs and non-tariff barriers and the emergence of regional trading blocs. Unfortunately, the volume and value of such trade is not always readily apparent because published trade figures frequently do not include data on processed potato products (e.g., frozen French fries, chips, starch). Such data is critical in trade analysis and especially in determining sub-sector competitiveness as the world increasingly becomes more competitive.

Generally, there have been some improvements in terms of production and growth rates of intra-SADC trade. Yet, yields in many of thee countries remain very low. In the case of seed potato, the cost of seed acts as a barrier to the development trade within the SADC region. Although some countries have shown stagnation in trade flows and others declined, overall growth in intra-SADC potato trade is evident.

CHAPTER 4
MARKET REFORMS, COMPETITIVENESS AND MARKET INTEGRATION: LITERATURE AND THEORETICAL FRAMEWORK

4.1 Introduction

First, the general effects of agricultural market reforms are explored. This is followed by a detailed discussion of competitiveness and market integration. Deregulation is expected to impact on export competitiveness. Its effect on market integration is discussed via its effect on price transmission. In order to address the major objective of determining how competitive South Africa's potato exports are, it is important to first understand the meaning and measurement of competitiveness. Competitiveness is therefore defined and some studies that have involved competitiveness within the agricultural sector highlighted.

Issues of competitiveness and comparative advantage are vital for producers, business managers, exporters and policy makers. In order to survive and continue to penetrate the global potato market, the South African potato industry needs to compete aggressively and in an economically sustainable manner. In a deregulated environment, as firms fight for profits, the competitive paradigm makes clear dynamic predictions: strong performers pass the market test and survive, while weak performers shrink, exit, or sell out. This transfer of market share from under-performers to more successful firms is a critical part of the competitive process. However, in a regulated market, inefficient firms can be protected. It is thus interesting to see whether the potato industry has managed to remain competitive in a deregulated market environment or not.

On the other hand, for a better understanding of the influence of deregulation on the relative prices faced by producers, it is necessary to investigate the extent of price transmission and market integration. Market integration is the process by which price interdependence occurs between different markets. The presence or absence of market integration has important implications to producers, processors and exporters.

4.2 The need for agricultural market reforms

In assessing lessons learnt from the deregulation of agricultural marketing in South Africa, Vink and Kirsten (2000) conclude that the process of deregulation resulted in a net welfare gain to the commercial agricultural sector, and thus also to the South African economy. McCorriston and MacLaren (2006) show that deregulation which directly changes the market structure characteristics can be an important aspect of trade reform and lead to significant distributional effects. Borrowing from agricultural market reform experience of Eastern and Southern Africa, Bayley (2000) summarizes that:

- Reform gives rise to opportunities for the expansion of small-scale and medium-scale agricultural processing and trading activities
- Reform may increase the level of price instability for both producers and consumers
- For domestic agricultural market reforms to have full impact, they need to be complemented by the liberalisation of agricultural trade and foreign exchange markets.

Bayley (2000) further notes that deregulation exposes an industry to increased competitive pressures from imports. Deregulating South Africa's potato industry was therefore expected to lead to a more efficient and competitive marketing system. Ward (2007) suggests that deregulation can enhance efficiency in one of two ways:

- Inefficient operations that developed because of regulations and because firms were insulated from actual and potential competition would be curtailed.
- Rents that accrued to well-organized groups benefiting from regulation (generally producers and labour) would be dissipated by unregulated competition.

Recent FAO reviews have classified methodological approaches for analysing the effect of market and trade reforms according to whether they are (a) descriptive and/or qualitative; (b) data based and/or survey related; or (c) general equilibrium modelling-based approaches. McCulloch and Winter (in FAO, 2003) provide a summary of methodological approaches used both within and across sectors. Although this classification is useful, disentangling the impacts of policy reforms is complex. For example, from the African experience, announced policy reforms are not always fully implemented.

This study mainly utilises a quantitative approach to analyse the objectives of the study. However, this does not negate the importance of qualitative investigation. As Sahn *et al* (1997) argue, whilst quantitative analysis can more fully address the counterfactual question of what would have occurred in the absence of reforms, they require substantial data and ultimately depend on how well actual economic behaviour is captured by model equations. It is in informing the latter that more descriptive approaches are often required.

Apparently, literature on agricultural market reform in Africa remains divided. Some studies on the effects of reform may conclude in favour of reform while others may be against (FAO, 2003). This varies from industry to industry and how well the reforms have been implemented. It might appear too early to conclude whether deregulation of the potato industry in South Africa was good or bad before looking at how various components within the industry have been affected. The following section discusses the literature on competitiveness and market integration and how various methods have been applied in the past to analyse the impact of market reform on these key components of the potato marketing system.

4.3 Competitiveness

4.3.1 Definition

Competitiveness is the ability of a sector, industry or firm to compete successfully in order to achieve sustainable growth within the global environment while earning at least the opportunity cost of returns on resources employed (Esterhuizen, 2006). Competitiveness is thus an indicator of the ability to supply goods and services in the location and form and at the time they are sought by buyers, at prices that are as good as or better than those of other potential suppliers, while earning at least the opportunity cost of returns on resources employed (Freebairn, 1986).

Two types of competition are included in the above definition. First is the competition on domestic and international product markets and thus the ability to gain and maintain market shares. Second is the competition in factor markets, where those factors employed in producing the goods have to earn at least their opportunity cost. Although pointing to different aspects, both types are indicative of the fact that

competitiveness is a relative measure. One has to make the comparison with a base value. In the case of a market share, it is with regard to market size. It is with this in mind that the international competitiveness of South Africa's potato industry is analysed.

Within the context of international trade, competitiveness can simply be defined as the ability of an industry (or firm or country) to trade and exchange products on a sustainable basis in the global market (Van Rooyen *et al*, 2001). Therefore, imports and exports have to be included in the determination of competitiveness. In view of all the structural and policy changes due to deregulation, competitiveness is viewed as the most important component for the success and survival of the potato industry.

Analyses of competitiveness may differ with respect to the level of investigation. Studies can be carried out for various levels of product aggregation, across the entire economy, a specific sector, or for a single product (or aggregate of products). The competitiveness of a product can be assessed at market (sector) level or for a specific farm. Another differentiation of competitiveness exists with regard to the spatial dimension of the analysis. Since it is a relative measure, the competitiveness of enterprises or regions within a country, or between countries, may be compared. The indicator used does not always reveal the spatial extension and the level of product aggregation of a given analysis (Frohberg & Hartmann, 1997). A large number of analyses of competitiveness evaluate the performance of an industry (or a sector) either by using an aggregate of all the outputs of this industry, or by looking at its most important commodities.

Competitiveness is closely linked to comparative advantage. The only difference between the two is that competitiveness includes market distortions, whereas comparative advantage does not (Frohberg & Hartmann, 1997). Both are based on the concept of general equilibrium. Therefore, indicators used to measure competitiveness have to make use of general equilibrium approaches, since only these take account of all the interdependencies in an economy. Although such analyses are desirable, they are not too frequently pursued because of the complexity involved. Studies that investigate only one part of the economy, e.g. an industry or an enterprise, and that approximate or neglect these interdependencies, are more common.

4.3.2 Indicators of competitive advantage

As mentioned above, the concept of competitiveness can be applied at different levels of product aggregation and spatial extension. In addition, past performance (ex-post) or the potential of competitiveness (ex-ante) can be used to assess the impact of new policies. Accounting methods such as production costs and gross margins (profitability), and domestic resource costs can be used to measure the potential of competitiveness. However, mathematical or simulation models are capable of providing the most comprehensive insight. Evaluation of the potential of competitiveness demands considerable man-power and data. For this reason, this study only focuses on analysis of past performance of competitiveness.

Several approaches can be used to analyze the past performance of competitiveness. Most frequently employed are market share indicators, the real exchange rate and Foreign Direct Investment (FDI). They differ widely in their methodologies and data requirements. The choice of the index to be used is often dictated by data availability. Market share indicators also demonstrate to the stakeholders in a given industry how

well they are reaching their customers in each neighbourhood across the sales region. This can therefore serve as the basis of marketing and business strategy. For these reasons, this study utilizes the market share indicators.

4.3.3 Trade and Market Share Indicators

An export product is considered competitive in world trade if its market share is on the increase (Green & Krieger, 2003). A host of different indicators have been developed to measure competitiveness based on market and trade information. Although designed for international comparison, they may also be used to contrast the competitiveness of different regions. These measures are usually calculated for single products or an aggregate of products. Most of these indicators are based on trade rather than on domestic market information. Although this is not without problems, one advantage of using trade data is that demand and supply responses are considered simultaneously (Van Royen *et al*, 2001). An additional advantage of using trade data is that the costs of marketing and transport to and from the port of entry are also taken into account.

Frohberg and Hartmann (1997) emphasize that competitiveness is a relative measure, hence indicators of competitiveness that compare one sector or industry in the economy relative to others are vital in providing information on the competitive position of a product, sector or subsection in an economy. On the contrary, indicators based on absolute production and market shares give little information on competitiveness. The more sophisticated and comprehensive measures of international competitiveness take account of this aspect. Such measures include the following:

- Relative Export Advantage Index (RXA),

- Relative Import Penetration Index (RMP) and
- Relative Trade Advantage Index (RTA).

These first two indices were originally developed by Balassa (1977, 1989) in what was referred to as the Relative Comparative Advantage (RCA) model. The RCA was later extended by Volrath (1991) to the Real Trade Advantage (RTA). Balassa's Relative Comparative Advantage method was used by Valentine & Krasnik (2000) to determine the competitive advantage of manufactures in the SADC region. Van Rooyen *et al* (2001) also analysed the comparative advantage of selected food chains in South Africa based on the Relative Trade Advantage (RTA) Index. From the point of view of trade theory and globalisation trends, the RTA has become important due to the growth in intra-industry trade. Empirical measurement of competitiveness using the RTA is discussed in the next chapter.

In preview, the RTA indicator implicitly weights the revealed competitive advantage by calculating the importance of relative export and relative import competitive advantages. Values below zero point to a competitive trade disadvantage while values above zero point to a competitive trade advantage. Nonetheless, this method also has its shortcomings. As noted by Balassa (1989), the problem with this type of analysis is that it says nothing about how a country acquired its market share. Market share may well be maintained by costly export subsidies. The sustainability of a competitive position, according to the RTA index, is therefore in question.

4.4 Market integration and price transmission

A fundamental issue when analysing policy reform in global agricultural markets is the extent to which domestic agricultural commodity markets in developing countries respond to changes in international prices. Price transmission from the world to domestic markets is central in understanding the extent of the integration of economic agents into the market process.

For a better understanding of the influence of deregulation on the relative prices faced by producers, it is necessary to investigate the extent of price transmission and market integration. Market integration is the process by which price interdependence occurs. Meyer (2006) asserts that markets are integrated when trade occurs between two markets and the difference in the prices equals the transaction costs to move the goods between these markets in the long run. Trade is discontinued if the difference in the market prices becomes less than the transaction costs thus the markets are no longer integrated. In this case, equilibrium market prices are determined by the forces of demand and supply in each market separately.

In analysing the impact of reforms, it is important to establish the extent to which changes in international prices are transmitted to domestic prices. If the purpose of reform is to increase the openness of the economy, then one may expect the transmission of changes in international price levels to be more fully reflected in changes to domestic prices. If changes in price series can be related to episodes of reform, it may be possible to assess the extent to which margins, and in some cases, the strength of price transmission, have changed. Judgements could then be made about the impact of reforms on producer prices and margins. To facilitate this, a

timeline of reforms impacting (directly and indirectly) on the commodity could be related to trends in the price series. A decomposition of price by source may also help to identify the extent to which reforms are contributing to price changes (FAO, 2003). Comparisons of the characteristics of price series across the different potato products should also be made to inform discussion of how reforms have impacted on relative prices.

Studies on the transmission of price signals are founded on concepts related to competitive pricing behaviour. In spatial terms, the classical paradigm of the Law of One Price, as well as the predictions on market integration provided by the standard spatial price determination models advanced by Takayama and Judge, (1972) postulate that price transmission is complete with equilibrium prices of a commodity sold on competitive foreign and domestic markets differing only by transfer costs, when converted to a common currency. These models predict that changes in supply and demand conditions in one market affect trade and therefore prices in other markets as equilibrium is restored through spatial arbitrage.

The absence of market integration or of complete pass-through of price changes from one market to another has important implications for economic welfare. Incomplete price transmission arising either due to trade and other policies, or due to transaction costs such as poor transport and communication infrastructure, results in a reduction in the price information available to economic agents and consequently may lead to decisions that contribute to inefficient outcomes (Rapsomanikis *et al,* 2003).

Price transmission studies are ostensibly an empirical exercise testing the predictions of economic theory and providing important insights as to how changes in one market

are transmitted to another, thus reflecting the extent of market integration, as well as the extent to which markets function efficiently. In addition to the body of research and application that tests economic theory, price transmission mechanisms feature prominently in all global agricultural partial equilibrium models, such as the World Food Model of the United Nations Food and Agriculture Organisation and other models such as that developed by Tyers and Anderson (1992). In these models the price transmission parameter values consist of key building blocks and play an important role in determining the direction, magnitude and distribution of welfare effects of trade policy scenarios.

Several studies have been done on price transmission, using analytical techniques to evaluate policy reform, such as *ex post* assessment of market integration in the context of the implementation of the structural adjustment programmes (Goletti & Babu, 1994). The large body of research on market integration and price transmission, both spatially and vertically, has applied different quantitative techniques and has highlighted several factors that impede the pass-through of price signals. Distortions introduced by governments in the form of policies either at the border, or as price support mechanisms weaken the link between international and domestic markets. Agricultural policy instruments such as import tariffs, tariff rate quotas, and export subsidies or taxes, intervention mechanisms, as well as exchange rate policies insulate the domestic markets and hinder the full transmission of international price signals by affecting the excess demand or supply schedules of domestic commodity markets (Mundlak & Larson, 1992; Rapsomanikis *et al*, 2003).

In theory, spatial price determination models suggest that, if two markets are linked by trade in a free market regime, excess demand or supply shocks in one market have

an equal impact on price in both markets. The implementation of import tariffs (ad valorem), in general, allow international price changes to be fully transmitted to domestic markets in relative terms. Thus a proportional increase in the international price result in an equal proportional increase in the domestic price at all points in time, provided that tariff levels remain unchanged (Rapsomanikis *et al*, 2003)..

Apart from policies, domestic markets can also be partly insulated by large marketing margins that arise due to high transfer costs. Especially in developing countries, poor infrastructure, transport and communication services give rise to large marketing margins due to high costs of delivering the locally produced commodity to the border for export or the imported commodity to the domestic market for consumption. High transfer costs and marketing margins hinder the transmission of price signals, as they may prohibit arbitrage (Badiane & Shively, 1998). As a consequence, changes in world market prices are not fully transmitted to domestic prices, resulting in economic agents adjusting (if at all) partly to shifts in world supply and demand.

A number of studies have examined price transmission between potato markets. Unfortunately, no such studies exist for Southern Africa. Jalonoja and Pietola (2004) examined spatial integration between Finnish and Dutch potato markets. The results suggested that the prices are cointegrated and the arbitrage system is functioning, but with a significant time lag between the Finnish and Dutch potato markets. Basu and Dinda (2003) utilized the error correction method and Engle-Granger tests to explore market integration for potatoes in Hooghly District, state of West Bengal, India. The study concludes that potato markets are competitive and efficient at the wholesale level. The potato markets are shown to be integrated mainly due to close proximity,

good communication facilities and good infrastructure availability among the market centres in the study district.

In another study Zachariasse and Bunte (2003) examined price transmission for potato products in the Netherlands and found that although transmission existed, it was asymmetric. They found that retailers followed negative price shocks at the farm level, but not positive price shocks. Maltsoglou and Tanyeri-Abur (2005) analysed the impacts of transaction costs on the degree of market integration using survey data collected from smallholder potato farmers located in the Peruvian Andes. The results show that, in addition to transport costs and market prices, information, negotiation and monitoring costs affect market integration. The study sheds light on possible policy options to support developing country smallholders in improving their access to national and global markets.

Most of the studies utilize time series econometric techniques that test for the co-movement of prices. These techniques, which include cointegration and error correction mechanism (ECM) models, have become the standard tool for analysing spatial market relationships, replacing earlier empirical tools such as the bivariate correlation coefficient and regressions. Nevertheless, time series analysis has also been criticized as unreliable with recent research focusing on switching regime models that incorporate data on prices, volumes traded and transactions costs (Barrett & Li, 2002). Non-linearities in market relationships that arise from arbitrage conditions, unsynchronized price cycles, discontinuous trade and non-stationary transfer costs are thought of as rendering linear representations and models unuseful and inaccurate.

4.5 Conclusion

In this chapter, competitiveness was defined, and the theory and various measures of competitiveness discussed. Market integration and price transmission were also discussed in the context of market reform. The next chapter builds on this theoretical framework to develop tools for analysing the competitiveness of South Africa's potato exports and extent of market integration in the wake of a deregulated industry.

It is clear that market reforms encourage agricultural industries to compete vigorously in markets. It is only by being competitive that the gains of reforms such as deregulation can be realised by the stakeholders within an industry. Similarly, producers, processors and traders within an industry stand to gain more if the markets are integrated.

There exists a reasonable body of analysis on the impact of market reforms and trade liberalisation. However, in the case of South Africa, most of the analysis only covers the first few years of these reforms and are not specific to the potato industry. Therefore, an update of some of this research is now urgently required. It makes sense for policy makers to develop a systematic and ongoing approach to the monitoring of trade and market reforms as the process gradually unfolds. Moreover, it is important to clarify exactly how these reforms (deregulation) have contributed to changes in trade flows and prices for the different potato products. Measurements of competitiveness and price transmission are ways of doing this.

CHAPTER 5

MEASUREMENT AND ANALYSIS OF THE COMPETITIVE STATUS OF SOUTH AFRICA'S POTATO INDUSTRY

5.1 Introduction

This chapter describes the methods and procedures employed in analysing the competitiveness of the South African potato industry. It begins by describing the kind of data used and the sampling design. For a better understanding of the country's competitive position, trends in trade flow are first established. This description is augmented by a detailed analysis on how competitive South Africa's exports are vis-à-vis other SADC countries.

It should be noted that although there are various methods that can be employed in the measurement of competitiveness, most of them are highly dependent on significant amount of data, which apart from South Africa are not readily available in many other African countries. For the purpose of this study, competitiveness is measured using a market share indicator (Relative Trade Advantage). Analysis is done for each of the three sub-industries within the potato industry in South Africa in terms of international competitiveness. In most cases, comparisons are made between South Africa and other SADC countries.

5.2 Data and data sources

Data used in this study is secondary time-series data because trends over time are important in drawing conclusions on the impact of deregulation. This data falls into two categories:

a. South Africa potato industry data

b. SADC regional trade data

5.2.1 South Africa's potato industry data

Data for the South African potato industry is sourced from Potatoes South Africa and Food and Agricultural Organisation statistical database (FAOSTAT). This is time-series data for fresh potatoes ranging from 1985 to 2006 and includes the standard fundamental variables under supply and demand. Although this database only provides a total of 21 observations, at least it provides a number of observations on domestic production and price trends before and after the deregulation of the potato industry.

5.2.2 SADC potato trade data

To analyse trade flows and to measure the competitiveness of the potato industry, it is necessary to determine how successful the industry traded its products, relative to its competitors, over time in the local and international market. For this purpose, import and export data is needed to compare South Africa's performance against regional and global competition. Country-level trade data was obtained from FAOSTAT. FAOSTAT (2008) affirms that the consistency of their data is checked through the framework of the Supply and Utilisation Accounts with established guidelines being used for preparation of such accounts.

This data is time series ranging from 1990 to 2006 and covers;

(i) Exports and imports (quantity and value) by origin and destination

(ii) Production volumes and area

(iii) Producer prices[7]

(iv) Consumption

It includes trade data for various categories of potatoes i.e. fresh potatoes, frozen potatoes, potato flour, potato starch and tapioca of potatoes with the latter four being processed products. Export and import volumes traded are measured in tonnes while their values are in US $ 1000. On the other hand, producer prices are in US $ per tonne and consumption in 1000 tonnes.

Five SADC countries (Mauritius, Mozambique, Malawi, Zimbabwe and Angola) have been selected for analysis based on the volume of trade in potatoes with South Africa and the rest of the world. It should be noted that there are limitations on analysis of competitiveness for the entire SADC region in the sense that complete trade data in potatoes is not available for a number of countries. Therefore, only the countries with sufficient data were selected for the analysis.

5.3 Trade flow analysis

A descriptive analysis is carried out on the growth rate in exports and demand for imports for South Africa and compared to other countries in the region and the world. Various indicators are employed in this descriptive analysis. These include:

[7]*The **producer's** price is the amount receivable by the **producer** from the purchaser for a unit of fresh potato output minus any VAT, or similar deductible tax, invoiced to the purchaser. It excludes any transport charges invoiced separately by the **producer**.*

The time series refer to the national average prices of potatoes comprising all grades, kinds and varieties, received by farmers when they participate in their capacity as sellers of their own products at the farm gate or first-point-of-sale.

5.3.1 Net trade

Net trade is estimated as the difference between exports and imports for a specific potato category.

Net Trade = $\mathbf{X_{it} - M_{it}}$**…… (1)**

Net trade ratio = $\mathbf{(X_{it} - M_{it}) / (X_{it} + M_{it})}$**……... (2)**

Where: X_{it} represents South Africa's exports of commodity *i* in time *t* to other countries while M_{it} is South Africa's imports of commodity *i* in time *t* from other countries.

Table 5.1 shows South Africa's net trade in potatoes from 1996 to 2005. The positive (+) sign implies exports exceed imports while a negative (-) sign implies imports exceed exports.

Table 5.1: South Africa's net trade in potatoes

Product	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Fresh Potatoes	+	+	+	+	+	+	+	+	+	+
Frozen Potatoes	+	+	+	+	+	+	+	+	-	-
Potato Flour	-	+	+	-	+	-	-	-	-	-
Potato Starch	-	-	-	-	-	-	-	-	-	-
Tapioca of potatoes	-	-	-	-	-	-	-	-	-	-

Source: Own calculations based on FAOSTAT data

As can be seen in Table 5.1, South Africa is a net exporter of fresh potatoes which comprises the highest proportion of exports. Net trade (with the rest of the world) in frozen potatoes also remained positive for a long time, until recent years when imports exceeded exports. The country remains a net importer of processed potato products (flour, starch, tapioca) to meet the high domestic demand.

5.3.2 Growth in export and import trade between South Africa, SADC and rest of the world

Growth in exports and imports is separately calculated as below. A comparison is made between South Africa's trade with SADC and the rest of the world for various potato products.

% growth of exports $= [(X_{it} - X_{it-1}) / X_{it-1}]*100$

$= [(X_{it} / X_{it-1}) - 1]*100$ ..... (3)

% growth of imports $= [(M_{it} / M_{it-1}) - 1]*100$ ..... (4)

Where: X_{it} represents South Africa's exports of commodity *i* in time *t* to other countries and M_{it} represents South Africa's imports of commodity *i* in time *t* from other countries

Table 5.2 shows the rate of growth in potato exports and imports for South Africa. A comparison is made between the percent growth of potato exports to SADC and the percent growth of potato exports to the rest of the world. Growth rate in exports is further compared to growth rate in imports for the specific potato categories.

Table 5.2: Growth rate in South Africa's potato exports and imports

	Exports to world 1996-2005	Exports to SADC 1996-2005	Imports from world 1996-2005
	Percent growth		
Fresh Potatoes	33.2	31	-91.4
Frozen Potatoes	48.8	51.8	2368
Potato Starch	-97	-97.4	-28.6
Potato Flour	-79	-83.7	-30.2
Tapioca of potatoes	371.4*	371.4*	86.5*

Asterisk (*) values are calculated for the period 1996 to 2004. The full table of export and import values for this period is provided in Table A2.5, appendix 2.

Source: Own calculations based on FAOSTAT database

From Table 5.2, it is clear that the rate of change in trade between South Africa and SADC is closely similar to the rate of change in trade between South Africa and the rest of the world for the selected products.

5.3.2.1 Export growth

Table 5.2 provides evidence that while exports of fresh and frozen products have grown significantly since deregulation of the agricultural market, exports of potato starch and flour have declined considerably. Exports of tapioca of potatoes grew considerably between 1996 and 2005. However, the growth rates in percentage terms are misleading because in absolute terms the exports of tapioca of potatoes remain very small.

Angola, Mauritius and Mozambique are the most important export destinations for South Africa's potatoes in the SADC region (FAOSTAT, 2008). Other export destinations include DRC, Madagascar, Malawi, Mozambique, Seychelles, Tanzania, Zambia and Zimbabwe. Potato exports by South Africa to the SADC region mainly comprise of fresh and frozen potatoes. Exports in potato flour and potato starch to the region are very low. Fresh potatoes and frozen potatoes exhibit an upward trend whereas potato starch and flour shows a downward trend in exports to the region.

Growth in exports of fresh potatoes is partly due to the expansion of the Shoprite Supermarket Chain into Southern Africa and Africa at large (Kirsten, 2008). Procurement, distribution and exports of fresh potatoes are done by Freshmark, a fresh produce division of the Shoprite Group. This is done from nine distribution centres located in the main cities of South Africa. Currently, Freshmark purchases about 90 percent of potatoes directly from producers with the focus on eliminating packaging costs and unnecessary handling (Freshmark, 2008). The rest of the

purchases are directly from the market, enabling the Shoprite Group to take advantage of price and product opportunities.

5.3.2.2 Import growth/decline

In terms of imports, there has been a decline in fresh potato imports by South Africa from the world as illustrated by the negative growth figure in Table 5.2. Imports of fresh products have been substituted by imports of frozen potatoes. In percentage terms, imports of frozen potatoes have grown tremendously, yet, in absolute terms the relative shift in imports is much smaller. Table 5.2 further shows that imports of starch and flour from the world have decreased as the local processing industry has developed with time.

5.4 Measurement of competitiveness

As discussed in the previous chapter, to determine the competitive status of the South African potato industry, the Relative Comparative Advantage (RCA) model developed by Balassa (1977, 1989) and extended by Volrath (1991) to the Real Trade Advantage (RTA) method is employed. Balassa's RCA method compares a country's share of the world market in one commodity relative to its share of all traded goods. The Relative Trade Advantage (RTA) index is used to reflect both imports and exports.

Using the RTA model, South Africa's trade performance in potatoes is analysed to determine the following:

- The country's relative share in world exports of potatoes
- How the share changes with time

Calculation of the RTA index is decomposed into 3 steps:

(i) Relative Export Advantage Index

(ii) Relative Import Penetration Index

(iii) Relative Trade Advantage Index

5.4.1 The Relative Export Advantage Index (RXA)

The index is defined as the ratio of a country's export share of a certain product in the world market to the same country's share in world export of all other commodities. The special feature of this measure is that the world 'total' is taken as the sum across all countries except the one studied. This avoids counting countries and commodities in both the numerator and the denominator. Thus, instead of including all exports in the summations of equation (5), the commodity and the country considered are excluded when total exports are summed up. This aspect is especially relevant if a country is fairly important in trade on international markets, and/or if the commodity considered is important in total trade. In these cases, double counting would lead to biased index values. As already pointed out in previous chapters, South Africa is the highest potato producer in the Southern African region hence important in trade within the region.

$$\mathbf{RXA_{ij}} = \left[X_{ij} \Big/ \sum_{l,l\neq j}^{u} X_{il} \right] \Big/ \left[\sum_{k,k\neq i} X_{kj} \Big/ \sum_{k,k\neq i,\ i\neq j}^{u} \sum X_{kl} \right] \quad \text{..... (5)}$$

Where X refers to exports, subscripts i and k denote the product while j and l the countries.The numerator is equal to a country's exports of a specific product category relative to the exports of this product from all countries except the country in question. The denominator reveals the exports of all products, except the commodity

in question, from the respective country as a percentage of all other countries' exports of all other products. The level of this indicator shows the degree of revealed export competitiveness and is interpreted as follows: values above unity suggest that the country has a competitive advantage in the considered product, whereas values below 1 point to a competitive disadvantage.

5.4.2 The Relative Import Penetration Index (RMP)

The Relative Import Penetration Index is very similar to the RXA. The differences are that it considers imports, represented in equation (6) by M, and that the interpretation is reversed from that of the RXA.

$$\mathbf{RMP_{ij}} = \left[M_{ij} \Big/ \sum_{l,l\neq j} M_{il} \right] \Big/ \left[\sum_{k,k\neq i} M_{kj} \Big/ \sum_{k,k\neq i,\ i\neq j} \sum M_{kl} \right] \quad \text{..... (6)}$$

The numerator is equal to a country's imports of a specific product category relative to the imports of this product from all countries except the country in question. The denominator reveals the imports of all products, except the commodity in question, to the respective country as a percentage of all other countries' imports of all other products. The level of this indicator shows the degree of revealed import penetration. A value of unity is a sign of competitive disadvantage, and values below that is an indication of competitive advantage.

5.4.3 The Relative Trade Advantage Index (RTA)

First used by Scott and Vollrath (1992), the RTA is more complex than the other two. This index gives the difference between the RXA and the RMP. Based on Balassa's original formula, the RTA for country *j* exporting good *i* is;

$$\mathbf{RTA_{ij} = RXA_{ij} - RMP_{ij}} \quad \text{..... (7)}$$

The competitive advantage revealed by this indicator is implicitly weighted by the importance of the relative export and the relative import advantages. Hence, it is not dominated by extremely small export or import values of the commodity considered. A positive value indicates a competitive advantage and a negative one a competitive disadvantage.

While the RXA and the RMP indexes are exclusively calculated using either export or import values, the RTA considers both export and import activities. From the point of view of trade theory, this seems to be an advantage.

The use of RMP alone can be very misleading since it can be heavily distorted due to protection of domestic markets. In the extreme case of an import ban or a prohibitively high import tariff, this measure indicates a high level of competitive advantage, while the reverse might be the case. Another factor which can lead to a distortion of all indicators considering exclusively either exports or imports is the existence of intra-industry trade. If for example, a country only acts as a transit country, the RXA might indicate high levels of competitiveness that would be purely artificial (Pitts *et al*, 1995). Therefore, in considering both exports and imports, the RTA is a comprehensive measure of competitiveness.

5.4.4 RTA results

Table 5.3 depicts South Africa's RTA in international potato trade. It describes the trends and status in the competitiveness of fresh potatoes and potato products from 1990 to 2005. The RTA has been obtained by calculating the difference between RXA and RMP. Based on Esterhuizen (2006), a product could be either competitive (RTA>1), marginally competitive (1>RTA>-1) or not competitive (RTA<-1).

Table 5.3: RTA for South Africa's potato value chain

	Fresh potatoes	Potato Flour	Potato Starch	Tapioca of potatoes	Frozen potatoes
1990		-1.21			
1991		-1.20			
1992	0.17	-0.58	-0.73	-4.13	0.02
1993		-0.62		-0.19	
1994	0.21	-0.34	-0.88	-6.81	0.11
1995	0.35	-0.45	-0.81	-12.13	0.08
1996	0.75	0.06	-0.88	-6.53	0.13
1997	1.00	1.63	-0.39	-6.32	0.04
1998	0.77	1.49	-0.74	-10.01	0.06
1999	0.65	0.07	-0.78	-7.81	0.12
2000	0.71	2.52	-1.18	-3.26	0.05
2001	0.74	0.12	-0.86	-2.57	0.09
2002	0.82	-0.08	-0.69	-0.49	0.08
2003	1.09	-0.14	-0.50	-1.13	0.07
2004	0.87	-0.53	-0.57	-1.64	-0.10
2005	0.96	-0.34	-0.56	-8.85	-0.22

Source: Own calculation based on FAOSTAT data

Note: Competitive (RTA>1), marginal competitive (1>RTA>-1), Not competitive (RTA<-1). No value is recorded in the years where no imports or exports or both occurred.

Potatoes (fresh)

The RTA index for South Africa's potato industry indicates the country has a marginal competitive advantage. The RTA's seemed to have picked up from the early nineties (below 0.5), but have remained relatively constant (approximately 0.85) over the past decade.

Potato Flour

The potato flour sub-industry exhibits interesting results. Prior to deregulation of the potato market, the industry was not competitive on the international market. However, after deregulation, potato flour exports from the country were highly competitive (1997-2001) for a few years. Yet, this trend reversed and from 2002 onwards, potato flour exports were only marginally competitive.

Potato starch

Starch is marginally competitive. This product has maintained this very stable marginal competitive trend through the years except in 2000 when it exhibited non-competitiveness.

Tapioca of potatoes

South Africa's tapioca of potatoes is not competitive on the international market. In fact, it is the only product that shows no signs of competitiveness of all table potato products traded by South Africa on the international market.

Frozen Potatoes

Frozen potatoes appear to have maintained a marginal competitive advantage both prior to and after deregulation of the potato market. Recent indices point to a deterioration in the competitive advantage for frozen potatoes with the index falling from positive values in 2003 to negative values in 2004 and 2005.

5.5 Conclusion

This chapter has provided an analysis of trade flows and international competitiveness of South Africa's potato industry. After the basic trends in growth of imports and exports were analysed, this chapter presented the calculation of the RTA indexes for the various potato products.

Whereas there has been positive growth in South Africa's net trade of fresh potatoes, there has been negative growth in net trade for processed products. It can thus be concluded that South Africa is a net exporter of fresh potatoes but remains a net importer of processed products. The comparison between South Africa's potato trade within SADC and the rest of the world points to the fact that South Africa's major market for the potatoes is SADC mainly due to the close proximity as (fresh) potatoes are bulky and perishable. The absence of processed potato products from SADC countries shows that the food processing industry is still underdeveloped compounded by the fact that production is low due to a number of supply response constraints. Such constraints include poor technology, high transport and transaction costs and lack of entrepreneurship.

The RTA indexes on their part showed that fresh potatoes, frozen potatoes and potato starch are marginally competitive whereas tapioca of potato is not competitive. The competitive position of potato flour has not followed a consistent trend over time with an initial improvement in competitiveness but then a decline from 2002 onwards.

CHAPTER 6

ANALYSIS OF MARKET INTEGRATION AND PRICE TRANSMISSION

6.1 Introduction

This chapter presents a discussion of the methods employed in analysing market integration and the results thereof. Market integration is measured by examining the extent of price transmission using co-integration techniques. The purpose of the price transmission analysis is to determine the degree of integration of two or more markets, notably the SADC / world market and the South African market. The SADC countries selected for the analysis are leading potato producers in the region and those for which relevant data was available. FAO (2003) reports that one of the potential effects of trade and market reforms is to increase the degree of market integration post reform. Similarly, competitive procurement and free internal trade following deregulation results in much stronger transmission of price signals across domestic markets (FAO, 2003). Price transmission analysis can therefore be used, in principle, to determine whether there is stronger evidence of transmission in the post reform period.

In order to analyse the potato markets, logarithmic transformation of annual domestic prices measured in US $ per tonne at the producer level, from January 1990 to December 2005, and a world reference price are used. The world price is estimated as an average of producer prices in the ten main potato trading nations based on net trade according to FAO statistics.

6.2 Analytical model

Conforti and Rapsomanikis (2005) demonstrate that given prices for a commodity in two spatially separated markets P_{1t} and P_{2t}, the Law of One Price and the Takayama-Judge model postulate that at all points of time, allowing for transfer costs C, for transporting the commodity from market 1 to market 2, the relationship between the prices is as follows:

$$\mathbf{P_{1t} = P_{2t} + C} \quad \textbf{..... (8)}$$

If a relationship between two prices, such as equation (8), holds, the markets can be said to be integrated. However, this extreme case may be unlikely to occur, especially in the short run. At the other end of the spectrum, if the joint distribution of two prices were found to be completely independent, then one might feel comfortable saying that there is no market integration and no price transmission. Rapsomanikis *et al* (2003) point out that spatial arbitrage is expected to ensure that prices of a commodity differ by an amount that is at most equal to the transfer costs with the relationship between the prices being identified as the following inequality:

$$\mathbf{P_{2t} - P_{1t} > C} \quad \textbf{..... (9)}$$

Fackler and Goodwin (2001) refer to the above relationship as the spatial arbitrage condition and postulate that it identifies a weak form of the Law of One Price, the strong form being characterized by equation (8). They also emphasize that relationship (9) represents an equilibrium condition. Observed prices may diverge from relationship (8), but spatial arbitrage causes the difference between the two prices to move towards the transfer cost. The spatial arbitrage condition implies that

market integration lends itself to cointegration with its presence being evaluated by means of cointegration tests.

If two spatially separated price series are cointegrated, there is a tendency for them to co-move in the long run according to a linear relationship (Gujarati, 2003). In the short run, the prices may drift apart, as shocks in one market may not be instantaneously transmitted to other markets or due to delays in transport. However, arbitration opportunities ensure that these divergences from the underlying long run (equilibrium) relationship are transitory and not permanent.

The spatial arbitrage condition encompasses price relationships that lie between the two extreme cases of the strong form of the Law of One Price and the absence of market integration. Depending on market characteristics, or the distortions to which markets are subject, the two price series may behave in a plethora of ways, having quite complex relationships with prices adjusting less than completely, or slowly rather than instantaneously and according to various dynamic structures or being related in a non linear manner. Balcombe and Morisson (2002) assert that given the wide range of ways prices may be related, the concept of price transmission can be thought of as being based on three notions, or components which include:

- Co-movement and completeness of adjustment which implies that changes in prices in one market are fully transmitted to the other at all points of time;
- Dynamics and speed of adjustment which implies the process by, and rate at which, changes in prices in one market are filtered to the other market or levels; and,

- Asymmetry of response which implies that upward and downward movements in the price in one market are symmetrically or asymmetrically transmitted to the other. Both the extent of completeness and the speed of the adjustment can be asymmetric.

Within this context, Rapsomanikis *et al* (2003) define complete price transmission between two spatially separated markets as a situation where changes in one price are completely and instantaneously transmitted to the other price, as postulated by the Law of One Price presented by relationship (8). In this case, spatially separated markets are integrated. In addition, this definition implies that if price changes are not passed through instantaneously, but after some time, price transmission is incomplete in the short run, but complete in the long run, as implied by the spatial arbitrage condition. The distinction between short run and long run price transmission is important and the speed by which prices adjust to their long run relationship is essential in understanding the extent to which markets are integrated in the short run. Changes in the price at one market may need some time to be transmitted to other markets for various reasons, such as policies, the number of stages in marketing and the corresponding contractual arrangements between economic agents, storage and inventory holding, delays caused in transportation or processing, or price-levelling practices (Rapsomanikis *et al,* 2003).

A number of time-series techniques can be used to test each of the components of price transmission and thus ultimately assess the extent of price transmission. These are as follows:

- Cointegration
- Causality

- Error Correction Mechanism (ECM)
- Symmetry

Based on Conforti (2004) and Rapsomanikis *et al* (2003), if two prices in spatially separated markets P_{1t} and P_{2t} contain stochastic trends and are integrated of the same order, say I(d), the prices are said to be cointegrated if:

$$\mathbf{P_{1t} - \beta P_{2t} = u_t \text{ is I(d)}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \mathbf{(10)}$$

β is referred to as the cointegrating vector (in the case of two variables a scalar), whilst equation (10) is said to be the cointegrating regression. The above relationship can be estimated utilizing *inter alia* Ordinary Least Squares (OLS). More specifically, P_{1t} and P_{2t} are cointegrated if there is a linear combination between them that does not have a stochastic trend even though the individual series contains stochastic trend(s) (Gujarati, 2003). Cointegration implies that these prices move closely together in the long run, although in the short run they may drift apart, and thus is consistent with the concept of market integration.

6.3 Testing framework

The sequence of the tests for the components of transmission is as follows:

(i) For each pair of prices, the first step is to test for the order of integration for each price utilizing the Augmented Dickey-Fuller (Dickey & Fuller, 1979) and the Phillips-Perron tests (Phillips & Perron, 1988). These are run with and without a time trend and a constant term, for a number of lags, both on the log-level series and the series in first differences. In the event that the series have a different order of integration, one can conclude that the markets are not integrated. In the case that the series are found to be I(0), assessment

is done of the dynamics of the relationship by means of Autoregressive Distributed Lag (ADL) models. Granger Causality is tested within a Vector Autoregression (VAR) framework to assess price transmission between the markets.

(ii) In the event that the tests indicate that the series are integrated of the same order, say I(1), the null of no cointegration is tested against the alternative hypothesis of cointegration following Engle and Granger (1987). Evidence against the null of no cointegration is taken to indicate that prices co-move and that markets are integrated. No restrictions are imposed or tested on the cointegrating parameter estimate. As noted earlier, inference on the extent of price transmission based on the size of the parameter may be misleading. In the event that the null of non cointegration is not rejected, the conclusion can be drawn that the markets are not integrated, and/or that one is unable to conclude that price transmission along the supply chain is complete.

(iii) In the event that tests indicate that the price series are cointegrated, the next focus is on the error correction representation, in the form of an ECM and on examining the short run dynamics, the speed of adjustment and the direction of Granger causality in the short or the long run.

6.4 Empirical results

Based on the testing framework provided in section 6.3, the following results were obtained:

(i) ***Test for the order of integration***

For each pair of producer prices, the first step was to test for the order of integration for each price utilizing the Augmented Dickey-Fuller (Dickey & Fuller, 1979) and the

Phillips-Perron tests (Phillips & Perron, 1988). The empirical distribution tables and critical values for the standard normal distribution are provided in appendix 4. These tests were run with and without a time trend and a constant term, for a number of lags, both on the log-level series and the series in first differences. Use of natural logarithimic transformation aloows for the interpretation of estimated coefficients as elasticities. The ADF and Phillips-Perron test statistics are presented in Table 6.1.

Table 6.1: ADF and Phillip-Perron Tests of producer prices

Series	Model	ADF			Phillips-Perron	
		Lags	τ_τ, τ_μ, τ	Φ_3, Φ_1	Lags	
WORLD	Trend & Intercept	*1*	*-4.03***	*5.52*	*2*	*-2.86*
Level	Intercept	*1*	*-4.19****	*8.95****	*2*	*-3.02**
	None	*2*	*0.51*	-----	*2*	*-0.06*
SOUTH AFRICA	Trend & Intercept	*0*	*-2.06*	*2.26*	*2*	*-2.14*
Level	Intercept	*0*	*-2.18*	*4.73*	*2*	*-2.29*
	None	*0*	*0.46*	-----	*2*	*0.75*
	Trend & Intercept	*2*	*-1.18*	*7.96*	*2*	*-8.94****
First difference	Intercept	*2*	*-0.01*	*7.10*	*2*	*-5.71****
	None	*2*	*0.00*	----	*2*	*-5.96****
MAURITIUS	Trend & Intercept	*0*	*-1.60*	*1.47*	*2*	*-1.63*
Level	Intercept	*0*	*-0.12*	*0.01*	*2*	*0.01*
	None	*0*	*2.24*	----	*2*	*2.55*
	Trend & Intercept	*0*	*-3.72**	*6.92****	*2*	*-3.78**
First difference	Intercept	*0*	*-3.42***	*11.67****	*2*	*-3.41***
	None	*0*	*-2.93****	----	*2*	*-2.95****
MALAWI	Trend & Intercept	*0*	*-2.52*	*3.53*	*2*	*-2.41*
Level	Intercept	*0*	*-1.68*	*2.82*	*2*	*-1.68*
	None	*0*	*0.20*	------	*2*	*0.29*
	Trend & Intercept	*0*	*-3.48**	*6.07****	*2*	*-3.58**
First difference	Intercept	*0*	*-3.46***	*12.00****	*2*	*-3.51***
	None	*0*	*-3.60****	-----	*2*	*-3.66****
MOZAMBIQUE	Trend & Intercept	*0*	*-2.51*	*3.77*	*2*	*-2.47*
Level	Intercept	*0*	*-2.67*	*7.11****	*2*	*-2.66*
	None	*0*	*-0.57*	-----	*2*	*-0.65*
	Trend & Intercept	*0*	*-4.07***	*8.32****	*2*	*-4.12***
First difference	Intercept	*0*	*-4.10****	*16.81****	*2*	*-4.17****
	None	*0*	*-4.26****	-----	*2*	*-4.34****
ZIMBABWE	Trend & Intercept	*0*	*-2.22*	*2.46*	*2*	*-2.17*
Level	Intercept	*0*	*-1.79*	*3.19*	*2*	*-1.79*
	None	*0*	*-0.15*	----	*2*	*-0.08*
	Trend & Intercept	*0*	*-3.23*	*5.21*	*2*	*-3.21*
First difference	Intercept	*0*	*-3.38***	*11.45****	*2*	*-3.40***
	None	*0*	*-3.53****	----	*2*	*-3.58****

**(**)[***] Statistically significant at 10(5)[1] % level*

On the basis of ADF and Phillips-Perron tests, both with and without a deterministic trend, there is insufficient evidence to reject the null hypothesis of non stationarity for all SADC price series. Graphical representations *(appendix 4)* and the pattern of autocorrelation evident in the correlograms support this result. When applied to the differenced series, both tests reject the null, indicating that all SADC price series are I(1). However, the null of non stationarity is rejected for the world prices indicating that world producer price series is I(0). I(0) implies that a variable is integrated of order zero, thus stationary. It can therefore be concluded that the differenced producer price series for South Africa, Mauritius, Malawi, Mozambique and Zimbabwe point in the direction of stationarity. It is thus imperative to test the null hypothesis of no cointegration to establish whether prices actually co-move or not amongst this group of countries.

(ii) Engle and Granger test for cointegration and Granger causality

With the differenced price series for the SADC countries exhibiting stationarity, this section tested for the existence of a cointegrating relationship among the differenced series. For each of the SADC potato markets, cointegration was tested using the Engle and Granger approach. The estimation equation considering differenced producer prices from the five SADC countries is provided below:

DLSA = C(1)*RES_MM + C(2)*DLMOZAQ + C(3)*DLMAU + C(4)*DLMALAWI + C(5)*DLZIMB + C(6)… ……(11)

Where RES_MM is the residual of the long run (cointegrating) equation while DLSA, DLMOZAQ, DLMAU, DLMALAWI and DLZIMB are the first differences of the log-level producer price series for South Africa, Mauritius, Mozambique, Malawi and Zimbabwe respectively. The results of this equation are summarized in table 6.2 below.

Table 6.2: Estimated ECM for equation 11

Dependent Variable: DLSA				
Variable	Coefficient	Standard Error	t-Statistic	p-Value
RES_MM	0.900228	1.30886	0.687795	0.5294
DLMOZAQ	-0.320331	0.351837	-0.910452	0.4141
DLMAU	2.155768	0.760624	2.834209	0.0471
DLMALAWI	-0.288789	0.18115	-1.594199	0.1861
DLZIMB	-0.012736	0.045633	-0.2791	0.794
C	-0.036552	0.060702	-0.602147	0.5795
Sample period: 1996 to 2005 R^2 = 0.76914 Adjusted R^2 = 0.480564 F-Statistic = 2.665298 S.E. of regression = 0.144552				

The adjusted R^2 of 0.480564 indicates that only 48% of the short-run variation in South Africa's potato producer prices is explained by the model. Additionally, all the regression coefficients (except for Mauritius) are not statistically significant at a 5% level of significance. This kind of representation yielded in unsatisfactory results and no cointegrating relationship could be established for this equation. Further adjustments were required to be made on the right-hand of equation 11 to remain with independent variables that could be explained economically and that are statistically significant in explaining the dependent variable.

The estimation equation for the ECM that resulted in a cointegrating relationship is as follows:

DLSA = C(1)*RES_MM(-1) + C(2)*DLMAU + C(3)*DLMOZAQ + C(4) …… (12)

The results of the Engle and Grenger test based on the above estimation equation are provided in table 6.3 below.

Table 6.3: Estimated ECM for equation 12

Dependent Variable: DLSA				
Variable	Coefficient	Standard Error	t-Statistic	p-Value
RES_MM(-1)	-1.739026	0.249903	-6.958792	0.0009
DLMAU	1.193144	0.148746	8.021336	0.0005
DLMOZAQ	0.700832	0.124757	5.617574	0.0025
C	0.008488	0.01358	0.625053	0.5594
Sample period: 1996 to 2005 R^2 = 0.979256 Adjusted R^2 =0.96681 F-Statistic = 78.67854 S.E. of regression = 0.032401				

Substituting in for the coefficients in equation 12 results in equation 13:

DLSA = -1.73902581*RES_MM(-1) + 1.193143958*DLMAU +
0.7008319835*DLMOZAQ + 0.008488484102 …… (13)

Based on table 6.3, the adjusted R^2 of 0.96681 indicates that approximately 97% of the short-run variation in South Africa's potato producer prices is explained by the model. Additionally, all the regression coefficients are statistically significant at a 5% level of significance. The coefficient of the lagged residual is -1.7 suggesting that the adjustment process is relatively fast. Intuitively, it is difficult to economically interpret the co-efficients in the ECM since we have "differenced away the theory". However, the signs of the coefficients make economic sense since increases in the rates of change of potato producer prices in Mauritius and Mozambique will increase the rate of change of South Africa's potato producer prices. However, further tests are needed to establish the direction of causality and to diagnose and test stability of the residual.

The residual of the ECM (equation 13) was subjected to diagnostic and stability tests as indicated in table below.

Table 6.4: Diagnostic and stability tests

Test	**H_0**	**Test Statistic**	**p-Value**	**Conclusion**
Jarque-Bera	Normally distribution	JB =0.71	0.70	Normal residuals
Ljung-Box Q	No autocorrelation	$LB_Q(6)$ =3.03	0.81	No 6^{th} order autocorrelation
Breusch-Godfrey	No autocorrelation	$nR^2(2)$ =3.86	0.05	No 2^{nd} order autocorrelation
ARCH LM	No heteroskedasticity	$nR^2(2)$ = 0.80	0.67	No heteroskedasticity
White	No heteroskedasticity	nR^2(no CT) = 8.60	0.20	No heteroskedasticity
Ramsey RESET	Stable parameters	LR(0) =0.17	0.68	Stable parameters i.e. no misspecification

The Jarque-Bera test failed to reject the null hypothsis of normally distributed residuals. The Ljung-Box Q and Breusch-Godfrey tests failed to reject the null hypothesis of no autocorrelation. The ARCH LM and White tests failed to reject the null hypothesis of no heteroskedasticity. Finally, the Ramsey RESET test failed to produce any evidence against the null hypothesis that the equation parameters are stable. Since all the diagnostic tests have been passed, the ECM has normally distributed residuals and stable parameters hence one can proceed to interpret the results.

The results for cointegration between South Africa, Mauritius and Mozambique (1997 to 2005) are summarized in Tables 6.5 and 6.6. Critical values for the cointegration test were calculated according to MacKinnon (1991):

$$C(p) = \Phi_\infty + \Phi_1 T^{-1} + \Phi_2 T^{-2} \quad \text{..... (14)}$$

The elaborate MacKinnon response surfaces for critical values of cointegration tests are provided in appendix 4.

Table 6.5: Calculation of critical values for cointegration test

n	Model	Point (%)	Φ∞	SE	Φ_1	Φ_2	T	Critical value
3	Constant, no trend	1	-4.2981	-0.0023	-13.79	-46.37	10	-6.14
3	Constant, no trend	5	-3.7429	-0.0012	-8.352	-13.41	10	-4.71
3	Constant, no trend	10	-3.4518	-0.001	-6.241	-2.79	10	-4.10

N is the total number of variables both on left and right hand side of equation excluding any constant and trend components while T is the sample size. The **Φ**'s are obtained form MacKinnon's tables, taking into account the deterministic structure and desired level of significance. Model employed for this calculation is constant without a trend. Critical values for integration are calculated at 10%, 5% and 1% levels of significance utilizing the MacKinnon tables. Based on these calculations, the critical values for cointegration are found to be -4.10, -4.71 and -6.14 for 10%, 5% and 1% levels of significance respectively.

Thererefore, there is strong evidence that South Africa's producer price and that of Mauritius and Mozambique are cointegrated, with the Engle and Granger test rejecting the null of no cointegration. Mauritius and Mozambique are important markets for South Africa's potatoes and potato products. Cointegration indicates that producers are integrated to the market process and that there is Granger Causality in at least one direction. The Granger causality tests indicate that South Africa Granger causes Mozambique and Mauritius producer prices.

Size of coefficient of the residual is an indication of speed of adjustment towards equilibrium as elaborated by Gujarati (2003). Small values tending to –1 indicate that

economic agents remove a large percentage of disequilibrium each period. Larger values, tending to 0, indicate that adjustment is slow. Extremely small values, less than –2, indicate an overshooting of economic equilibrium. A value of zero (i.e. insignificant), is indicative of no adjustment thus not an error-correcting mechanism. Positive values would imply diversion from the long-run equilibrium path – this would be inconsistent with the entire notion of economic equilibrium and short-run adjustment. In this case, the estimated ECM results suggest that the adjustment process is relatively fast with a coefficient of the lagged residual being -1.7 as shown in equation 13.

Having provided evidence that South Africa's potato producer prices co-move with that of Mauritius and Mozambique, the following part tests for direction of Granger causality. The results are summarised in table 6.7.

Table 6.6: Pair-wise Granger causality tests

Lags: 3			
Null Hypothesis:	Obs	F-Statistic	Probability
DLMOZAQ does not Granger Cause DLSA	11	0.5074	0.69803
DLSA does not Granger Cause DLMOZAQ		5.11687	0.07436
DLMAU does not Granger Cause DLSA	11	0.14729	0.92625
DLSA does not Granger Cause DLMAU		0.35977	0.03634

The tests fail to reject the null hypotheses that a change in Mozambique's/Mauritius' producer prices does not Granger cause a change in South Africa's producer prices but reject the null hypothesis that a change in South Africa's producer price Granger causes a change in Mozambique's/Mauritius producer price. The results therefore suggest that there is strong evidence for causality from the domestic potato market to the regional market. It appears that over time, changes or shocks in the domestic

producer price pass through into Mozambique and Mauritius. However, these changes are not adequate to drive market integration between South Africa and the rest of SADC countries.

A further analysis was done to establish whether there exists a cointegrating relationship between South Africa's producer price and the world producer price. The estimation equation is as below:

DLSA = C(1)*RES_WORLD + C(2)*LWORLD + C(3) …….. (15)

Where RES_WORLD is the residual of the long run equation while LWORLD is the log-level of world producer price. The world price has not been differenced because the ADF and Phillip-Perron tests in table 6.3 already proved that the world producer price series is stationary.

Table 6.7: Estimated ECM for equation 15

Dependent Variable: DLSA				
Variable	Coefficient	Standard Error	t-Statistic	p-Value
RES_WORLD	0.406841	0.307463	1.323219	0.2273
LWORLD	0.504149	0.387083	1.30243	0.234
C	-2.596761	2.01487	-1.288798	0.2384
Sample period: 1996 to 2005 R^2 = 0.329966 Adjusted R^2 =0.138528 F-Statistic = 1.723616 S.E. of regression = 0.186157				

Based on table 6.8, the adjusted R^2 of 0.138528 indicates that only 13% of the short-run variation in South Africa's potato producer prices is explained by the model. Additionally, all the regression coefficients are not statistically significant at a 5% level of significance. Therefore, the Engle and Granger cointegration tests provide insufficient evidence against the null hypothesis of no cointegrating relationship

between South Africa's producer price and the world price. A control test was also done using Netherlands but yielded similar results. The empirical results for this test are provided in appendix 4. Netherlands is among the leading producers and exporters of potatoes coupled with the fact that it has strong trading and economic links with South Africa. This suggests absence of integration between South Africa and the leading international markets.

6.5 Discussion and conclusion

Previous sections show that majority of SADC countries produce and also import potatoes although there is a difference in the volumes. In essence, the South African market is neither integrated with the world market nor the majority of SADC countries. There is sufficient evidence to conclude that the South African market is well integrated with only the Mauritius and Mozambique markets in the long run, whilst price signals are also being transmitted in the short run. Since the direction of causality is from South Africa to these two countries, it shows that South Africa plays a crucial role in determining potato prices in these two countries. These findings make sense when it is taken into consideration that compared to these two countries, South Africa is the dominant producer of potatoes by far.

The inherent attributes of fresh potatoes (perishable and bulky) make transaction and transport costs high thus inhibiting complete price transmission. Hence, when it comes to fresh potatoes, exporters are thus forced to mainly trade with neighbouring countries. On average only 6 to 7 percent of South Africa's annual production of fresh potatoes was exported over the past decade.

Furthermore, there is absence of causality in prices from any of the external markets to South Africa. It follows that exogenous factors such as international producer prices do not play a major role in determining potato prices at the farm gate level in South Africa. Therefore, the major price determinant is the normal supply and demand dynamics in the domestic market.

This study demonstrates that time series analysis can provide useful insights into the issue of market integration and price transmission if an appropriate testing framework is employed and the results are interpreted correctly. Cointegration and the ECM are useful tools as they provide a stylized picture of the relationship between two prices.

However, a major drawback of this test for cointegration stems from the fact that when there are more than two variables in a model, there may exist more than one cointegrating vector. Gujarati (2003) and Harris (1995) provide sufficient evidence to support this. In fact, it is possible to have up to $n-1$ linearly independent cointegrating vectors amongst n variables. Engle and Granger's test for cointegration cannot distinguish between several cointegrating vectors and linear combinations of these vectors. Only when $n=2$ is it possible to show that the cointegration vector is unique. Future research may utilize the Johansen test for cointegration which can distinguish between more than one cointegrating vector amongst several variables.

CHAPTER 7

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The initial chapters of this study provided an overview of the major aspects of the South African potato industry and those of the regional and international market in order to create a better understanding of the competitive environment in which the South African potato industry operates. Later chapters described the methodologies and analyzed the impact of deregulation on production, trade volumes and prices via indicators of competitiveness and market integration.

In total, six SADC countries were selected for analysis of competitiveness and price transmission: South Africa, Angola, Mauritius, Mozambique, Malawi and Zimbabwe. The Revealed Comparative Advantage method provided an insight into the issue of competitiveness for the various countries while market integration and price transmission were subjected to a testing framework utilizing cointegration and Error Correction Models.

Whereas there has been positive growth in South Africa's net trade of fresh potatoes, there has been negative growth in net trade for processed products. The RTA indexes on their part showed that fresh potatoes, frozen potatoes and potato starch are marginally competitive whereas tapioca of potato is not competitive. The potato chain in South Africa is relatively marginal as far as international competitiveness is concerned. It is also important to note from the empirical evidence of this study that the potato chain exhibits a negative trend in competitiveness when moving from the

primary to the processed product. These empirical findings are also supported by the actual trade data that shows that South Africa is a net exporter of fresh potatoes but remains a net importer of processed products.

The final part of the analysis focused on time series techniques to test for spatial price transmission in a number of potato markets in SADC region. South Africa's potato market was found to be integrated with that of Mozambique and Mauritius but is not integrated with Malawi, Zimbabwe and the world market.

Although South Africa's potato industry can hardly be counted among major exporters in the world, it has made its presence felt in other African countries. While the local potato industry has been exporting potatoes for years, exports started to pick up about 10 years ago. The country exports between 6% and 7% of its production, and most of this goes to countries in the rest of Africa, especially SADC region.

The Potato Exporters Forum helps to create an environment conducive to growth of exports. The forum ensures adherence to market practices and compliance with standards which include minimum grading standards and phytosanitary protocols. The forum also promotes good relations and co-operation amongst exporters and producers in a deregulated environment to ensure the successful export of potatoes.

The main markets for exports are Namibia, Mozambique, Botswana, Angola, Zambia, Mauritius and Swaziland. Very small quantities of exports end up in European and Middle East markets. The presence north of the equator is also minimal because North African countries such as Egypt and Algeria are themselves big potato growers. The

main competitors to local producers are India, Australia and European Union countries such as Netherlands.

Due to its geographic proximity with the SADC market, South Africa has an edge over many other countries, especially those in Europe. The SADC Trade Protocol has played a role in facilitating trade. There is a significant flow of potatoes across the border. A number of potato trucks from Johannesburg and Pretoria are transported daily to countries like Angola, Namibia, Zambia and Malawi. Local growers have also benefited from the rapid evolution and expansion of supermarket chains throughout Africa especially Shoprite. South Africa exports far more to the SADC region than it imports from SADC. Some of the SADC countries like Mozambique are heavily reliant on South African potatoes.

Potato export industry however faces a number of challenges and it still remains a budding industry in South Africa. The greatest challenge is the bulkiness and perishability of the fresh product which highly impedes trade. Secondly, there are increasing imports of processed potatoes, especially frozen French fries. These threaten the local processing industry. Non-tariff barriers also continue to impede export of potatoes. The exchange rate also highly influences exports. E.g. in 2007, the volume of potato exports decreased compared to previous year due to the strong Rand. Because of the strong Rand, local growers have lost some of their international market to competitors.

Despite these challenges, much more is to be gained from deregulation and international trade if the industry's weaknesses are addressed and solutions sought. For instance, improved linkages and networks across the international markets would

ensure South Africa explores trends that are important to its potato industry. Lastly, promotion of initiatives aimed at developing industry awareness of global competitors and markets would keep South Africa at the forefront of global competitiveness.

REFERENCES

Badiane, O. & Shively, G.E. 1998. Spatial Integration, transport costs and the response of local prices to policy changes in Ghana. *Journal of Development Economics*, 56:411-431.

Balcombe, K.G. & Morrison, J. 2002. *Commodity price transmission: A critical review of techniques and an application to selected export commodities*. Report to the Food and Agriculture Organisation of the United Nations.

Balassa, B. 1977. Revealed Comparative Advantage revisited: An analysis of relative export shares of the industrial countries, 1953-1971. *Manchester school, 45, 327-344*

Balassa, B. **1989.** *Comparative advantage, trade policy and economic development*. New York and London.

Barrett, C.B. & Li, J.R. 2002. Distinguishing between equilibrium and integration in spatial price analysis. *American Journal of Agricultural Economics*, 84:292-307.

Basu, J. P. & Soumyananda Dinda. 2003. Market integration: an application of error correction model to potato market in Hooghly District, West Bengal. Indian Journal of Agricultural Economics, 58(4):742-751

Batt, J. P. 2003. Examining the performance of the supply chain for potatoes in the Red River Delta using a pluralistic approach. *Supply Chain Management: An International Journal,* 8(5):442-454.

Bayley, B. 2000. *A Revolution in the Market. The Deregulation of South African Agriculture.* Oxford Policy Management.

Black, V. 2008. GM potatoes in South Africa - a critical analysis. The African Centre for Biosafety, Johannesburg, South Africa.

Cassim, R., Onyango, D. & Van Seventer, **D. E. 2004**. *The State of Trade Policy in South Africa*. Johannesburg: Trade and Industrial Policy Strategies (TIPS)

CIP. 2008. International Potato Center - Centro Internacional de la Papa [Online] Available from:www.cipotato.org/potato/facts

Collier, U. 1998. Deregulation in the European Union: environmental perspectives. European University Institute. Working Group on Environmental Studies

COMESA. 2001. Integrating trade and investment regionally. *Annual Report 2001.*

Conforti, P. 2004. *Price transmission in selected agricultural markets.* FAO commodity and trade policy research working paper No. 7

Conforti, P. & Rapsomanikis, G. 2005. Market Integration, Price Transmission and Import Surges. *FAO Import Surge Project Working Paper no. 6 May 2005*

Department of Agriculture (DoA). 2003. *The Potato supply chain*. Food pricing monitoring committee report. [Online] Available from: www.nda.agric.za [Accessed: 2007-05-21].

Department of Agriculture (DoA). 2006. *Trade Potential between South Africa and Angola.* Pretoria: Department of Agriculture.

Dickey, D. & Fuller, W. 1979. Distribution of the Estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74:427-431.

DPRU. 2001. Trade Patterns in the SADC Region: Key Issues for the FTA. DPRU Policy Brief No. 00/P9. March 2001.

Du Toit, J.P & Ortmann G.F. 2009. Impact of market deregulation on the competitiveness of commercial milk producers in East Griqualand: a unit cost ratio (UCR) analysis: 1983-2006 .*Agrekon, Vol 48, No 2 (June 2009)*

Engle, R.F. & Granger, C.W.J. 1987. Cointegration and error correction: representation, estimation and testing. *Econometrica*, 55:251-276.

ESRF. 2003. *Trade policies and agricultural trade in the SADC region: challenges and implications. Regional Synthesis Report*. This paper was presented at the Southern Africa Regional Conference on "Agricultural Recovery, Trade and Long-term Food Security", March 26-27, Botswana.

Esterhuizen, D. **2006.** *An Evaluation of the competitiveness of the South African Agribusiness sector.* Unpublished PhD thesis. Pretoria: University of Pretoria.

Fackler, P.L. & Goodwin, B.K. 2002. Spatial Price Analysis. *In* Gardner B. and Rausser, G (eds.) *Handbook of agricultural economics*. Volume 1, Chapter 17. Amsterdam: Elsevier Science.

FAO. 2003. Conceptualizing the Linkages. *Trade Reforms and Food Security*. Rome: Food and Agriculture Organization of the United Nations. [Online] Available at: www.fao.org. [Accessed: 2007-07-20]

FAO. 2007. *High Prices and Volatility in Agricultural Commodities*. Food Outlook. Global Market Analysis.

FAOSTAT. **2008**. Web pages [Online] Available from: www.fao.org. [Downloaded: 2008-08-22]

Finger, J. M. 1975. Trade Overlap and Intra-Industry Trade. *Economic Inquiry*, *3(4):581 – 589*. Western Economic Association

Freebairn, J. 1986. *Implications of wages and Industrial policies on competitiveness of Agricultural Export Industries.* Paper presented at the Australian Agricultural Economics Society Policy Forum, Canberra.

Freshmark. 2008. [Online] Available from: www.shopriteholdings.co.za/retailing-services/Freshmark.asp

Frohberg, K. & Hartmann, M. 1997. *Comparing Measures of Competitiveness*. Discussion Paper No. 2. Institute of Agricultural Development in Central and Eastern Europe.

GIS. 2008. Boosting potato production through mechanization. Government Information Service, Prime Minister's Office, Mauritius

Goletti, F. & Babu, S. 1994. Market liberalization and market integration of maize markets in Malawi. *Agricultural Economics*, 11:311-324.

Goodwin, B.K & Schroeder, T.C. 1991. Cointegration Tests and Spatial Price Linkages in Regional Cattle Markets. *American Journal of Agricultural Economics*, 73(2): 452-464.

Government Gazette. 2004. Volume 471: Number 26753

Green P.E & Krieger A.M. 2003. Modeling competitive pricing and market share: Anatomy of a decision support system..The Wharton School of the University of Pennsylvania, Steinberg Hall-Dietrich Hall, Philadelphia, PA 19104-6371, USA

Gujarati, D.N. 2003. *Basic Econometrics.* Fourth Edition. McGraw Hill, 2003. New York

Harris, R. 1995. *Using Cointegration Analysis in Econometric Modelling.* Prentice Hall.

Horton, D. 1987: *Potatoes production, marketing and programs for developing countries.* Westview Press (Boulder).

Ihle, R. & von Cramon-Taubadel1 S. 2009. Country and border effects in the transmission of maize prices in Eastern Africa: evidence from a semi-parametric regression model

ISMEA. 1999. The European Agro-Food System and the Challenge of Global Competition. In: FAO. 2003. *Trade Reforms and Food Security*: *Conceptualizing the Linkages*. Rome: Food and Agriculture Organization of the United Nations.

IYP. 2008. The United Nations International Year of the Potato 2008. [Web page] *http://www.potato2008.org*

Jalonoja, K. & Pietola, K. 2004. Spatial integration between Finnish and Dutch potato markets. *Food Economics*, 1(1):12-20

Johansen S. **1991.** Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica,* 59:551-1580.

Joyce, M. J. 1988. *Potato Varietal Development Programme in Zimbabwe.* Paper Presented at the Regional Seed Potato Workshop, Harare, Zimbabwe, 22-27 February 1988.

Kassier Repoert. 1992. *Report of the committee of inquiry into the Marketing Act.* Pretoria, Department of Agriculture: Pretoria

Kirsten, J. 2008. Verbal communication with the author on 29 April. Pretoria

Kirsten, J. & Vink, N. 2003. *Agricultural Policy changes in South Africa 1996-2002.* Paper prepared for the Roles of Agriculture International Conference 20-22 October, 2003 – Rome, Italy

Kirsten, J. F. & Van Zyl, J. 1999. Comparing notes on the approaches and progress with land reform in Southern Africa: The South African land reform programme. *Agrekon* 38: 326-342.

Koester, U. 1993. Policies for promoting regional agricultural trade. *Food Policy Journa*l, August: 355-365.

Lele, U. 1981. Cooperatives and the poor: a comparative perspective. *World Development*, 9:55-72.

Louw, A. & Emongor, R. A. **2004.** *Regoverning Markets: Securing Small Producer Participation in Restructured National and Regional Agri-food Systems.* Report 1 prepared for International Institute for Environment and Development (IIED) London, Pretoria, July.

MAIFS. 2008. Crops - Potatoes, Onion & Garlic. Ministry of Agro Industry, Food Production and Security. Republic of Mauritius

Maltsoglou, I. & Tanyeri-Abur, A. 2005. *Transaction Costs, Institutions and Smallholder Market Integration: Potato Producers in Peru.* ESA Working Paper No. 05-04. Agricultural and Development Economics Division of the Food and Agriculture Organization of the United Nations.

MAP Act. 1996. Marketing of Agricultural Products Act, No. 47 of 1996. Republic of South Africa.

McCorriston, S. 2006. *Trade Liberalisation under Imperfect Competition in Commodity Markets.* Paper for the Conference on 'Governance, Coordination and Distribution along Commodity Value Chains' organised by FAO, Rome, April.

McCorriston, S. & MacLaren, D. 2006. *'(Partial) De-Regulation of State Trading Importers in Selected Developing Countries.'* Mimeo: University of Exeter.

McCulloch, N., Winters, L. A., Cirera, X. 2001. *Trade liberalization and poverty: A Handbook.* In: FAO. 2003. *Trade Reforms and Food Security*: *Conceptualizing the Linkages*. Rome: Food and Agriculture Organization of the United Nations.

Meyer, F. H. 2006. *Model Closure and Price formation under switching grain market regimes in South Africa.* PhD Thesis. Pretoria: University of Pretoria.

Moll, T. 1993. Macroeconomic policy in turbulent times. In Lipton, Merle and Simkins, Charles (Eds). *Op cit*: 235-270.

Mundlak, Y. & Larson, D.F. 1992. "On the transmission of world agricultural prices." *World Bank Economic Review*, 6:399-422.

NAMC & Commark Trust. 2007. *A Diagnostic Study of the Potato Subsector: Unlocking the potential for contribution towards ASGI-SA*

Narayanan, S. & Gulati, A. 2002. *Globalization and the Smallholder: Towards an Approach to Analysis.* Washington DC: IFPRI.

National Agricultural Marketing Council (NAMC). 2002. *Report on the Investigation into Fresh Produce Marketing, Report 2: Fresh produce marketing in South Africa*. Pretoria: National Agricultural Marketing Council.

National Agricultural Marketing Council (NAMC). 2007. *Application for the Implementation of Statutory Measures in the Potato Industry.* NAMC. Pretoria. January 2007.

Organisation for Economic Co-operation & Development (OECD). 1992. *Integration of Developing Countries into the International Trading System.* Paris: OECD.

Organisation for Economic Co-operation & Development. 2006. *OECD Review of Agricultural Policies - South Africa.* [Online] Available from: www.oecd.org/agr/support [Accessed: 2007-04-02].

Oxfam. 2000. *Agricultural trade and the livelihoods of small farmers.* Oxford: Policy Department.

Phillips, P.C.B. & Perron, **P. 1988**. Testing for a unit root in time series regression. *Biometrica*, 75:335-346.

Pitts, E., Viaene, J., Traill, B., & Gellynk, X. 1995. Measuring Food Industry Competitiveness. Structural Change in the European Food Industries, Discussion Paper Series, No. 7.

Potatoes South Africa. 2005. Potato industry statistics. Unpublished Report, Potatoes South Africa, Pretoria.

Potatoes South Africa. 2007. *Web-pages* [Online] Available from: www.potatoes.co.za [Accessed: 2007-04-16].

Rapsomanikis, G., Hallam, D. & Conforti, P. 2003. Market integration and price transmission in selected food and cash crop markets of developing countries: review and applications. *Commodity Market Review*, 2003-2004. FAO. Rome.

SADC. 2004. Press Briefing by Fudzai Pamacheche, Supervisor of Trade, Industry, Finance and Investment Directorate on 9 March 2004, Arusha. [Online] Available from: www.sadc.int/news/news_details

SADC. 2007. *Trade: Impact of Trade Liberalisation on Intra-Regional Trade Flows/Non-tariff barriers.* [Online] Available from: *www.sadc.int* [accessed: 2007-03-24]

SADC. 2008. SADC Review 2007/2008: SADC Profile. Web pages. [Online] Available from: www.sadc.int

SADOCC. 2006. Zimbabwe declares potatoes strategic crop / Gold production plummets. Southern Africa Documentation and Cooperation Centre. [Online] Available from: http://www.sadocc.at/news/2006/2006-089.shtml. [Accessed: 2009-02-13]

Sahn, D.E., Dorosh, P.A. & Younger, S.D. 1997. *Structural Adjustment Reconsidered: Economic Policy and Poverty in Africa*. Cambridge University Press.

Sandrey, R. 2007. *The Four Pillars of South African Agricultural Trade Policy.* Tralac Trade Brief No. TB08/2007

Sandrey, R. & Vink, N. 2006. *How can South Africa exploit new opportunities in agricultural export markets? Lessons from the New Zealand experience.* Tralac Working Paper No 19/2006. November 2006.

Scott, G. J. 2002. Maps, models, and muddles: World trends and patterns in potatoes revisited. *Potato Research 45 (2002):45-77*

Scott, L. & Vollrath, T. L. 1992. Global competitive Advantage and overall Bilateral Complementary in Agriculture: A Statistical Review, United States Department of

Agriculture, Economic Research Service, *Statistical Bulletin,* No. 850, Washington D.C.

Scrimgeour, F. & Sheppard R. 1998. *An Economic Analysis of the Deregulation of Selected Israeli, South African and South American Producer Boards*. A Report Prepared for MAF Policy. MAF Policy Information Paper No. 20. Wellington

Shephard G.S. & Futrell G.A. 1982. *Marketing Farm Products: Economic Analysis.* Iowa.

Takayama, T. & Judge, G.G. 1971. *Spatial and temporal price allocation models*. Amsterdam: North Holland.

Tyers, R. & Anderson, K. 1992. *Disarray in world food markets: a quantitative assessment*, Cambridge University Press.

USAID. 2008. Helping to Restore Angola's Agricultural Sector. [Online] Available from: www.usaid.gov/ao/business_agriculture.html. [Accessed: 2008-02-12]

Valdés, A & Leresche, K. M. 1993. Agricultural Policy Reforms and Regional Market Integration in Malawi, Zambia, and Zimbabwe.

Valentine, N. & Krasnik, G. 2000. SADC Trade with the rest of the world: Winning export sectors and Revealed Comparative Advantage Ratios. *The South African Journal of Economics,* 68(2): 266-285.

Van Campenhout, B. 2007. Modelling trends in food market integration: Method and an application to Tanzanian maize markets. *Food Policy*, 32(1): 112-127

Van Rooyen, C. J., Esterhuizen, D. & Doyer, O. T. 2001. Creating a chain reaction-A key to increased competitiveness in South African Agribusiness. *The South African Journal of Economics*, 69:3 September 2001.

Vink, N. 1993. 'Entrepreneurs and the political economy of reform in South African agriculture'. *Agrekon,* 32(4):153-166

Vink, N. & Kirsten, J. 2000. *Deregulation of agricultural marketing in South Africa: Lessons learned.* The Free Market Foundation. Sandton.

Volrath, T. I. 1991. A theoretical evaluation of alternative trade intensity measures of Revealed Comparative Advantage. *Weltwirtschaftliches Archiv 127(2): 262-280*

Workman, D. 2007. Top Ten Potato Countries. [online] Available from: *www.suite101.com* [Accessed: 2008-01-10]

World Bank, **2007.** *Combined Methods Case study: Malawi Agricultural Market Reform PSIA*. Report by Poverty Analysis Monitoring Team, DFID and Social Development Department. The World Bank,Washington, DC..

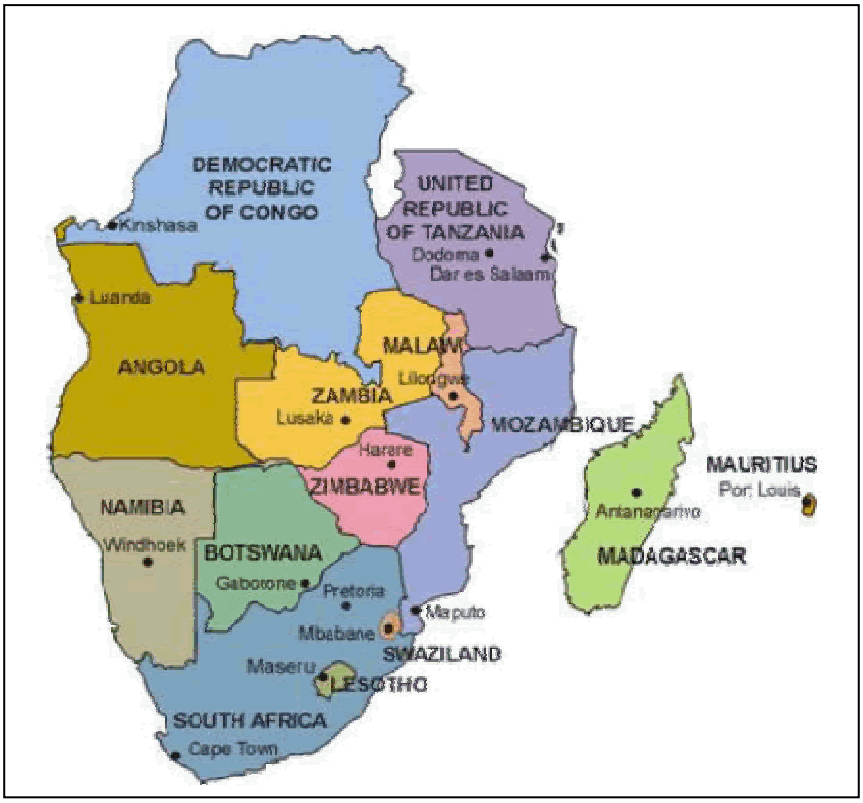
Yumkella, K., Roepstorff, T., Vinanchiarachi, J. & Hawkins, T. 1999. *Global and Structural Transformation in Sub-Sahara Africa*. In: FAO. 2003. *Trade Reforms and Food Security*: *Conceptualizing the Linkages*. Rome: Food and Agriculture Organization of the United Nations. [Online] Available at: www.fao.org. [Downloaded: 2007-07-20]

Zachariasse, V. & Bunte, F. 2003. *How are farmers faring in the changing balance of power along the food chain?* Paper presented at the Conference on changing Dimensions of the Food Economy: Exploring the Policy Issues, 6-7 February, The Hague, Netherlands.

APPENDICES

APPENDIX 1: SADC MEMBER COUNTRIES

Figure A1.1: Map of SADC countries



1. DRC
2. Tanzania
3. Angola
4. Zambia
5. Malawi
6. Mozambique
7. Zimbabwe
8. Botswana
9. Namibia
10. South Africa
11. Lesotho
12. Swaziland
13. Mauritius
14. Madagascar

Source: *http://www.sadc.int/member_states/index.php*

Table A1.1: Selected Basic Indicators for SADC – 2005

	Area Sq Km ('000)	Population ('000)	GDP US $ (million)	GDP/Capita US $	Imports US $ (million)	Exports US $ (million)
Angola	1,247	15,116.0	19,110.0	1,264	5,831.8	13,475.0
Botswana	582	1,711.0	8,485.3	4,959	4,778.5	3,530.1
DRC	2,345	59,554.0	6,600.0	111	1,580.0	1,440.0
Lesotho	30	2,333.8	1,396.0	598	1,120.0	568.0
Madagascar	587	16,900.0	5,840.0	346	1,310.0	2,133.0
Malawi	118	11,938.0	1,879.0	157	926.0	484.0
Mauritius	2	1,233.0	6,287.0	5,099	2,760.0	1,990.0
Mozambique	799	18,961.5	5,933.0	313	2,035.0	1,504.0
Namibia	824	2,001.0	5,500.0	2,749	2,107.0	1,829.0
South Africa	1,219	46,586.6	213,097.0	4,574	57,600.0	56,500.0
Swaziland	17	1,105.0	1,800.0	1,629	1,470.0	1,780.0
Tanzania	945	35,300.0	10,361.0	294	2,430.0	1,452.0
Zambia	753	10,987.5	5,408.0	492	2,013.0	1,457.0
Zimbabwe	391	11,892.0	3,050.0	256	2,600.0	1,900.0
SADC	**9,859**	**235,619.4**	**294,746.3**	**1632**	**88,561.3**	**90,042.1**

Source: *Economist Intelligence Unit estimates for imports and exports*

APPENDIX 2: DATA

Table A2.1: SADC table potato production (1000 tonnes)

	Angola	DRC	Lesotho	Malawi	MAU	MOZAQ	SA	SWAZI	TZ	Zambia	ZIMB
1990	34.00	33.28	45.00	350.00	17.82	70.00	1260.59	6.00	210.00	9.00	31.00
1991	36.00	34.01	50.00	360.00	16.45	71.00	1322.52	6.00	180.00	10.00	31.00
1992	40.00	35.00	55.00	350.00	19.18	70.00	1215.00	6.00	180.00	8.00	25.00
1993	14.00	112.92	60.00	370.00	13.78	72.00	1134.00	6.00	180.00	10.00	30.00
1994	27.00	115.82	70.00	350.00	17.80	74.00	1316.00	6.00	180.00	9.00	31.00
1995	27.50	86.69	70.00	397.21	15.72	72.00	1321.00	6.00	200.00	8.00	30.00
1996	28.00	87.47	70.00	702.89	10.64	73.00	1552.00	6.00	245.00	10.00	31.00
1997	24.00	88.25	75.00	975.01	17.58	74.00	1579.02	6.00	240.00	9.00	30.00
1998	25.00	88.00	80.00	1552.72	14.61	75.00	1667.00	6.50	250.00	8.00	29.00
1999	19.11	89.05	85.00	1840.40	15.32	76.00	1669.00	5.50	255.00	10.00	30.00
2000	26.55	89.85	90.00	2037.28	13.84	80.00	1721.00	6.00	250.00	10.00	32.00
2001	158.39	90.66	90.00	2852.01	16.35	80.00	1793.00	6.00	240.00	11.00	33.00
2002	179.39	91.48	90.00	1061.41	13.34	80.00	1647.00	6.00	240.00	11.00	35.00
2003	269.20	91.89	90.00	1100.00	12.36	80.00	1496.00	6.00	195.96	11.00	35.00
2004	241.95	92.30	90.00	1784.75	11.25	81.24	1786.00	5.99	237.64	11.00	34.40
2005	307.30	92.72	98.77	1800.00	12.78	82.10	1878.00	5.98	250.66	14.04	34.33
2006	307.30	93.14	98.77	1800.00	11.31	82.10	1862.86	5.98	250.66	14.04	34.33

Table A2.2: Per capita consumption (g/capita/day)

Country	Angola	Botsw	DRC	M'gscar	Malawi	Mau	Mozaq	Namibia	Seych	SA	Swazi	Tz	Zambia	Zimb
1990	11	25	2	40	73	50	13	30	25	65	0	15	0	7
1991	8	25	2	39	79	49	13	28	27	65	0	14	0	6
1992	6	25	3	38	80	48	13	26	28	65	0	13	0	5
1993	5	25	4	37	72	48	12	25	29	66	0	13	0	5
1994	5	24	5	36	67	48	12	24	30	68	1	13	0	5
1995	5	24	5	35	81	49	12	23	30	71	3	14	0	6
1996	6	25	5	34	127	50	12	23	30	73	4	15	0	6
1997	6	26	5	33	193	50	12	23	31	74	7	16	0	5
1998	5	29	5	31	252	49	12	24	31	75	4	16	0	6
1999	4	31	5	30	289	48	11	25	30	75	0	16	0	6
2000	6	34	5	28	297	47	11	24	28	74	0	16	0	6
2001	13	37	5	26	282	47	11	21	27	74	3	15	0	6
2002	21	38	4	25	261	47	11	18	26	75	1	15	2	6
2003	27	39	3	23	247	47	10	15	26	76	0	15	3	5
2004	33	38	3	22	242	47	10	14	28	78	1	15	3	6
2005	38	37	2	21	240	47	10	14	30	80	23	15	3	6

Table A2.3: FPM prices (R/tonne)

	Pretoria	Jo'burg	Bloem	Kaapstad	PE	East-Lond	Durban	PMB	Klerk	Vereen	Springs
1991	520	504	470	534	501	510	493	431	459	504	495
1992	1042	1046	946	989	964	964	1002	929	968	1050	1001
1993	595	598	550	646	572	585	626	566	542	583	581
1994	726	749	691	837	736	737	715	657	684	712	731
1995	927	962	894	1019	932	940	936	862	874	932	919
1996	823	852	758	863	829	806	816	729	779	826	815
1997	881	905	811	921	896	908	852	749	828	886	863
1998	1078	1101	1013	1071	1002	1025	1049	962	1042	1045	1054
1999	920	952	872	1000	939	914	898	797	856	878	901
2000	1200	1234	1149	1291	1259	1219	1194	1060	1144	1171	1178
2001	1204	1261	1163	1224	1221	1165	1172	1007	1135	1157	1162
2002	1991	2031	2030	1996	2111	2054	1944	1731	1942	1960	1945
2003	1950	1995	1998	1936	2001	2009	1911	1673	1902	1921	1832
2004	1562	1604	1567	1529	1652	1636	1542	1338	1511	1547	1476
2005	1745	1804	1730	1863	1861	1830	1723	1504	1689	1699	1669

Table A2.4: Producer Prices (US $/tonne)

	M'gscar	Malawi	Mauritius	Mozaq	SA	Zimbabwe	Nether	World
1991	156.92	296.08	233.19	502.00	177.09	331.37	132.11	210.87
1992	258.05	301.67	263.44	414.91	339.41	326.96	73.93	172.16
1993	311.95	274.15	249.94	406.96	182.39	205.61	57.07	152.67
1994	298.63	172.73	256.12	367.89	202.77	163.53	175.83	238.02
1995	38.96	128.37	269.06	257.25	252.54	150.02	236.66	287.39
1996	43.34	249.14	291.56	412.82	189.56	165.96	93.72	159.19
1997	58.93	364.51	308.68	403.89	188.80	219.63	76.87	154.47
1998	59.73	210.44	291.76	392.63	191.74	168.93	163.83	214.00
1999	117.76	247.19	279.68	365.20	150.42	151.25	175.01	189.44
2000	103.58	237.94	316.20	323.42	173.64	2476.48	31.77	144.38
2001	88.64	338.36	307.25	272.68	159.95	3923.56	78.78	169.57
2002	101.58	369.48	338.76	262.27	165.45	604.35	81.88	162.76
2003	80.43	364.50	405.00	289.75	236.62	742.73	111.73	208.84
2004	60.92	408.39	455.43	337.99	305.84	532.28	158.27	226.49
2005	61.96	417.79	445.39	352.43	328.66	524.45	157.21	210.20

Table A2.5: South Africa's trade with SADC

	SA exports to SADC (1000 US $)				SA imports from SADC (1000 US $)			
	Potato flour	Potato starch	Potatoes	Potatoes, frozen	Potato flour	Potato starch	Potatoes	Potatoes, frozen
1992	117	14	1903	134	0	0	270	2
1993	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1994	135	0	2147	758	0	0	53	23
1995	489	104	4133	335	0	0	10	46
1996	1508	272	6174	1228	0	0	0	53
1997	2507	297	5937	483	11	0	0	0
1998	2437	275	6607	992	0	0	2	0
1999	973	197	5552	1022	0	0	0	0

2000	2884	18	4291	633	0	0	0	0
2001	517	4	4771	751	0	0	0	0
2002	460	1	5817	842	3	0	0	0
2003	243	13	9226	992	0	0	0	0
2004	170	30	9045	1153	10	0	0	0
2005	245	7	8085	1864	0	0	0	0

Table A2.6: South Africa's trade with rest of the world

EXPORTS (1000 US $)

Product	Total merchandise		Potatoes		Potato Flour		Potato Starch		Tapioca of potatoes		Frozen Potatoes	
Region	World	SA	World	SA	World	SA	World	SA	World	SA	World	SA
1990	3.49E+09	23579328	1374295		124017.7	415.3	186360.39	14.49	4435.5	19.64	750642.7	704.46
1991	3.5E+09	23360832	1767601		146693	80.36	240266.04	11.19	4560.01	58.04	824915.3	1007.14
1992	3.75E+09	23950500	1565239	2139	171415.1	118	216124.15	14	5479.84	7	890216.7	166
1993	3.75E+09	24321200	1225107		159371	229.46	219254.18	30.36	5168.64	46.43	886798.3	2023.21
1994	4.28E+09	24987000	1708018	2486.22	179261.1	168.39	207418.83	3	4530.13	54.88	1184376	850.67
1995	5.11E+09	28331500	2278025	4657	226051.8	533	267671.86	107	5256.25	2	1625568	885
1996	5.34E+09	29496700	1607418	6772	251206.9	1536	281142.19	273	4152.34	21	1487150	1336
1997	5.54E+09	28221500	1257786	6444.67	230174.1	2761	251260.33	297	4282.87	63.62	1558008	514.55
1998	5.47E+09	28497500	1708620	6852	216356.7	2499	214102.71	308	4194.18	10	1878594	1057.46
1999	5.67E+09	26713300	1876095	5881	251405	1033	204476.68	197	3897.71	15.63	2196641	1364.33
2000	6.38E+09	29983000	1254674	4420.44	211340	2914.29	247317.02	19	5631.85	60.19	1914650	683
2001	6.13E+09	28996700	1438883	5038.29	196975.7	579.75	247204.25	4	6550.45	36	2081265	990
2002	6.51E+09	29723000	1634870	6298	225684	489.28	289406.17	7	6779.78	58	2251756	916
2003	7.56E+09	36290000	1864784	9923	278005.2	300	326561.42	17	5213.7	53	2641857	1136.68
2004	9.1E+09	45720000	2218718	9732	284532.5	210.97	310740.41	30	6116.83	99	3180789	1222
2005	1.04E+10	51874000	1875987	9022	313107.8	322	244183.77	8	6288.26	12.95	3124265	1989

IMPORTS (1000 US $)

Product	Total merchandise		Potatoes		Potato Flour		Potato Starch		Tapioca of potatoes		Frozen Potatoes	
Region	World	SA	World	SA	World	SA	World	SA	World	SA	World	SA
1990	3.6E+09	17076368	1325273		128348.3	1035	255859		4662.4		701478.6	
1991	3.62E+09	17499904	1853682		160790.5	996.8	310046.5		5929.21		863114.6	
1992	3.88E+09	18451800	1752828	348	177985.5	586	334423.7	1174	12565.57	255	934913.8	46
1993	3.79E+09	18050200	1223842	328.16	204120.3	820.96	281809.6		7470.06	56	978538.4	
1994	4.32E+09	21538900	1744768	307	255273.2	634	293234	1287	6072.57	259.41	1294007	97
1995	5.15E+09	26837900	2462849	229	335230.6	1536	374305.5	1729	7221.45	434	1739152	129
1996	5.39E+09	27035800	1795880	81	338539.4	1774	366216.6	1942	7297.79	264	1614572	272
1997	5.57E+09	31242600	1484104	64	297122.5	1230	315503.5	1106.43	8081.42	401	1630708	244
1998	5.52E+09	26786200	1973686	12.25	286991.6	1035	294028.4	1445	7626.2	370	1904261	427.75
1999	5.76E+09	24079500	2005370	77.54	316264.3	1060	291314.7	1193.92	8303.04	291.43	2316113	107
2000	6.54E+09	29695000	1461248	246.8	358554.4	727.69	308310.2	1673	10120.53	250	2120503	209
2001	6.3E+09	28040300	1568163	2.22	303290.9	679.62	307646.1	1186	14636.2	240.23	2328929	110
2002	6.63E+09	29267000	1843727	196	339845.5	837.82	316791.6	973	15211.19	158.3	2297067	57
2003	7.74E+09	40670000	2077110	208	420275.4	809.12	364550.9	983	25082.9	424	2638381	324
2004	9.34E+09	48240000	2356848	1.5	356210.9	1241.4	374184.6	1139	19861.08	492.36	3176056	2948
2005	1.07E+10	66500000	2054030	7	366143.1	1238.3	391476.2	1386.71	14692.42	806	3078068	6713

Source: *FAOSTAT, 2008*

APPENDIX 3: OUTPUT, CALCULATIONS AND CONVERSIONS

Table A3.1: RXA, RMP and RTA Indices for South Africa

	POTATOES			POTATO FLOUR			STARCH			TAPIOCA			FROZEN		
	RXA	RMP	**RTA**	RXA	RMP	**RTA**	RXA	RMP	**RTA**	RXA	RMP	**RTA**	RXA	RMP	**RTA**
1990				0.49	1.71	**-1.21**	0.01			0.65			0.14		
1991				0.08	1.28	**-1.20**	0.01			1.92			0.18		
1992	0.21	0.04	**0.17**	0.11	0.69	**-0.58**	0.01	0.74	**-0.73**	0.20	4.33	**-4.13**	0.03	0.01	**0.02**
1993		0.06		0.22	0.84	**-0.62**	0.02			1.39	1.58	**-0.19**	0.35		
1994	0.25	0.04	**0.21**	0.16	0.50	**-0.34**	0.00	0.88	**-0.88**	2.09	8.90	**-6.81**	0.12	0.01	**0.11**
1995	0.37	0.02	**0.35**	0.42	0.88	**-0.45**	0.07	0.89	**-0.81**	0.07	12.20	**-12.13**	0.10	0.01	**0.08**
1996	0.76	0.01	**0.75**	1.11	1.05	**0.06**	0.18	1.06	**-0.88**	0.92	7.45	**-6.53**	0.16	0.03	**0.13**
1997	1.01	0.01	**1.00**	2.37	0.74	**1.63**	0.23	0.62	**-0.39**	2.94	9.26	**-6.32**	0.06	0.03	**0.04**
1998	0.77	0.00	**0.77**	2.23	0.74	**1.49**	0.27	1.01	**-0.74**	0.46	10.47	**-10.01**	0.11	0.05	**0.06**
1999	0.66	0.01	**0.65**	0.87	0.80	**0.07**	0.20	0.98	**-0.78**	0.85	8.66	**-7.81**	0.13	0.01	**0.12**
2000	0.75	0.04	**0.71**	2.96	0.45	**2.52**	0.02	1.20	**-1.18**	2.29	5.55	**-3.26**	0.08	0.02	**0.05**
2001	0.74	0.00	**0.74**	0.62	0.50	**0.12**	0.00	0.87	**-0.86**	1.16	3.73	**-2.57**	0.10	0.01	**0.09**
2002	0.84	0.02	**0.82**	0.47	0.56	**-0.08**	0.01	0.69	**-0.69**	1.88	2.37	**-0.49**	0.09	0.01	**0.08**
2003	1.11	0.02	**1.09**	0.22	0.37	**-0.14**	0.01	0.51	**-0.50**	2.13	3.25	**-1.13**	0.09	0.02	**0.07**
2004	0.87	0.00	**0.87**	0.15	0.67	**-0.53**	0.02	0.59	**-0.57**	3.26	4.90	**-1.64**	0.08	0.18	**-0.10**
2005	0.96	0.00	**0.96**	0.21	0.54	**-0.34**	0.01	0.57	**-0.56**	0.41	9.26	**-8.85**	0.13	0.35	**-0.22**

Source: Own calculation based on data from FAOSTAT, 2008.

Table A3.2: Foreign exchange rates - annual average of daily data - spot mid point quotes (unit: local currency per US $)

Year	Angola (Kwacha)	Malawi (Kwanza)	Mauritius (Rupee)	Mozambique (New Metical)	SA (Rand)	Zimbabwe (Dollars)
1996	0.13	15.31	17.95	11.52	4.30	0.01
1997	0.23	16.44	21.06	11.77	4.61	0.01
1998	0.39	31.07	23.99	12.11	5.53	0.02
1999	1.97	43.95	25.14	12.64	6.11	0.10
2000	8.40	59.42	26.12	15.38	6.94	0.11
2001	20.48	72.52	29.07	20.52	8.62	0.14
2002	43.05	76.22	29.95	23.28	10.51	0.14
2003	74.33	96.17	27.97	23.26	7.55	1.56
2004	83.20	108.01	27.51	22.11	6.45	11.89
2005	86.57	117.59	29.38	22.91	6.37	57.55
2006	80.37	135.84	31.64	26.00	6.77	249.79

Source: *IMF-IFS & global insight*

Table A3.3: Diagnostic tests on ECM

Test	**H_0**	**Test Statistic**	**p-Value**	**Conclusion**
Jarque-Bera	Normally distribution	JB =0.71	0.70	Normal residuals
Ljung-Box Q	No autocorrelation	$LB_Q(6)$ =3.03	0.81	No autocorrelation
Breusch-Godfrey	No autocorrelation	$nR^2(2)$ =3.86	0.05	No autocorrelation
ARCH LM	No heteroskedasticity	$nR^2(2)$ = 0.80	0.67	No heteroskedasticity
White	No heteroskedasticity	nR^2(no CT) = 8.60	0.20	No heteroskedasticity
Ramsey RESET	Stable parameters	LR(0) =0.17	0.68	Stable Parameters

Table A3.4: ECM estimation output

Dependent Variable: DLSA
Method: Least Squares
Date: 02/19/08 Time: 15:55
Sample(adjusted): 1997 2005
Included observations: 9 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RES_MM(-1)	-1.739026	0.249903	-6.958792	0.0009
DLMAU	1.193144	0.148746	8.021336	0.0005
DLMOZAQ	0.700832	0.124757	5.617574	0.0025
C	0.008488	0.013580	0.625053	0.5594

R-squared	0.979256	Mean dependent var	0.061146
Adjusted R-squared	0.966810	S.D. dependent var	0.177850
S.E. of regression	0.032401	Akaike info criterion	-3.720159
Sum squared resid	0.005249	Schwarz criterion	-3.632503
Log likelihood	20.74071	F-statistic	78.67854
Durbin-Watson stat	1.453694	Prob(F-statistic)	0.000125

Dependent Variable: DLSA
Method: Least Squares
Date: 12/13/09 Time: 16:40
Sample: 1996 2005
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RES_NETHER	0.406510	0.348955	1.164934	0.2822
LNETHER	-0.000676	0.134512	-0.005028	0.9961
C	0.029471	0.625095	0.047146	0.9637

R-squared	0.167598	Mean dependent var	0.026345
Adjusted R-squared	-0.070231	S.D. dependent var	0.200567
S.E. of regression	0.207490	Akaike info criterion	-0.064138
Sum squared resid	0.301366	Schwarz criterion	0.026637
Log likelihood	3.320692	F-statistic	0.704701
Durbin-Watson stat	1.268801	Prob(F-statistic)	0.526217

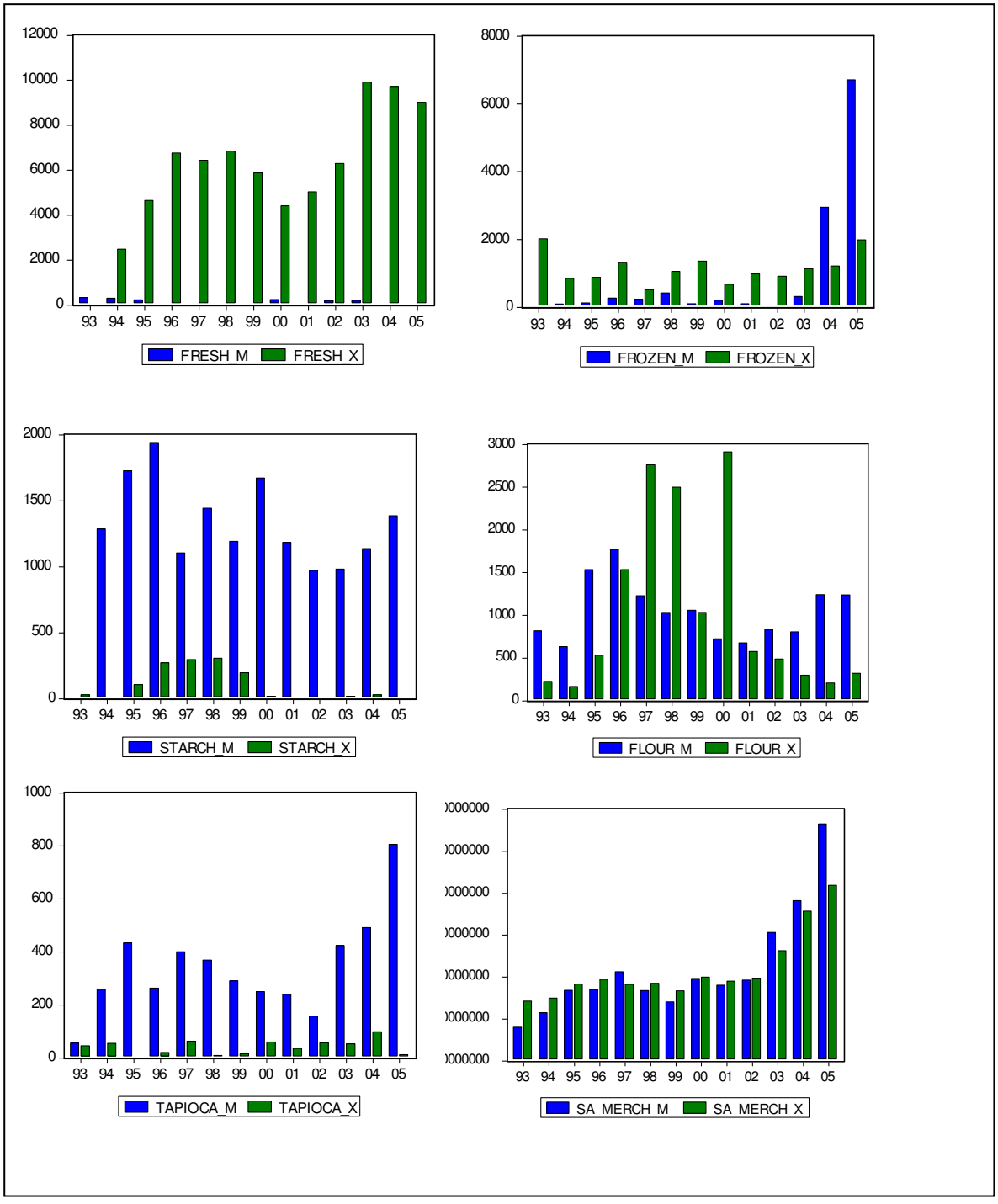
Table A3.5: Granger-Causality Tests

Pairwise Granger Causality Tests
Date: 02/27/08 Time: 18:23
Sample: 1991 2005
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Probability
DLMOZAQ does not Granger Cause DLSA	11	0.50740	0.69803
DLSA does not Granger Cause DLMOZAQ		5.11687	0.07436
DLZIMB does not Granger Cause DLSA	11	2.30223	0.21886
DLSA does not Granger Cause DLZIMB		0.92089	0.50724
DLMAU does not Granger Cause DLSA	11	0.14729	0.92625
DLSA does not Granger Cause DLMAU		0.35977	0.03634
DLMALAWI does not Granger Cause DLSA	11	1.06128	0.45853
DLSA does not Granger Cause DLMALAWI		4.42104	0.09252
LWORLD does not Granger Cause DLSA	11	1.21448	0.41255
DLSA does not Granger Cause LWORLD		9.76183	0.02597
DLZIMB does not Granger Cause DLMOZAQ	11	0.29274	0.82967
DLMOZAQ does not Granger Cause DLZIMB		0.04631	0.98494
DLMAU does not Granger Cause DLMOZAQ	11	0.86220	0.52973
DLMOZAQ does not Granger Cause DLMAU		1.92404	0.26731
DLMALAWI does not Granger Cause DLMOZAQ	11	0.06129	0.97758
DLMOZAQ does not Granger Cause DLMALAWI		1.96977	0.26065
LWORLD does not Granger Cause DLMOZAQ	11	0.52712	0.68707
DLMOZAQ does not Granger Cause LWORLD		1.59405	0.32365
DLMAU does not Granger Cause DLZIMB	11	1.04600	0.46350
DLZIMB does not Granger Cause DLMAU		3.27934	0.14064
DLMALAWI does not Granger Cause DLZIMB	11	0.46888	0.72003
DLZIMB does not Granger Cause DLMALAWI		0.09459	0.95907
LWORLD does not Granger Cause DLZIMB	11	0.88077	0.52247
DLZIMB does not Granger Cause LWORLD		1.31779	0.38517
DLMALAWI does not Granger Cause DLMAU	11	1.50989	0.34079
DLMAU does not Granger Cause DLMALAWI		0.77184	0.56709
LWORLD does not Granger Cause DLMAU	11	0.87856	0.52332
DLMAU does not Granger Cause LWORLD		24.6795	0.00484
LWORLD does not Granger Cause DLMALAWI	11	0.47549	0.71620
DLMALAWI does not Granger Cause LWORLD		0.55038	0.67439

APPENDIX 4: DISTRIBUTION GRAPHS AND TABLES

Figure A4.1: Comparison of S.A Exports to and Imports from world (1000 US $)



Empirical Distribution of ϕ_3

Sample	Probability of a smaller value							
Size (T)	0.01	0.025	0.05	0.10	0.90	0.95	0.975	0.99
25	0.74	0.90	1.08	1.33	5.91	7.24	8.65	10.61
50	0.76	0.93	1.11	1.37	5.61	6.73	7.81	9.31
100	0.76	0.94	1.12	1.38	5.47	6.49	7.44	8.73
250	0.76	0.94	1.13	1.39	5.39	6.34	7.25	8.43
500	0.76	0.94	1.13	1.39	5.36	6.30	7.20	8.34
∞	0.77	0.94	1.13	1.39	5.34	6.25	7.16	8.27

Source: Dickey and Fuller (1981)

Empirical Distribution of ϕ_1

Sample	Probability of a smaller value							
Size (T)	0.01	0.025	0.05	0.10	0.90	0.95	0.975	0.99
25	0.29	0.38	0.49	0.65	4.12	5.18	6.30	7.88
50	0.29	0.39	0.50	0.66	3.94	4.86	5.80	7.06
100	0.29	0.39	0.50	0.67	3.86	4.71	5.57	6.70
250	0.30	0.39	0.51	0.67	3.81	4.63	5.45	6.52
500	0.30	0.39	0.51	0.67	3.79	4.61	5.41	6.47
∞	0.30	0.40	0.51	0.67	3.78	4.59	5.38	6.43

Source: Dickey and Fuller (1981)

Critical Values for the Standard Normal Distribution – n(0,1)

Probability of a smaller value							
0.01	0.025	0.05	0.10	0.90	0.95	0.975	0.99
-2.33	-1.96	-1.65	-1.28	1.28	1.65	1.96	2.33

Response Surfaces for Critical Values of Cointegration Tests

n	Model	Point (%)	ϕ_∞	SE	ϕ_1	ϕ_2
2	Constant, no trend	1	-3.9001	(0.0022)	-10.534	-30.03
		5	-3.3377	(0.0012)	-5.967	-8.98
		10	-3.0462	(0.0009)	-4.069	-5.73
2	Constant + trend	1	-4.3266	(0.0022)	-15.531	-34.03
		5	-3.7809	(0.0013)	-9.421	-15.06
		10	-3.4959	(0.0009)	-7.203	-4.01
3	Constant, no trend	1	-4.2981	(0.0023)	-13.790	-46.37
		5	-3.7429	(0.0012)	-8.352	-13.41
		10	-3.4518	(0.0010)	-6.241	-2.79
3	Constant + trend	1	-4.6676	(0.0022)	-18.492	-49.35
		5	-4.1193	(0.0011)	-12.024	-13.13
		10	-3.8344	(0.0009)	-9.188	-4.85
4	Constant, no trend	1	-4.6493	(0.0023)	-17.188	-59.20
		5	-4.1000	(0.0012)	-10.745	-21.57
		10	-3.8110	(0.0009)	-8.317	-5.19
4	Constant + trend	1	-4.9695	(0.0021)	-22.504	-50.22
		5	-4.4294	(0.0012)	-14.501	-19.54
		10	-4.1474	(0.0010)	-11.165	-9.88
5	Constant, no trend	1	-4.9587	(0.0026)	-22.140	-37.29
		5	-4.4185	(0.0013)	-13.641	-21.16
		10	-4.1327	(0.0009)	-10.638	-5.48
5	Constant + trend	1	-5.2497	(0.0024)	-26.606	-49.56
		5	-4.7154	(0.0013)	-17.432	-16.50
		10	-4.4345	(0.0010)	-13.654	-5.77
6	Constant, no trend	1	-5.2400	(0.0029)	-26.278	-41.65
		5	-4.7048	(0.0018)	-17.120	-11.17
		10	-4.4242	(0.0010)	-13.347	0.0
6	Constant + trend	1	-5.5127	(0.0033)	-30.735	-52.50
		5	-4.9767	(0.0017)	-20.883	-9.05
		10	-4.6999	(0.0011)	-16.445	0.0

Source: MacKinnon (1991)

Percentage Points of the Asymptotic Distribution of τ_α in Model A
Time of Break Relative to Total Sample Size: λ

λ =	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1%	-4.30	-4.39	-4.39	-4.34	-4.32	-4.45	-4.42	-4.33	-4.27
2.5%	-3.93	-4.08	-4.03	-4.01	-4.01	-4.09	-4.07	-3.99	-3.97
5%	-3.68	-3.77	-3.76	-3.72	-3.76	-3.76	-3.80	-3.75	-3.69
10%	-3.40	-3.47	-3.46	-3.44	-3.46	-3.47	-3.51	-3.46	-3.38
90%	-1.38	-1.45	-1.43	-1.26	-1.17	-1.28	-1.42	-1.46	-1.37
95%	-1.09	-1.14	-1.13	-0.88	-0.79	-0.92	-1.10	-1.13	-1.04
97.5%	-0.78	-0.90	-0.83	-0.55	-0.49	-0.60	-0.82	-0.89	-0.74
99%	-0.46	-0.54	-0.51	-0.21	-0.15	-0.26	-0.50	-0.57	-0.47

Source: Perron (1989)

Percentage Points of the Asymptotic Distribution of τ_α in Model B
Time of Break Relative to Total Sample Size: λ

λ =	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1%	-4.27	-4.41	-4.51	-4.55	-4.56	-4.57	-4.51	-4.38	-4.26
2.5%	-3.94	-4.08	-4.17	-4.20	-4.26	-4.20	-4.13	-4.07	-3.96
5%	-3.65	-3.80	-3.87	-3.94	-3.96	-3.95	-3.85	-3.82	-3.68
10%	-3.36	-3.49	-3.58	-3.66	-3.68	-3.66	-3.57	-3.50	-3.35
90%	-1.35	-1.48	-1.59	-1.69	-1.74	-1.71	-1.61	-1.49	-1.34
95%	-1.04	-1.18	-1.27	-1.37	-1.40	-1.36	-1.28	-1.16	-1.04
97.5%	-0.78	-0.87	-0.97	-1.11	-1.18	-1.11	-0.97	-0.87	-0.77
99%	-0.40	-0.52	-0.69	-0.75	-0.82	-0.78	-0.67	-0.54	-0.43

Source: Perron (1989)

Percentage Points of the Asymptotic Distribution of τ_α in Model C
Time of Break Relative to Total Sample Size: λ

λ =	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1%	-4.38	-4.65	-4.78	-4.81	-4.90	-4.88	-4.75	-4.70	-4.41
2.5%	-4.01	-4.32	-4.46	-4.48	-4.53	-4.49	-4.44	-4.31	-4.10
5%	-3.75	-3.99	-4.17	-4.22	-4.24	-4.24	-4.18	-4.04	-3.80
10%	-3.45	-3.66	-3.87	-3.95	-3.96	-3.95	-3.86	-3.69	-3.46
90%	-1.44	-1.60	-1.78	-1.91	-1.96	-1.93	-1.81	-1.63	-1.44
95%	-1.11	-1.27	-1.46	-1.62	-1.69	-1.63	-1.47	-1.29	-1.12
97.5%	-0.82	-0.98	-1.15	-1.35	-1.43	-1.37	-1.17	-1.04	-0.80
99%	-0.45	-0.67	-0.81	-1.04	-1.07	-1.08	-0.79	-0.64	-0.50

Source: Perron (1989)

Line graphs for stationary producer price series